13491 Haverstock Hill

Cambridge Gate Properties

Arboricultural Report
JA Consulting

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Arboricultural Report

Relating to: 5-17 Haverstock Hill
Chalk Farm
London
NW3 2BP

Purpose of the Report:
The report is designed to fulfil the recommended criteria for the provision of arboricultural information in validating planning applications (ref: Department for Communities and Local Government Circular 02/2008 and the associated guidance document entitled 'Validation of Planning Applications')

Included within the contents of this report is:

- Full Tree Survey: Compliant to British Standard BS 5837 (2012): *Trees in relation to design, demolition and construction –Recommendations*
- Tree Impact Assessment detailing the Arboricultural Implications and potential impact from the proposed development on the local tree population. Outline trees to be retained, trees to be removed and appropriate tree protection measures to be implemented.
- Arboricultural Method Statement detailing any tree protection measures necessary, the implication of tree protection measures, phasing of works and any special requirements.
- Sufficient information to accompany a planning application submitted to the relevant authority

Report Produced for: Mr P Jess CBRE

Date: 19th April 2016

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Executive Summary

- This report is produced to accompany the planning application for the proposed works at Haverstock Hill garages. The project concerns the proposed demolition of the existing garage block and the construction of Private and social housing, consisting of studio, one, two and three bedroom properties with bike storage and play space. Office and retail space within the footprint of the current garage, with the potential for additional onsite facilities.

- The building is to be set back from the boundary wall that can be viewed at page: 42. This will reduce and in most cases remove incursions into the RPAs of trees numbered 27-37. Root incursions have been used to show percentages of incursions and can be viewed at pages: 4 and 5.

- The overall Arboricultural Impact of the development is considered **Low**:

- Initially a total of 37 trees were surveyed, however as the majority sit well outside the area proposed for development this has been reduced to the 13 off site trees that border the property and have the potential to impact upon this proposal.

- A total of 1 category C specimen tree is to be removed (entirely) as a consequence of this proposal; the breakdown is shown at the table below.

Breakdown of tree removals (Entire & Partial)			
Category A	***Category B***	***Category C***	***Category U***
0	0	1	0

- Tree to be removed as a consequence of this proposal is T2 a tree of low category with a limited life expectancy located on the roadside footway Haverstock Hill.

- T33 has been highlighted as having stem and scaffold decay; it has been graded as U (or at best a low C grade tree) and highlighted for removal. However this tree is an offsite tree (Eton Place) and its removal is not a prerequisite of the proposal. The tree is believed to be the subject of a Tree Preservation Order (TPO) Ref: C567/ 2006. It has also been recently heavily reduced and thereby decreasing the impact of the decay by reducing the wind sails of the canopy.

- Two trail holes were excavated to around 800mm depth in order to determine the depth of the foundation of the boundary wall and to establish if roots had passed through or underneath the foundations. This was at the base of T33 (Sycamore) and the base of 30 (Sycamore) on the eastern side of the boundary wall.

- The wall base was different in the two locations, the first By T33 being around 400mm to the base of the wall foundation with a depth of re-enforced concrete to a depth of around 250mm with crushed concrete to around 700mm. A root that was running parallel to the wall from the TPO'd Sycamore was found with at around 800mm and was 35mm thick. It appeared not to penetrate radially inwards to the site but was localised close to the wall. This is more likely due to water runoff from the wall and gaps between the wall and the adjacent kerb/ road edge.

- The second trial hole located to the front of the small garage adjacent to the edge of a concrete hard standing by T30, again 250mm thick was excavated to a depth of 800mm. The wall base was at 700mm and the root was found at a depth of 800mm, with a thickness of 75mm and again was very close to the wall and running parallel to it. The roots appeared to move slightly further out from the wall but the limit of penetration was not fully established.

- The holes were kept close to the wall and were no larger than around 800mm square.

- Any works in this area will need to be carried out under supervision. The roots may be severed but it is likely that this will have to be around 3-4m from the wall and will have to be determined by the appointed arboriculturalist at the time of excavation. Any decisions regarding root severance will need to be communicated with the local authority tree officer.

- Some overhang of canopies from trees numbered T28, T29, T30, T31, T32 and T37 may require facilitative pruning to allow the positioning of a piling rig if required. It is not anticipated that this will be more than 1-1.5m. However as the proposal shows that the existing roadway (or replacement) is to stay, crown lifting will be required for any high-sided vehicles such as potential waste freighters or delivery lorries to highway specifications.

