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Site Details: 35 Camden Mews, London, Nw1 9BY

Prepared for: Threefold Architects

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Title: TA_35CM_AIA_001

Published Date: 21st April 2016

Report Index

## 1.0 – Summary of Instruction

An Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* was commissioned by our client, Threefold Architects.

The AIA and report are required in support of an application for planning consent, to demonstrate that development proposals at the above address will not adversely impact on the physiological health and/or the structural condition of nearby trees.

The development scheme relates to:

- Proposed partial demolition of a two storey 2-bedroom house and extension to a three storey 4-bedroom house, including alterations to front and rear elevations.

Instructions were to:

- Carry out a tree survey in accordance with the British Standard *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* to:
    - Prepare an Arboricultural Impact Assessment (AIA) to evaluate the potential direct and indirect effects of the proposed design and associated construction activity on nearby trees.
    - Categorise the trees at and adjacent (if applicable) to the site to ascertain their suitability for retention.
    - Identify the tree constraints to the development to assist with scheme feasibility, conception and design.
    - Make recommendations for measures to be taken to protect the retained trees during the development process, to safeguard their short and long term health and condition, including those trees which are situated on adjacent properties / land to the proposed development site (if applicable).
    - Provide all relevant tree data including species, dimensions, life stage, condition assessments and make preliminary management recommendations where necessary.
    - Highlight the arboricultural implications that the development process may have on the retained trees and provide a method statement to show the necessary controls required to mitigate those identified implications.
    - Produce findings in a written report for submission to the local planning authority.

The British Standard Institute publication *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations* is referred to throughout this report. This is a nationally recognised standard typically used by Local Planning Authorities to assess planning applications.
It is frequently referred to in planning conditions to enforce protection or control of works that may be harmful to trees both on and off the site.

This report has been produced in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations* for use by our client for planning purposes only. Information provided by third parties used in the preparation of this report is assumed to be correct.

2.0 – Report Limitations – (*The scope of this report is restricted by the following limitations*)

- *All observations of tree conditions were from ground level, a visual assessment of external features only, assisted as required by the use of binoculars, a metal probe and a rubber sounding mallet (used for audible resonance testing) where necessary.*
- *Below ground tree roots and buried parts were not inspected.*
- *The location of one Prunus avium (Wild Cherry) tree was included on the Proposed Site Plan provided by Threefold Architects. (Dwg.15103_100, Rev. C).*
- *The locations of two additional trees were measured as site conditions allowed during the tree survey and have been added to the Proposed Site Plan (Dwg.15103_100, Rev. C).*
- *The Proposed Site Plan (Dwg.15103_100, Rev. C) has been used to create the Tree Constraints and Tree Protection Plans in the Arboricultural Impact Assessment (AIA) report.*
- *All measurements of tree heights, crown spreads and crown clearance from ground level are recorded to the nearest half metre for dimensions up to 10m and to the nearest metre for dimensions over 10m.*
- *Stem diameters are measured to the nearest 10mm or where inaccessible, estimated based on the visible features and characteristics of the tree in question. Stem diameter measurements are adjusted in accordance with Table D.1 of Annex D in BS 5837:2012 as required.*
- *Detailed background information is not known concerning the past history of the site, the soil type, geology or hydrology of the environs. No inspection material has been acquired by Tree Sense Arboricultural Consultants for assessment by a laboratory.*
- *Geotechnical analysis and soil assessment will be necessary at the site to understand the soil structure and sub soil conditions in respect of the scheme feasibility.*
- *Assessing the potential influence of trees upon load-bearing soils beneath existing and proposed structures, resulting from water abstraction by trees on shrinkable soils, was not included in the contract brief and is not, therefore, considered in any detail in this report. Tree Sense Arboricultural Consultants cannot be held responsible for damage arising from soil shrinkage or heave issues related to the retention or removal of trees on site.*
- *The recommendations made in this report relate to the assessment of the trees and their surroundings at the time of inspection. Treatment recommendations assume that the client understands that tree management is a continuing process, requiring regular attention and that as part of this process the condition of the trees should be thoroughly reassessed at regular, timely intervals, with hazard checks after periods of likely tree stress, e.g. after periods of severe weather.*
- *Weather conditions were dry and bright on the day of the survey.*
- *Where a tree is subject to a Tree Preservation Order (TPO) and/or stands within a designated Conservation Area, it will be necessary for the tree owner or his/her appointed agent to ensure appropriate compliance with planning requirements, before any recommended, non-urgent treatments can be undertaken. (See Section 12).*
- *This report is compiled into a single PDF file designed for electronic release. If printing this document, please note that the plan drawings may be a different size or orientation to the standard A4 / portrait of the rest of the report. Some PDF reader software may also automatically adjust the size of drawings included in this report. The Tree Constraints Plan and Tree Protection Plan are drawn to the scale indicated in Sections 8.1 and 9.1.1 respectively.*

## 2.1 – Time Limits

It should be understood that trees are not static objects, but growing, living organisms; and their condition, size and relationship to buildings and other trees can change significantly and sometimes unpredictably over a period of time. Therefore this report has a validity period of 12 months from the date of publication and is subject to any suggested management recommendations being undertaken within the correct time frames.

## 2.2 – Severe Weather Limitations

Impacts of severe drought, storm, inundation, land slip or subsidence are not covered by this report.

## 2.3 – Tree Safety Matters / Tree Risk Assessment

The Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 (Trees in relation to design, demolition and construction - Recommendations)* is carried out in sufficient detail to gather data for and to inform the current project.

Our appraisal of the structural integrity of trees on and adjacent (if applicable) to the site is of a preliminary nature and sufficient only to inform the current project. The tree assessment is carried out from ground level as is appropriate for this type of survey, without invasive investigation.

The disclosure of hidden tree defects cannot therefore be expected. Whilst the survey is not specifically commissioned to report on matters of tree safety, we report obvious visual defects that are significant in relation to the existing and proposed land use. As such, General Management Recommendations (GMR) may be made regarding the assessed trees, in respect of good urban tree management.

## 2.4 – Visual Tree Assessment (VTA)

The Visual Tree Assessment (VTA) method of inspection is an internationally recognised tree hazard assessment method developed by Prof. Claus Mattheck: *Body Language of Trees – a handbook for failure analysis (HMSO, 1994).*

The basis of VTA is the identification of (external) symptoms which a tree produces in reaction to a weak spot or area of mechanical stress. These can then be interpreted in terms of potential direct impact hazard features within a tree.

The VTA method of inspection does not allow for opinions to be made concerning the risk of a trees potential to cause indirect impact on nearby structures. Indirect impact refers to potential problems caused by changes in soil moisture content in shrinkable soils (i.e. those soils with a high clay content); to which trees can be a contributing factor.

The tree inspection survey undertaken at the above site was conducted in accordance with Stage 1 of the VTA process.

3.0 – Background and Process

The development proposal at the above property is currently in the initial feasibility, planning and design stage.

The Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* was commissioned to be undertaken as part of the initial feasibility study at the planning stage of the process.

The elements of the AIA at this stage in the process were to undertake the tree survey, categorise the trees and identify the tree constraints to the development, with a view to assisting with the conceptual design and feasibility of the proposal.

The AIA was commissioned after an initial design proposal had been prepared and therefore, the tree constraints initially may not have been taken fully into consideration. The identified tree constraints should inform and assist with the final design, including any necessary engineering solutions and demolition/construction methods which will need to be explored in respect of minimising damage to retained trees in the short and long term, both above and below ground level. Additionally, the identified constraints will also determine the specification and positioning of tree protection measures to be employed at the site, to safeguard the trees above and below ground throughout the development process to completion.

Following the identification of tree constraints, the AIA evaluates the identified direct and indirect effects of the proposed design in relation to nearby trees. The assessment will consider the effect of any tree loss or damaging activities proposed in the vicinity of retained trees. Activities such as:

- *Removal of existing structures and/or hard surfacing.*
- *Installation of new hard surfacing.*
- *The location and dimensions of all proposed excavations or alterations in ground levels.*
- *Construction of new structures above ground level.*

In addition to the permanent works, account should be taken to the buildability of the scheme in terms of access, plant machinery use, adequate operational space and provision for the storage of materials including topsoil, without inflicting damage to the retained trees. Post development pressure on nearby trees must also be closely considered and assessed.

As well as an evaluation of the extent of the impact on existing trees, the AIA includes and details within this document:

*a) The tree survey;*

*b) Trees selected for retention, clearly identified (e.g. by number) and marked on a plan with a continuous outline;*

*c) Trees to be removed, also clearly identified (e.g. by number) and marked on a plan with a dashed outline or similar;*

*d) Trees to be pruned, including any access facilitation pruning, also clearly identified and labelled or detailed as appropriate;*

*e) Areas designated for structural landscaping that need to be protected from construction operations in order to prevent the soil structure being damaged;*

*f) Evaluation of impact of proposed tree losses (if applicable);*

*g) Evaluation of tree constraints and production of a draft tree protection plan including details of tree protection measures;*

*h) Issues to be addressed by an arboricultural method statement where necessary in conjunction with input from other specialists associated with the project.*

## 4.0 – General Site Observations

The site at 35 Camden Mews features a semi detached, two storey house, with front garden / driveway.

The front garden is entirely paved with a level area for off street vehicle parking located on the north side of the site. The parking area is accessed from the street (Camden Mews) via a rolling shutter style garage door.

In terms of significant trees, one mature *Prunus avium* (Wild Cherry) tree is located within a brick built retaining bed close to the front boundary of the site.
Additionally, the front garden features raised planting beds along both the north and south sides. The raised beds are also enclosed within low, brick built retaining walls. Each of these raised beds features one *Alianthus altissima* (Tree of Heaven).

A mature, climbing Wysteria is growing up the front face of the dwelling which is proposed to be removed. Other small ornamental shrubs and low laying plants feature in the front garden planting beds at the front of the property.

The rear of the property features a small paved courtyard at the south west side of the property. No trees are present in the rear courtyard.

Three significant trees were considered and recorded for inclusion in the Arboricultural Impact Assessment (AIA), all of which feature within the front garden.

It is understood that T1, the *Prunus avium* (Wild Cherry) is subject to a Tree Preservation Order (TPO) and the site features within the Camden Square Conservation Area.
(*As confirmed by Mr. Anir Unarkat at Camden Council by phone on the 20th April 2016*)

All trees considered in the *BS 5837:2012* AIA study are shown on the Tree Constraints / Tree Protection Plans in Sections 8.0 and 9.1 respectively.

Details of all the individual trees surveyed for inclusion can be found in the Individual Tree Data Table in Section 5.0 below, with further tree data comments provided in Section 5.2.

## 5.0 – Individual Tree Survey Data

| Tree No. | Species | Height (m) | Stem Diameter (mm) | Branch Spread (m) | First Significant Branch Height and Direction of Growth (m) | Canopy Height (m) | Life Stage | General Comments Inc. Physiological and Structural Condition | Preliminary Management Recommendations | Estimated Remaining Contribution (Years) | Category |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Prunus avium* *(Wild Cherry)* | 7 | 250 | N –2<br>E – 2<br>S – 2<br>W – 2 | 2 – NE | 4 | M | Physiological Condition – Fair<br>Structural Condition – Fair<br>Old grafted Cherry tree which has been heavily pruned in the past.<br>Suspected *Ganoderma pfeifferi* disease, due to a mature fruiting body bracket observed on the south side of the stem base.<br><br>*G. pfeifferi* is a parasitic fungus, the mode of decay being de-lignifying white rot, breaking down both Lignin and Cellulose in wood tissue and can lead to the stem failure.<br>Sounding hammer testing of the stem around the bracket suggested the heartwood is sound, however this does not guarantee the integrity of the underlying heartwood.<br>(See Tree Data Notes Section 5.2 below)<br><br>**Tree is subject to a Tree Preservation Order (TPO).** | GMR:<br><br>Due to the tree location in a high target area at the front of the property and the significance/mode of decay of the suspected *Ganoderma pfeifferi* disease, our recommendation would be to have the tree removed.<br><br>*Target Assessment: Front Garden, House, Camden Mews Carriageway.*<br><br>*TPO tree – Local Authority will need to grant permission for removal.*<br><br>**(See Tree Data Notes Section 5.2 below)** | _ | U |
| 2 | *Alianthus altissima* *(Tree of Heaven)* | 8 | 150 | N – <1<br>E – 2<br>S – 2<br>W – 2 | 4 – E | 5 | Y | Physiological Condition – Good<br>Structural Condition – Good<br>Located within the raised planter on the north side of the site. Major roots visible at ground level and appear to have caused direct impact damage to the retaining wall of the planting bed, where cracking and distortion was observed.<br><br>**In respect of scheme feasibility, this tree and the planting bed will need to be removed.** | Remove tree.<br><br>(Unavoidable in respect of scheme feasibility). | <10 | C 1 |
| 3 | *Alianthus altissima* *(Tree of Heaven)* | 9 | 125 | N – 2<br>E – 2<br>S – <1<br>W – 2 | 3 – E | 4 | Y | Physiological Condition – Good<br>Structural Condition – Fair<br><br>Located within the raised planter on the south side of the site. | _ | <10 | C 1 |

5.1 - Key to Table 5.0

1) Height describes the height of the tree from ground level in metres
2) Stem Diameter is the diameter of the trunk in millimetres measured at 1.5m from ground level. For multi stemmed trees, a single stem diameter equivalent (SE) is calculated and is indicated beneath the measurements of each separate stem. (Est.) indicates the stem diameter was estimated due to the tree being obscured and/or inaccessible to measure.
3) Branch Spread is the length of branch spread from the centre of the tree in the direction of each cardinal point in metres
4) First Significant Branch Height and Direction – Clearance h
5) eight from the ground of the first major structural branch of the trees' crown and it's direction of growth
6) Canopy Height is the distance between the lowest visible canopy branches and ground level in metres
7) Life Stage is represented as: Y= young (*in first third of life expectancy*), SM = Semi Mature (*in second third of life expectancy*), M= Mature (*final one third of life expectancy*). Trees considered to be beyond their likely life expectancy are normally classed as OM = Over Mature or V = Veteran
8) Physiological Condition relates to the vitality of the tree, Structural Condition relates to the presence of structural defects. *(i.e. dead branches, cavities, splits, included bark etc.)*
9) Estimated Remaining Contribution is an indication of the minimum useful contribution the tree will provide
10) Preliminary Management Recommendations detail any initial arboricultural practices to be undertaken before construction activity begins
11) Category grading is based on tree categorization guidelines provided within The British Standard 5837:2012 Trees In relation to design, demolition and construction - Recommendations (See 6.0 below)

Major deadwood = over 25m diameter, Minor deadwood = under 25mm diameter.

GMR = General Management Recommendation

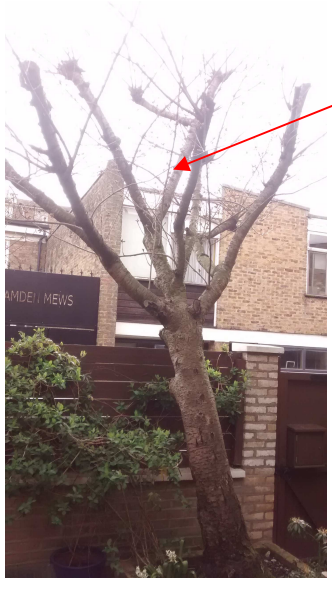
5.2 – Tree Data Notes

The trees detailed individually in Table 5.0 above are those to be considered as potentially affected by the proposed development project.

The tree survey identified that T1 is host to suspected *Ganoderma pfeifferi* disease, a parasitic, fungus which destroys both Lignin and Cellulose in wood tissue and can lead to stem failure.
The fruiting body observed at the stem base on the south side of the tree appears to be old, however, the fungus mycelium are likely to be active beyond what can be seen externally.

Sounding hammer testing around the bracket and stem base suggested that the underlying heartwood is intact; however, this is not a guarantee of the integrity of the heartwood.
Further semi invasive investigation using Resistograph or Picus tomography would need to be undertaken to ascertain a more accurate understanding of the heartwood condition, if the tree is to be retained. However, I do not believe this to be a cost effective measure to take as the tree does not provide overwhelming amenity value to the area and can be replaced with a healthy, young tree to mitigate its loss.

A fruiting body of suspected *Ganoderma pfeifferi* fungus was observed at the stem base on the southern side of the tree.