- T37 will require crown lifting to a height of approximately 7m over the entrance and the roadway to allow access for delivery vehicles and any resurfacing works to the existing through road between the property and the boundary wall. Resurfacing works adjacent to the base of T37 will require monitoring by a competent aboriculturalist to ensure that roots are not impacted upon.

- 7 x individual trees located on the boundary with the neighbour's property have partial incursions of their RPAs by the existing wall and driveway (also restricting root activity and three of these trees will have minor incursion of no more than 4% due to the construction of the basement or building. These three will require Arboricultural supervision during excavation phases of the build as roots have been shown to stray across the boundary through the base of the wall. The depth of the foundation of the wall has shown some restricted root movement into the area immediately adjacent to the wall, though I do not consider that full penetration of the roots to the edge of the RPAs is likely. The latest proposals for the basement have limited the incursions into the full RPA by restricting the size of the basement. In addition the penetration of water along the base of the boundary wall appears to have concentrated root growth parallel with the wall with little radial movement of the roots. Supervision for any excavation works within the RPAs to the eastern side of the wall is a requirement during construction. The table below is intended to provide informed reasoning and is based on the assumption that roots have travelled unrestricted through/beneath the existing boundary wall and that any basement is flush to the wall. The new retaining wall highlighted green on the plan Appendix: 6 p: 40 is the extent to which the percentages are based against.

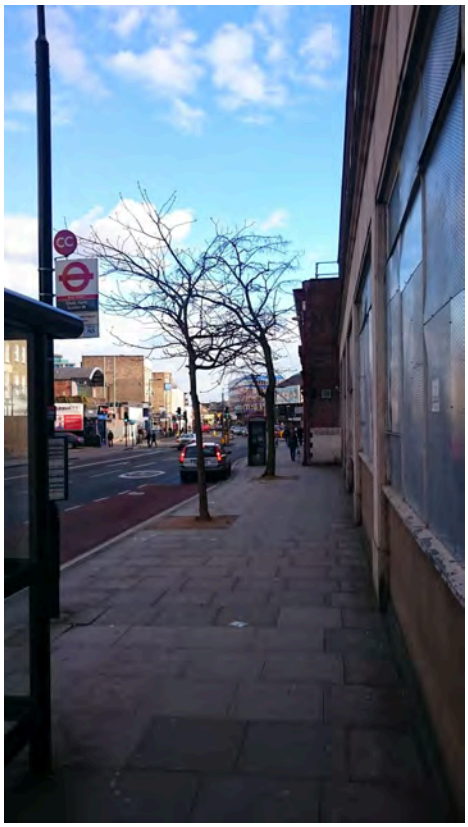
Trees requiring supervised excavation UKPN Cable Trenching				
Tree No.	***Species***	***Category***	***Activity to supervise***	***Nominal potential Incursion %***
T30	Sycamore	B2	Supervised trenching within the RPA	17.8%
T31	Sycamore	B2	Supervised trenching within the RPA	0.7%
T32	Sycamore	B2	Supervised trenching within the RPA	7.5%
T34	Common Pear	B2	Supervised trenching within the RPA	36.2%
T37	Sycamore	B2	Supervised trenching within the RPA	3.4%

Trees requiring supervised excavation due to basement construction				
Tree No.	***Species***	***Category***	***Activity to supervise***	***Actual Incursion %***
T32	Sycamore	B2	Supervised construction basement within the RPA	0.6%
T34	Common Pear	B2	Supervised construction basement within the RPA	21.1%

T33 has not been included as it is currently graded as a U grade tree

T27-T36

T37



T1-T2

G26 -T27

CONTENTS

Planning Considerations

- Under the Town and Country Planning Act 1990, local authorities have a statutory duty to consider the protection of trees and to require planting of trees when granting planning permission for proposed developments. The potential effect of development of trees, whether statutorily protected (e.g. by a tree preservation order or by their inclusion within a conservation area) or not, is a material consideration that is taken into account in dealing with planning applications.