The Cherry tree (T1) in the front garden of 35 Camden Mews has been heavily pruned historically, and offers little or no amenity value.

The tree is considered to be in a high target area in close proximity to the Camden Mews carriageway.

It is recommended to have the tree removed due to the presence of *Ganoderma pfeifferi* fungus and have a replacement tree planted.

5.2 – Tree Data Notes – Cont'd

In the context of safety and tree owner duty of care, my professional opinion is that the tree should be removed, as the tree is host to an aggressive, parasitic disease which can severely undermine the structural integrity of the tree and may spread to other host species in the local vicinity.
The tree is considered to be in a high target area and may cause property damage or personal injury should the tree fail.
The tree in my opinion does not offer a high level of visual amenity to the area and has not been managed to a particularly good standard in the past. Planting of a new tree in its place would mitigate its loss and provide a more attractive, longer term amenity tree in the area.

**T1 is subject to a Tree Preservation Order (TPO) and is situated within a Conservation Area therefore, the decision to retain or remove the tree is ultimately that of the Local Authority.**

**Following a conversation with Ian Gracie, The Planning Officer at Camden Council on the 21st April 2016, it was concluded after referring the case to the Tree Officers that no objection would be raised to the removal of T1.**

**Following the removal of T1, it will need to be replaced with another tree which will be detailed further in terms of size and species by planning condition.**

Additionally and in respect of the proposed scheme design, T2 will need to be removed along with the raised planting bed on the north side to facilitate the proposed development. (See Tree Constraints Plan in Section 8.0).

Again, following the removal of T2, it is likely that a replacement tree will need to be planted. Similarly, this will be detailed further via planning condition.

For the purposes of the Arboricultural Impact Assessment (AIA), T1 and T2 will be shown as removed, in respect of the Tree Protection Plan and Arboricultural Method Statement (AMS).

Recommendations for tree surgery work may have been made in the interest of good tree management (*General Management Recommendations*) and are not necessarily required in relation to the proposed development project.
(I.e. the recommended removal of T1).

Any tree surgery work recommended must be undertaken following the correct procedures relating to trees protected by Tree Preservation Orders or which are growing within a designated Conservation Area. (See Section 12).

All recommended tree work must be undertaken in accordance with guidelines set out in *BS 3998:2010 Tree work – Recommendations.*

*The following sections provide information regarding the categorisation of the surveyed trees and the tree constraints identified following the tree survey at the site.*

## 6.0 – Tree Categorisation

The purpose of Tree Categorisation as detailed in *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*, is to identify the quality and value of existing tree stock, allowing informed decisions to be made concerning which tree(s) should be retained or removed should development occur. This process is the starting point of the tree survey, following a land survey and should, ideally, be undertaken before any site design or layout is proposed.

Once it has been established which trees are suitable to remain and are worthy of retention, the necessary measures to protect them throughout the course of the development project must be undertaken.

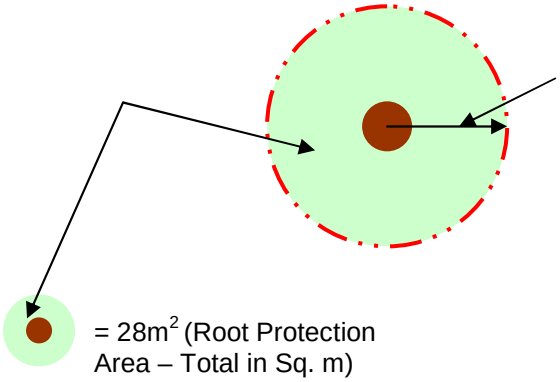
The following sections relate to the protection of the trees categorised for retention, during the construction process at the development site, and to trees which are growing adjacent to the development site.
The first of these sections identifies and details the tree constraints at the site, which are required to assist with the design proposal and scheme feasibility and to ensure the correct levels of tree protection measures are later applied.

## 7.0 - Tree Constraints

The tree constraints are the influences the trees will have below and above ground level in relation to the development area. The below ground restraints are represented by the trees Root Protection Area (RPA), the above ground restraints are represented by the trees size and position, including shading patterns caused by crown density and spread which may affect light into newly developed buildings.

## 7.1 - RPA (Root Protection Area) – (Below Ground Constraints)

The RPA radius is taken from the centre of the tree stem, encircling the tree to give the RPA Area (example based on T1 shown below) **:




** Tree root systems do not necessarily show the symmetry indicated in the above example, the development of all roots is influenced by the availability of water, nutrients, oxygen and soil penetrability. As far as these conditions allow, the root system tends to develop sufficient volume and area to provide physical stability.

The following table indicates the Root Protection Areas (RPA) for the trees which were assessed as part of the Arboricultural Impact Assessment (AIA).
The RPA's have been calculated using stem diameter measurements (at 1.5m above ground level) collected at the time of the tree survey and are detailed in Table 5.0.
RPA calculations are made using formulae detailed in *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* – Section 4.6 and Table D.1.

| Tree No. | RPA Radius (m) | RPA Area ($m^2$) |
|---|---|---|
| 1 | 3 | 28 |
| 2 | 1.8 | 10 |
| 3 | 1.5 | 7 |

To be removed

## 7.2 – Above Ground Constraints

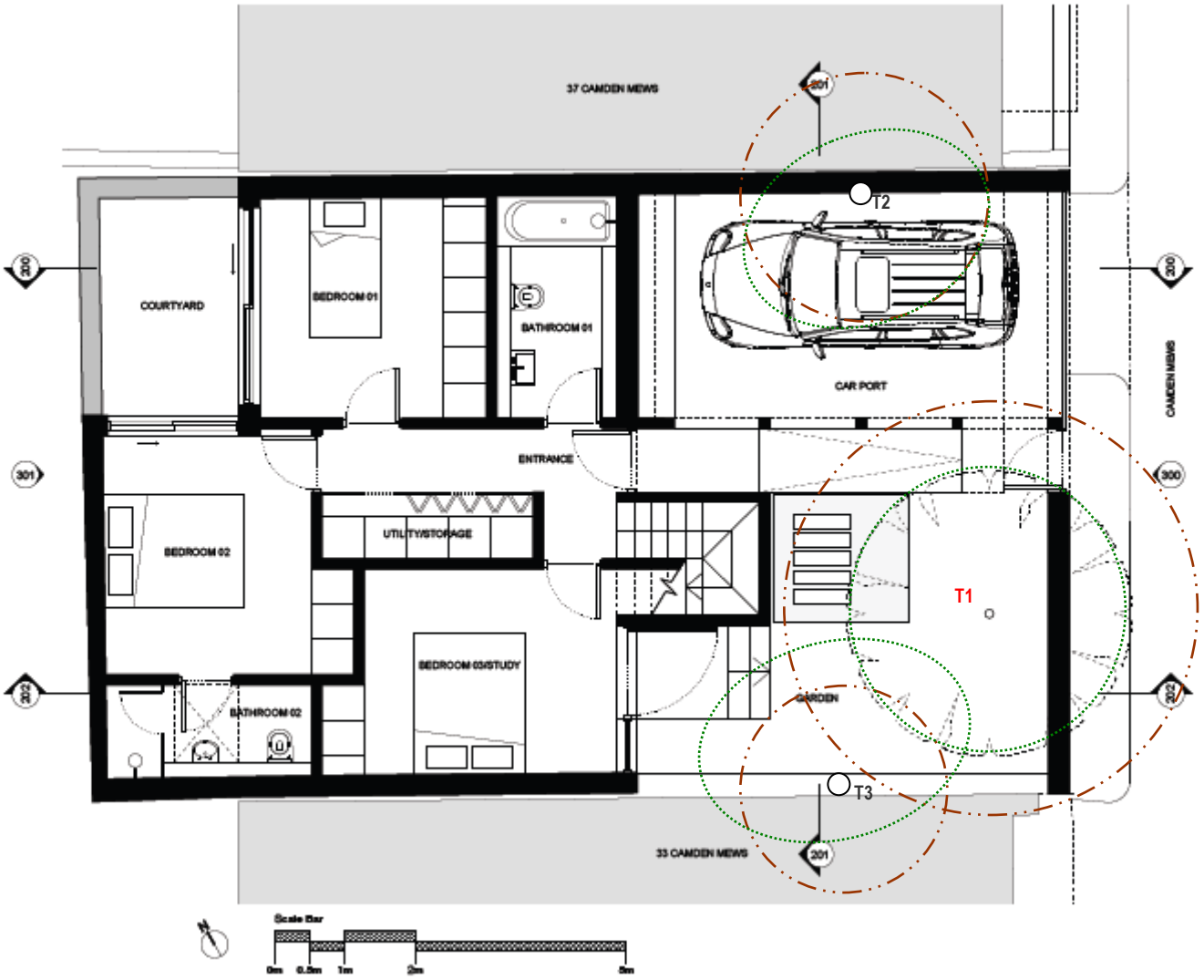
The above ground constraints caused by tree locations, height and the spread of branches can pose constraints to the development project in respect of demolition work, new building design, position and operational space requirements.
For example, if the lateral branch spread of a tree extends into areas where development activity is likely, there is a risk of potential direct impact from site machinery and construction activity on the tree crowns which may cause damage to branches. Tree stems and exposed buttress roots are also above ground constraints which need to be considered in respect of possible impact damage to them. Post development pressure is also of material consideration in respect of future tree pruning requirements and frequency following completion of the development.

Shading issues should also be considered in respect of tree size, form and position in relation to the proposed new structure.
Species characteristics such as density of foliage, and whether trees are deciduous or evergreen are important factors to consider in respect of shading issues which may affect light levels into the proposed dwelling.

Any proposals for above ground service installations such as telecommunication cables should also be considered with close reference to the above ground constraints posed by the trees at the development site, their location and their crown spreads.

The Tree Constraints Plans (TCP) and Tree Protection Plan (TPP) in Sections 8.0, 8.0.1 and 9.1 below, indicate the above and below ground constraints of all relevant trees at and adjacent to the site, with comments relating to the identified constraints in Sections 8.1 and 8.2.

## 8.0 – Tree Constraints Plan (TCP)




## Key to Symbols:

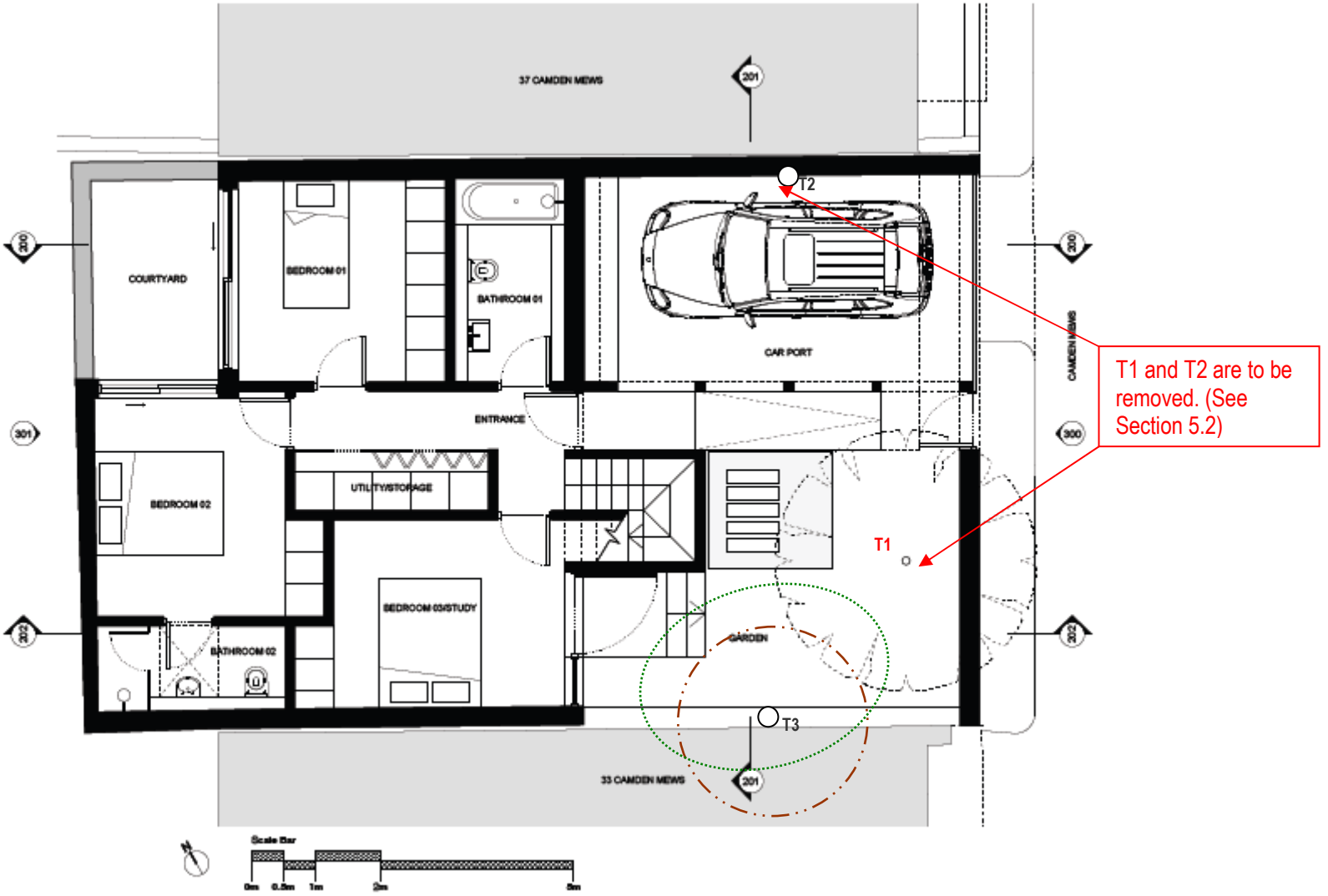
T# = Category C tree

T# = Category U tree - Remove

= Root Protection Area (RPA)

= Crown Spread (N, E, S, W)

8.0.1 – Tree Constraints Plan (TCP) – (Retained Trees Only)




## Key to Symbols:

T# = Category C tree

= Root Protection Area (RPA)

= Crown Spread (N, E, S, W)

## 8.1 - Tree Constraints Plan Notes:

The Tree Constraints Plan (TCP) in Section 8.0 is provided for illustrative purposes only, and is shown to approximate 1:100 scale based on the site plan provided by Threefold Architects.
Section 8.0.1 provides the Tree Constraints Plan (TCP) for retained trees only.

The TCP is provided only to indicate the position, category and numbering of the surveyed individual trees and provide an indication of the tree constraints by showing a graphic of the calculated Root Protection Areas (RPA) and the tree crown spreads.

RPA measurements can be found in the RPA table in section 7.1, crown spread measurements can be found in table 5.0 above.
**Only the RPA measurements detailed in section 7.1 are to be used to measure out and determine the positioning and installation of the Construction Exclusion Zone (CEZ) fencing and ground protection at the site (if required), unless otherwise detailed or advised.**

As described in section 7.1 above, tree root systems do not necessarily show the symmetry indicated in the above Constraints Plan, the development of all roots is influenced by the availability of water, nutrients, oxygen and soil penetrability. As far as these conditions allow, the root system tends to develop sufficient volume and area to provide physical stability.

Using the formula described in *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* (Section 4.6 of the standard), the calculated RPA should be shown as a nominal circle on the Tree Constraints Plan with a radius based on 12 times the stem diameter for a single stem tree.

8.2 – Tree Constraints Assessment & Findings

The identified constraints shown on the Tree Constraints Plan (TCP) in Section 8.0 were established following the tree survey, using data collected at that time.
The tree constraints are to be used to assist with the final design and feasibility of the project and to determine the layout of tree protection measures to create the Construction Exclusion Zones (CEZ) at the site.

- T1, is categorised as a 'U' grade tree (unsuitable for retention) and is to be removed due the presence of *Ganoderma pfeifferi* fungus;

- T2 poses a material constraint to the proposal and will need to be removed to facilitate the proposed development. The tree cannot be realistically retained in respect of the proposed scheme design.

In both cases, the loss of the above trees from the site will need to be mitigated by replacement planting of new trees. Details relating to the size and species required will be informed by planning conditions, as confirmed by Ian Gracie during our conversation of 21st April 2016.