- Trees can offer many benefits, including the provision of visual amenity, softening or complementing the effect of the built environment, and adding maturity to new developments by making places more comfortable in tangible ways by contributing screening and shade, reducing wind speed and turbulence, intercepting snow and rainfall, and reducing glare.

- Particular care is needed regarding the retention of large, mature trees that become enclosed within the new development**.** Where such trees are retained, adequate space should be allowed for their long-term physical retention and future maintenance. It is often forgotten that the RPA provided for trees is the minimum requirement and where large trees are to be retained in the interest of the development; additional space should be given to protect the root systems of these trees. Failure to do so will result in a waste of effort and financial resources and is likely to result in the decline or loss of these trees, it is therefore essential to give serious consideration to large individual trees within developments. Spaces such as greens or large roundabouts can provide the space for such trees as well as being a focal point within a development

- Trees may have the potential to provide valuable habitat for significant, red data book and protected species. It is recommended that consideration be given to the requirement for ecological surveys. These surveys are an essential tool when considering retaining poor quality species, that may at first sight appear to provide high habitat potential, but when surveyed are in fact lifeless hulks that provide little benefit as a habitat.

Design and Site Layout Considerations

- The trees locations can be found on the tree locations plan (TLP) at **appendix 5**.

- Details of the trees can be found within the tree survey schedule (TSS) at **appendix 2b.**

- Tree constraints (including the Root Protection Areas) and tree protection measures are shown on the Tree Protection Plan (TPP) at **appendix 6**.

- The Root Protection Area (RPA) is a layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority. The RPA is initially shown as a circle, the shape (but not size of area) may be adjusted to reflect physical constraints or topographical features limiting root activity. Prior to any adjustment of the trees RPA zones the changes should be assessed by a suitably experienced arboriculturalist. It is essential that during any site planning exercises the current and future growth potential of retained trees should be considered.

- The RPA for single stem trees broadly equates to a radius 12 times the stem diameter of

the tree at 1.5m above ground level or the extent of canopy spread, whichever is the greater. For multi- stemmed, low branching trees or those with trunks with an irregular girth the point of stem diameter measurement is adjusted in consideration of these factors and in accordance with the illustrations in British Standard BS 5837 (2012): *Trees in relation to design, demolition and construction –Recommendations*): (Annex C).

- The RPA should form part of a construction exclusion zone (CEZ) during development works. It should be fenced-off and protected in accordance with BS5837 (2012): Pages: 20-21. The canopy is likewise susceptible to damage during construction work and requires similar protection.

- No activities that result in excavations, changes in soil level or soil compaction should take place within the RPAs of any retained trees, especially older mature trees that are more susceptible to disturbance of their root systems. This includes the storage and mixing of materials, any construction work (including the erection of scaffolding and the excavation of service trenches or soakaways), movement by vehicles or even excessive trafficking by pedestrians.

- If construction has to take place within the RPA then certain measures need to be adopted to avoid disturbance or damage to the roots and to maintain moisture infiltration and gaseous diffusion into the soil.

- Services likewise should be routed (where possible) outside the existing or potential root zone of trees. Where it is unavoidable, then adherence to NJUG4: NJUG Guidelines For The Planning And Maintenance Of Utility Apparatus In Proximity To Trees (Issue 2) – Operative Handbook is required.

- The location and siting of new facilities near trees should consider the potential impact on and conflict with both below and above ground parts of the trees (roots, stem and canopy). This should take into account the ultimate size of existing young and middle-aged trees at maturity. Conversely the impact of the tree on the activities should also be considered with regard to maintenance of services and the potential for damage should the tree fail and damage the equipment or roots lift and damage below ground pipework or cables.

Outline boundary of site

Trees and Management of Health and Safety

- It is recommended that periodic arboricultural assessments be undertaken in order to regularly assess the full health and safety of all trees both in full leaf and following leaf fall. The assessments should be based on target, frequency of use and access. Trees known to have defects and that have been retained must be inspected at timescales set by a suitably experienced aboriculturalist with sufficient knowledge in risk management of tree

- All tree protection measures will be installed prior to any construction or development operations starting on site with locations viewed on the Tree Protection Plan (TPP) and details specified within the Arboricultrual Method Statement (AMS).

- Arboricultural supervision is only infrequently, periodically required to ensure that tree protection fencing is in place, to the required standard as described/shown in the AMS and on the TPP. A pre-start meeting is a must between all main parties.