The proposed extension at the rear of the dwelling incorporating the courtyard area does not impact on the retained tress above or below ground level.

The Tree Constraints Plan (TCP) in Section 8.0.1 is provided based on retained trees only, with the RPA's ,crown spreads and tree numbers removed to provide a clear indication of the constraints posed only by trees to be retained at the site.

In respect of the retained trees, none are shown to pose an above or below ground constraint to the development proposal in its current design. No RPA's are shown to be impacted upon by the proposed new extension development and no above ground constraints are posed by tree locations and/or crown spreads/heights. T3 is the only tree to be retained, and features within a small planting bed along the southern side of the site. The crown of the tree is minimal in terms of scaffold branches and shows good ground clearance of at least 4m.

To summarise, in terms of the proposed design, the Arboricultural Impact Assessment (AIA) can conclude that the scheme is feasible in the form of its current design without adversely impacting upon the physiological health or structural condition of retained on site trees.

Tree protection measures must be installed at the site to create Construction Exclusion Zones (CEZ) to safeguard the trees above and below ground level from the detrimental effects of construction activity etc.
If RPA's have been calculated to feature in areas of previously unmade ground, these should be wholly excluded where possible by barrier fencing or safeguarded using suitable ground protection measures as required.

In the case of T3, the shown RPA is not exposed in open/unmade ground, as it is located within a raised brick planting bed and the entire front garden is hard surfaced with paving slabs. The tree stem will need to be protected above ground level by the installation of simple fencing to prevent direct impact damage from site activity and prevent contaminate substances from being stored / spilled in the planting bed.
*(See Tree Protection Plan (TPP) in Section 9.1 and the Arboricultural Method Statement (AMS) in Section 10.1 below).*

Section 9.0 provides some general information concerning Construction Exclusion Zones and why they must be installed at sites where trees (including their RPA's) would otherwise be exposed to construction related damage.

The Tree Protection Plan (TPP) in Section 9.1 indicates the layout of the required CEZ measures, with further tree protection requirements detailed in Section 9.2.
All of the relevant arboricultural implications are addressed in Sections 10.0 and 10.1 below, detailing what control measures are required to mitigate the identified implications to the retained on site trees.

## 9.0 – Construction Exclusion Zone (CEZ) – (General)

Retained trees on and in close proximity to the site must be protected by barriers and/or suitable ground protection before any materials or machinery are brought onto the site, and before any demolition, development (including soil stripping) commences.

Where all activity can be excluded from the tree's Root Protection Area (RPA), vertical barriers are to be erected to create a Construction Exclusion Zone (CEZ). Where, due to site constraints construction activity cannot be fully or permanently excluded in this manner from all or part of a trees' RPA in unmade ground, suitable temporary ground protection is to be installed over exposed RPA sectors.

The RPA measurements of the surveyed trees (as shown in section 7.1 above) are used to determine the Construction Exclusion Zones (CEZ) around the trees, protecting them during the construction phases to eliminate the possibility of damage above or below ground level.
The CEZ is created by fencing off the area and/or installing suitable ground protection that is fit for purpose, using the calculated distance of the trees' RPA Radius as shown in the table in section 7.1 above.
The CEZ is required so that the calculated RPA's of trees remain undisturbed during the development process by excluding all activity from the area, or by protecting any exposed RPA sectors from pedestrian and vehicular traffic with suitable ground protection if exposed outside of the barrier fencing.
The CEZ should also be positioned to protect tree stems, buttress roots and any low tree branches which may travel beyond the calculated RPA. In these cases, barrier fences should be extended to incorporate the low crown branches behind them if possible.

The storage of building materials also must not occur within the CEZ. An area for storage of materials, fuels, spoil and the mixing of cement and concrete will be determined during the planning phase to ensure the RPA's of the trees are not affected. (See Arboricultural Method Statement (AMS) 10.1 below).
Materials which can be considered as contaminates such as cement, concrete mixings, spoil and fuels, whose accidental spillage would cause damage to a tree, should be stored and handled well away from the outer edge of any tree RPA. This also includes vehicle washings and care must be taken to ensure that sloping ground will not allow for contaminates to travel into the CEZ.

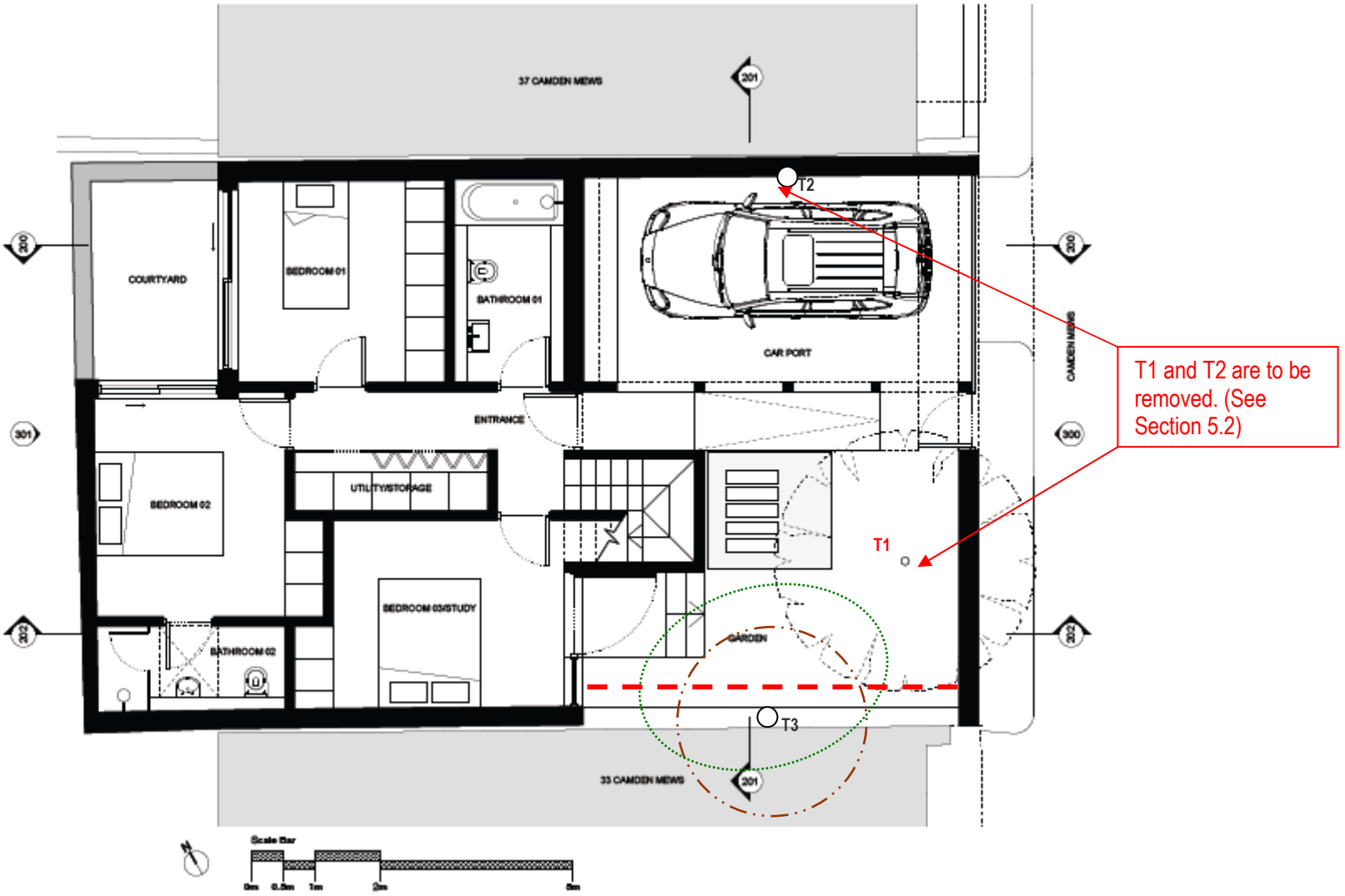
Fires on site should be avoided if possible. Where they cannot be avoided, they should not be lit where heat could affect foliage or branches. The potential size of the fire and wind direction should be taken into account when determining the fires location and it should be attended at all times until safe enough to leave. Notice boards, cables or other services must not be attached to the tree stems.

The CEZ must be considered as sacrosanct and not removed or altered without prior consultation with a Tree Sense Arboriculturist. The fencing should also display a sign with words to the effect of "Construction Exclusion Zone – Keep Out".

Care must also be taken to ensure that any site activity involving any cranes or vehicles with booms, jibs and counterweights can operate without coming into contact with the protected tree(s). CEZ fencing should be extended to encapsulate low spreading branches if they travel beyond the calculated RPA.

Direct impact from vehicles with tree crowns and stems can cause irreparable damage and may make their safe retention impossible. Consequently, any transit or traverse of plant in proximity to trees should be conducted under the supervision of a banksman, to ensure that adequate clearance from trees is maintained at all times.

## 9.1 – Tree Protection Plan (TPP)




**Key to Symbols:**

T# = Category C tree

= Root Protection Area (RPA)

= Barrier fencing

= Crown Spread (N, E, S, W)

9.1.1 – Tree Protection Notes

The above Tree Protection Plan (TPP) is for illustrative purposes only, and is shown to approximate 1:100 scale based on the proposed site drawing supplied by Threefold Architects.
The TPP is provided only to indicate the position, category and numbering of the surveyed trees to be retained and provide an indication of the tree constraints by showing a graphic of the calculated Root Protection Areas (RPA) and tree crown spreads.

Positions of barrier fencing are shown on the TPP and are to conform to the specifications detailed in Sections 9.2.
**Do not scale from this drawing, all dimensions to be checked on site using details provided in Sections 5.0 and 7.1.**

The barrier fence line shown on the TPP to create the front of site Construction Exclusion Zone (CEZ) is suggested as the simplest and most effective layout to exclude all construction activity from T3 above ground level.
The CEZ in this position will prevent all construction access beyond the fencing safeguarding the tree above ground level. The RPA of T3 will not be at risk of soil compaction at ground level, as the front garden is entirely hard surfaced with paving slabs affording adequate protection. The small area of open ground inside the planting bed will be excluded by the CEZ fencing to prevent contaminate substances from being stored or spilled in the raised planting bed.

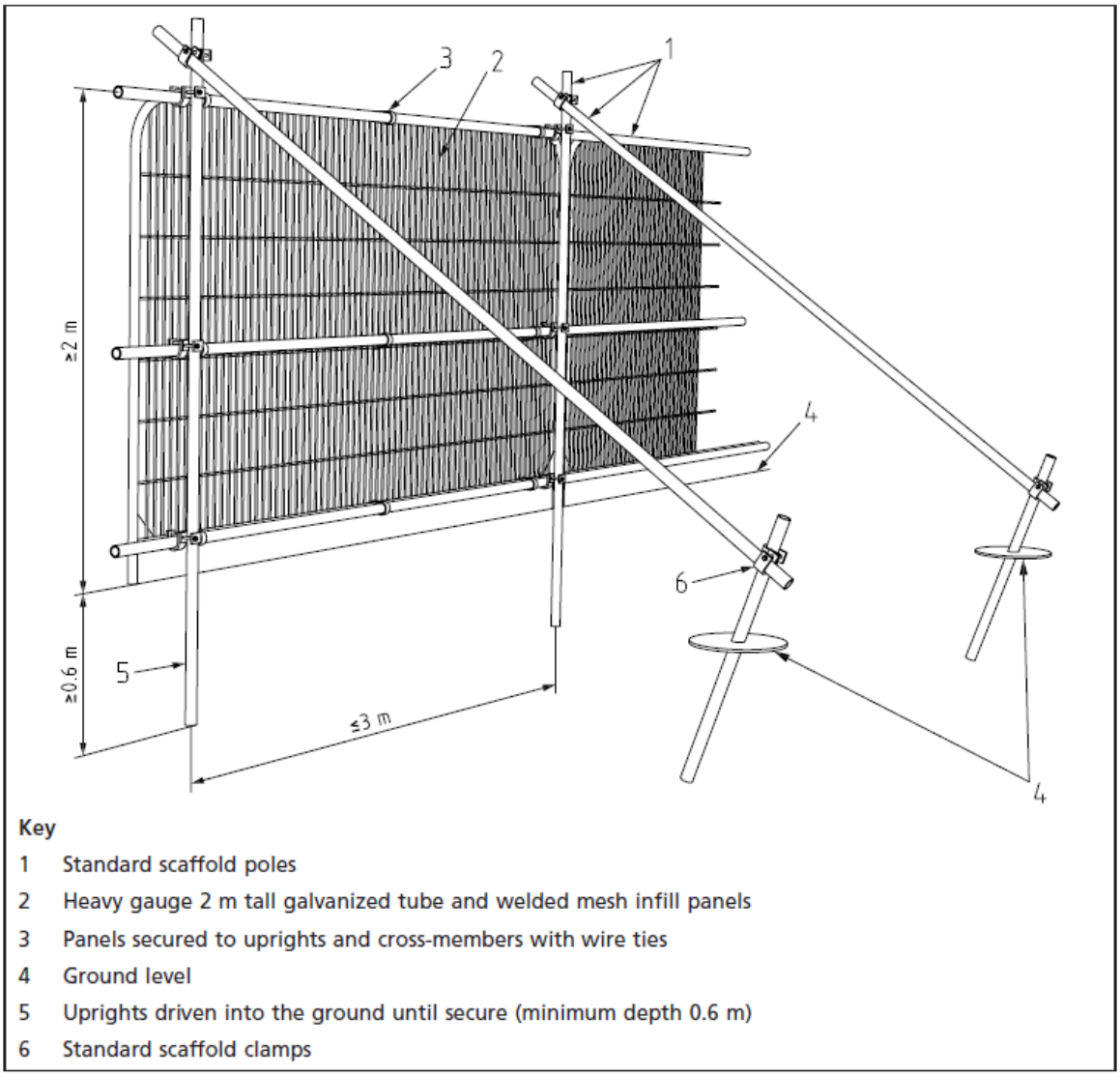
Tree protection measures are to be installed before development work begins and after any preliminary management recommendations have been completed. CEZ's are to remain in place throughout the course of the development process until completion and must be the final part of the work site to be dismantled and removed.

**CEZ fencing must conform to the specifications detailed in Section 9.2.**

*The following sections detail the Construction Exclusion Zone fencing and ground protection specifications as detailed in BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations*

## 9.2 - Protective Barrier Specification

**Figure 2 Default specification for protective barrier**

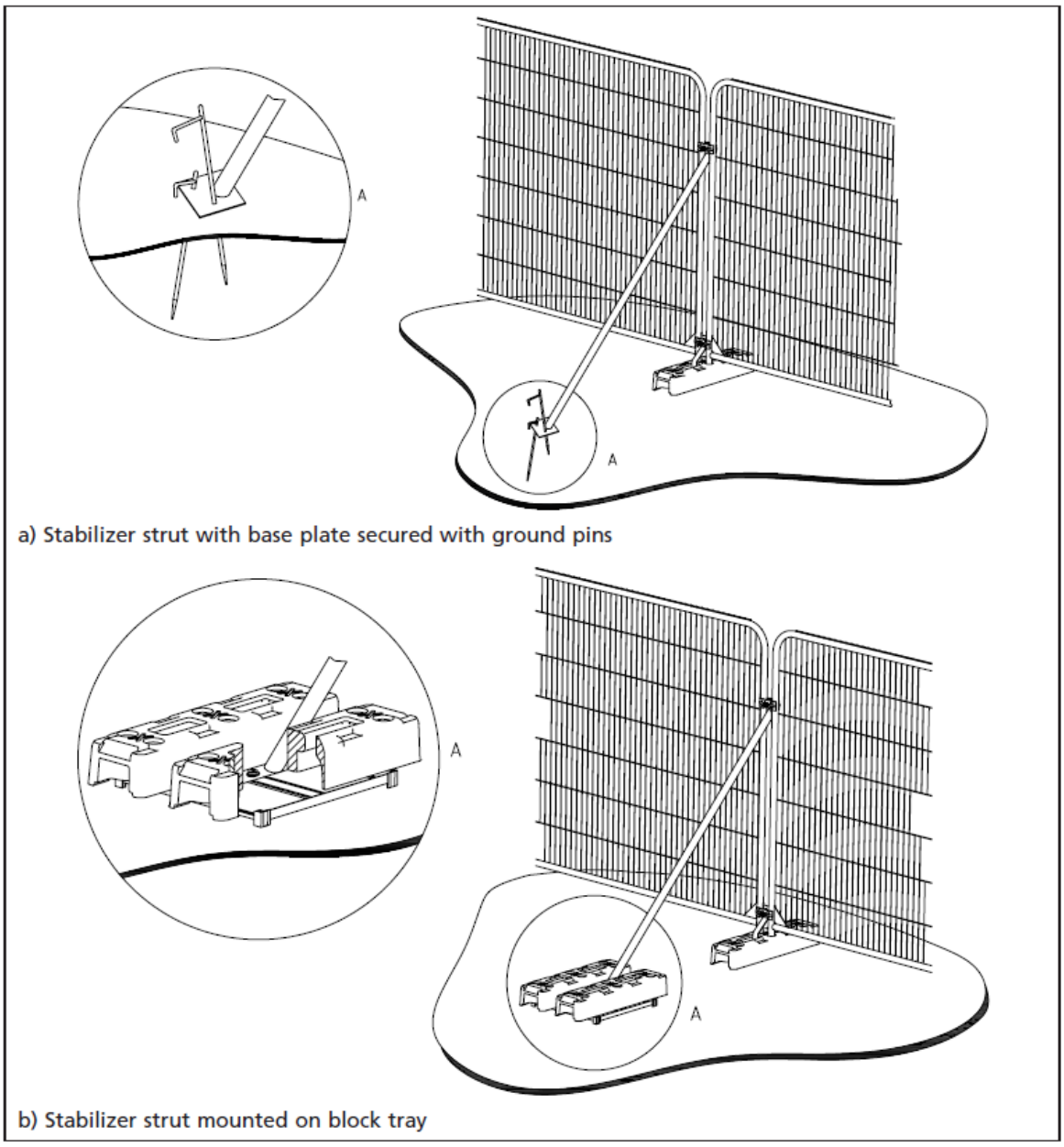



**Key**

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

N.B - Barrier fencing should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work being undertaken around them. In most cases, barrier fencing should conform to and be installed to the specification shown in figure 2 above. This specification of fencing is preferred as it is resistant to impact, can be re used and allows for inspection of the protected area.

Figure 3 **Examples of above-ground stabilizing systems**




a) Stabilizer strut with base plate secured with ground pins

b) Stabilizer strut mounted on block tray

N.B – Depending on the intensity of construction activity, site circumstances and associated risk of damaging incursion into a tree's RPA, an alternative level of protection may be suitable in place of the default level of protection.

Figures 3a and 3b above give examples of above ground stabilising systems which may be appropriate in certain circumstances.

**In the case of the development project at 35 Camden Mews, the Construction Exclusion Zone (CEZ) fencing to safeguard T3 above ground level will conform to the specification as shown in Figure 3b, due to the existing hard surfaced ground conditions present at the site.**

## 9.3 - Ground Protection Specification

Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier.

In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed.

Where the set-back of the tree protection barrier would expose unmade ground to construction damage, new temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site.

New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

The ground protection might comprise one of the following:

a) For pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) For pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) For wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

d) For wheeled or tracked movements, within a tree RPA, the ground protection should be designed by an engineer to accommodate the likely loading.
A “no dig” solution must be used to avoid root loss due to excavation. In addition the structure of the hard surface should be designed to avoid localized soil compaction. The use of a three dimensional cellular confinement system (CCS) acting as a load suspension layer is recommended and will avoid localized soil compaction by evenly distributing the carried weight over the track width and wheelbase of any vehicles that will use the access.

**Temporary ground protection measures are not required at the site, as all calculated RPA sectors for on site trees at ground level are present beneath existing hard standing.**

10.0 – Arboricultural Implications Assessment

The potential direct and indirect impacts on the trees which may arise from the proposed development and related construction activity, (identified following the tree constraints survey are as follows:

- **Soil compaction in tree root protection areas caused by**:
  - Development activity – pedestrian and plant movement around the site throughout the course of the development project;
  - Storage of bulk building materials at the site;
  - Skips and storage of bulk building waste before collection and removal from the site;
  - Temporary site unit positions and contractor's car parking areas.
- **Root severance caused by:**
  - Excavations for the proposed extension foundations;
  - Excavations for the installation of new underground services, including drainage and soakaways;
  - The removal of any existing hard surfaces.
- **Soil contamination caused by:**
  - Spilt or discharged building materials (including fuels and spillages resulting from the mixing and preparation of cement and concrete);
  - Building waste storage either short or long term (including skips).
- **Direct damage to trees above ground level (stems and crowns) caused by**:
  - Storing building materials against tree stems and buttress roots;
  - Vehicle collision with tree stems and crown branches;
  - Travel paths of crane booms and jibs coming into contact with tree crowns;
  - Fixing temporary lighting / signage etc to tree stems and branches;
  - Pruning of branches to facilitate operational space for the development;
- **Restriction of aqueous and gaseous exchange in the soil caused by:**
  - Non permeable hard surface installation in outside areas.

Site specific controls relating to mitigation measures to be implemented in respect of these implications can be found in the Arboricultural Method Statement 10.1 below.

10.1 – Arboricultural Method Statement (AMS)

The table below indicates the potential Arboricultural Implications at the site during the construction phases and details the appropriate control measures to be employed.

| Implication | Control |
|---|---|
| • **Soil compaction in Root Protection Areas (RPA)**<br>*Soil compaction by pedestrian movements and wheeled/tracked plant operations can cause tree root death by compacting soil to a state which is detrimental to tree root health. Heavily compacted soil restricts aqueous and gaseous exchanges in the soil environment which are vital for healthy root development.* | • T1 and T2 are to be removed prior to commencement of the build project.<br>• The RPA's calculated for retained trees at the front of the site (T3) feature entirely beneath existing hard standing (Paving).<br>• No RPA's feature in areas of open / unmade ground and are therefore, not at risk of soil compaction.<br>• If avoidable, building materials, waste (including skips), and temporary site facilities (if required) will not be stored / located in close proximity to T3.<br>• Contractor's car parking is available in paid parking spaces on nearby residential roads.<br>• All tree protection measures (Construction Exclusion Zone fencing), must be installed before any materials or machinery is brought on to the site. |
| • **Root severance**<br>*Root severance caused by excavations or by the removal of hard standings inside Root Protection Areas (RPA) can result in the loss of abundant fibrous root networks. This loss of roots can greatly reduce a trees ability to perform its physiological life processes. The loss of major woody roots can also compromise a tree's anchorage and greatly increase the risk of trees being wind thrown.* | • Excavations required for the construction of the proposed extensions will not feature inside the calculated RPA of any retained trees at the site.<br>• Geotechnical analysis and soil assessment by a structural engineer will be necessary at the site to understand in greater detail the soil structure and sub soil conditions in respect of foundation specification and design.<br>• No excavations are proposed to be required inside of tree RPA's for the installation of new underground services (such as drainage and water mains pipes, or soakaways etc).<br>• If required, their locations and positions will need to be determined with consideration to the below ground tree constraints shown in this report and with further consultation with the project Arboriculturist.<br>• Any tree roots which are exposed during the course of excavation works will be immediately wrapped or covered to prevent desiccation and protect from temperature changes whilst exposed and advised to the project Arboriculturist.<br>• Any roots exposed over 25mm in diameter will not be severed without prior consultation with the project Arboriculturist.<br>• Existing hard standings are to remain in situ throughout the course of the development and are not proposed to be removed. |

| | |
|---|---|
| • **Soil contamination**<br>*Soil contamination caused by the spillage of contaminate building materials such as concrete, fuels or paint for example, can severely pollute the soil in which tree roots populate. Heavily contaminated soil can lead to tree root death.* | • No areas of unmade ground feature at ground level at the site where retained tree RPA's have been calculated.<br>• A small area of open ground is present inside the raised planting bed where T3 is located. This will be excluded by the CEZ fence line to prevent contaminate materials being stored or spilled in the planting bed.<br>• All building materials and waste (including skips) will be stored outside of the Construction Exclusion Zone (CEZ) at all times.<br>• Contaminate materials such as oils, fuel, chemicals and gases will be stored and handled away from the CEZ and are to be stored and handled in accordance with the Control of Substances Hazardous to Health Regulations 2002 (COSHH).<br>• The preparation of building materials will occur only in designated areas at the site and outside of the CEZ at all times.<br>• Consideration will be given at all times to ensure that sloping ground will not allow for any contaminating substances to travel into areas where tree RPA's may be affected. |
| • **Direct damage to trees above ground level (stems, buttress roots and crowns)**<br>*Trees can be severely damaged by construction activity above ground level.*<br>*Tree stems, crown branches and buttress roots are all at risk of suffering direct impact damage from pedestrian and vehicle movements, material and waste storage around them, the use of cranes and other plant which use jibs or booms and by fixing temporary signs and lighting to them.* | • All building materials to be used at the site will be stored in designated storage areas at the site.<br>• Retained trees, (stems and buttress roots) will be excluded behind the Construction Exclusion Zone (CEZ) fencing, as indicated on the Tree Protection Plan in Section 9.1.<br>• All vehicles and plant machinery (if required) will only operate in areas outside of the CEZ.<br>• Retained tree stems and buttress roots will be wholly excluded and safeguarded against any potential vehicle collision damage by the CEZ barriers.<br>• The CEZ fencing will exclude all pedestrian and vehicle access to trees above ground level.<br>• Crown heights have been measured and do not pose a height clearance or crown spread constraint to the development or operational requirements.<br>• **The CEZ fencing must remain in situ throughout all phases of the development to completion and will be the last apparatus to be removed from the site.**<br>• No crane use has been proposed to be used at the site.<br>• No signage or temporary lighting is permitted to be fixed to any tree stem or branch.<br>• Site hoardings and fencing will display relevant signage with words to the effect of "Construction Exclusion Zone – Keep Out". |
| • **Restriction of aqueous and gaseous exchange in the soil**<br>*The installation of new, non permeable hard standings over tree Root Protection Areas (RPA) can greatly restrict water and oxygen from entering the underlying soil.*<br>*Tree roots depend heavily on goods availability of water, nutrients and the exchange of Oxygen, Nitrogen and Carbon Dioxide in the soil to survive.* | • New non permeable hard standings are not proposed to be installed in any areas of the site.<br>• Existing hard standings are to remain in situ throughout the course of the development to completion. |

10.2 - Responsibilities

- It will be the responsibility of the main contractor to ensure that the planning conditions attached to planning consent are adhered to at all times and that a monitoring regime in regards to tree protection is adopted on site.
- The main contractor must assign tree protection monitoring duties to one or more individuals working at the site, who will be responsible for all tree protection monitoring and supervision.
- The individual(s) assigned tree protection monitoring duties must:
    - Be present on site for the majority of the time;
    - Be fully aware of (a) the Tree Protection Plan and (b) the tree protection measures to be installed and maintained throughout all phases of demolition and construction;
    - Be responsible for ensuring all tree protection measures are adhered to as detailed in the Arboricultural Method Statement (AMS);
    - Ensure all site operatives **without exception** read and understand the tree protection and control measures detailed in the AMS;
    - Keep a written record signed by all site operatives indicating they have read and understood the control measures detailed in the AMS;
    - Maintain a written record of Tree Protection / Construction Exclusion Zone inspections, to be kept up to date by the person(s) who have been designated the inspection and monitoring duties;
    - Have the authority to stop any work that is causing, or has the potential to cause, harm to any retention trees;
    - Be responsible for ensuring that all site operatives including sub contractors are aware of their responsibilities toward on/off site trees and the consequences of the failure to observe these responsibilities;
    - Make immediate contact with the Project Arboriculturist in the event of any tree related problems occurring, whether actual or potential. *(Contact details including telephone number and email address is listed on the Title Page)*
- The Construction Exclusion Zone fencing and signs must be maintained in position at all times and checked on a regular basis by the on site person(s) who have been designated that responsibility.
- The main contractor will be responsible for contacting the Local Planning Authority and the Project Arboriculturist at any time issues are raised relating to the trees on site.
- If at any time pruning works are required permission must be sought from the Local Planning Authority first and then carried out in accordance with *BS 3998:2010 Tree Work – Recommendations* (As updated).
- The main contractor will ensure the build sequence and phasing is appropriate to ensure that no damage occurs to the trees during the construction processes. Protective fences will remain in position and undisturbed until completion of ALL construction works on the site.

The main contractor will be responsible for ensuring sub-contractors do not carry out any process or operation that is likely to adversely impact upon any tree on site.

## 11.0 - Report Summary

This report has been produced following a tree survey conducted in accordance with BS 5837:2012 Trees *in relation to design, demolition and construction – Recommendations*. The assessment seeks to advise the development team on arboricultural matters, assist with scheme feasibility and to advise on the tree protection measures to be employed at the site throughout all construction phases of the development.

The information produced within this report follows the tree survey conducted on the 8th April 2016. The report provides an assessment of the trees associated with the above development site, based on information supplied by the development team and observations recorded at the time of the survey.

It is concluded that the current proposed scheme is feasible from an arboricultural standpoint, based on the findings and recommendations detailed within this report.

The removal of T1 and T2 has not met with any objection from associated Planning / Tree Officers at Camden Council.
Following discussions on the 21st April 2016 with Ian Gracie, it was concluded that the above trees can be removed and their loss mitigated by replacement tree planting. Details of replacement tree sizes and species will be advised by Camden Council by way of a planning condition. The TPO afforded to T1 will be transferred to its replacement.

In terms of associated site activity, the protective Construction Exclusion Zone (CEZ) fencing to be installed at the front of the site will ensure the safeguarding of T3 above and below ground level. The calculated RPA of T3 currently features beneath existing hard standing (paving slabs) and is not at risk of soil compaction. The open ground of the raised planting bed where T3 is located will be excluded by the CEZ fencing.

All building material storage areas, site facilities, material preparation areas and general access around the site by operational staff will not be restricted by the CEZ fencing/hoarding.

If any design changes are made to any aspect of the proposed development project due to the identified tree constraints, operational restrictions, geotechnical concerns or otherwise, revisions or additions to tree protection, damage mitigation measures and site layouts will need to be made and a revised report produced.

This is a Development Control, not a Building Control focused document. In regard to the latter, this deals with foundation depth and design in relation to trees using NHBC/Zurich national guidance. For advice, consult with the local council Building Control Officer or an approved NHBC inspector in order to gain Full Plans Approval or a Completion Certificate. The latter are governed by the Building Act 1984 and Building Regulations 2010.
As such the above Building Control issues are outside the remit of a Consulting Arborist.

Full detailed specification of the development project and engineering methods etc. will be supplied by the development team separately.

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## 12.0 – Legal and Planning Consents

- Appropriate legal and planning consent should be gained before undertaking any tree work; for example if the tree(s) are subject to a Tree Preservation Order (TPO), permission must first be obtained from the Local Authority. Permission is not required for emergency tree work on dead, dying or dangerous TPO trees; however the Local Authority should be advised.
- Six weeks notice is required to be given to the local authority via a Section 211 Notice for any proposed tree surgery work on trees situated within a designated Conservation Area. Again, permission is not required for emergency tree work on dead, dying or dangerous trees within a Conservation Area; however the Local Authority should be advised.
- Tree owners have a responsibility as a common law duty of care, as well as responsibilities under statutory law, to ensure that trees growing within the boundaries of their property are maintained to reduce to an acceptable level the risk of potential harm befalling other people or property.
- In the course of undertaking any tree work, the client is advised to ensure that operational assessments and procedures are in place, and to take due consideration of the legal requirements.

- Key legislation includes (but is not restricted to):

    - The Wildlife and Countryside Act (1981)
    - Occupiers Liability Act (1957/84)
    - Highways Act (1980/86)
    - Town and Country Planning Act (1990/Regulations 1999/Amendment 2008/09)
    - Anti-Social Behaviour Act (2003) – Part 8 (High Hedges)
    - The Countryside Rights of Way Act (2000)
    - The Conservation (Natural Habitats etc.) Regulations (1994)
    - The Badgers Act (1992)

## 13.0 - Publications

- Other publications which are relevant to the development proposal to which further reference is advised includes but is not restricted to:

    - National House Building Council (N.H.B.C) Chapter 4.2 – (Building near trees);

    - National Joint Utilities Group (NJUG) Volume 4 – (Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees).

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