- Care we need to be exercised by UKPN to ensure that their contractors comply with NJUG 4 guidance when installing the power cables.

Building Contractor

- The recommendations and instructions as specified within the AMS are vital in securing successful retention of the tree stock on site and any questions or areas of uncertainty can be willingly explained. If there are any areas of doubt or in need of further clarification the appointed arboricultural consultant must be contacted before proceeding.

- Tree protection is required throughout the development during the construction and tree protection must be installed prior to work starting on site. Once installed it must be signed off by the appointed arboricultural consultant. **This fencing and the areas it protects must be considered as sacrosanct, it must, under no circumstances be moved without the explicit written permission of the approved arboricultural consultant.**

- The TPP shows the location of the tree protection measures but exact locations should always be agreed on site with the appointed arboricultural consultant prior to the start of construction. This enables alterations to be made to maximize usable site space and prevent unnecessary costs. Tree protection can also double up as site security where possible.

- No materials are to be delivered in or onto CEZs or RPAs unless the RPAs have been covered with suitable ground protection and at the approval of the planning authority.

- **ALL TREE PROTECTION STAYS IN PLACE UNTIL ALL WORKS AND GROUND WORKS ARE COMPLETE. THE AREA BEHIND THE BARRIERS IS KNOWN AS THE CONSTRUCTION EXCLUSION ZONE (CEZ) AND IS NOT TO BE ENTERED AT ANY POINT DURING THE WITHOUT CONFIRMATION FROM THE APPOINTED ARBORICULTURAL CONSULTANT.**

- Site huts and contractors yard shall be located away from retained trees; the location of which is to be decided during the pre-site meeting.

- Site huts and storage are to be positioned outside Root Protection Areas but can be used to form/contribute towards tree protection where appropriate. However site huts with internal generators must be carefully sited to prevent damage from the hot exhaust gases produced. This can easily damage branches, causing death of the branch in extreme cases. Services for these facilities must be considered as part of the proposals to prevent damage to retained trees.

- Any services above or below ground that are proposed prior to planning consent e.g. gas, electric, drainage, soak-a-way's, foul water must be approved by the appointed arboricultural consultant if they enter the RPA of any retained tree (this is to include services to site huts and washrooms). RPAs are viewable on the TPP and attached plans. In all cases the building contractor working within the RPAs of retained trees will adhere to Trees and Utilities Volume 4: NJUG Guidelines For The Planning, Installation And Maintenance OF Utility Apparatus In Proximity to Trees (Issue 2) 19th November 2007.

  http://www.njug.org.uk/wp-content/uploads/V4-Trees-Issue-2-16-11-2007.pdf

- If at any point there is confusion or need for clarification over operations inside RPA's do not hesitate to contact the appointed arboricultural consultant.

Arboricultural Contractor

- All tree works requested are listed in the Tree Survey Schedule and the identification and location of the trees can be viewed on the TPP

- **Tree works will need to be carried out in accordance with the Arboricultural Method Statement.**

- **Trees to be removed are: T2. Facilitative pruning of T28, T29, T30 and T37 to a point starting at 0.5m beyond boundary wall to a height of 6 -7 metres from ground level.**

- Tree works will be undertaken in a way that does not cause damage to retained trees or plants, be they above or below ground. Location of machinery is to be located so as not to

cause soil compaction, heat damage from exhaust emissions, and abrasion damage from material or vehicles.

- If there is any confusion on the identification of trees or specification, contact must be made with the appointed arboricultural consultant for clarification.

- Trees must be inspected fully before works are undertaken to identify if there are any nests or habitats within the trees and to ensure they are of sufficient strength to support the weight of a climber whilst undertaking works as described in "The Tree Climbers Companion Second Edition".

Appointed Arboricultural consultant is Julian Abraham of J A Consulting

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1.0 Introduction

1.1 **Proposal:** The project concerns the proposed demolition of a surplus garage storage facility and the construction of a housing development consisting of private and social housing, with Retail outlets at street level.

- A tree survey and tree survey schedule in accordance with BS: 5837 (2012).
- Detail and review the arboricultural implications of the proposal, its potential impact on the surrounding tree population and local amenity value
- Present an affective tree protection strategy for the duration of the development and method statement outlining such measures
- Provide the necessary arboricultural information to accompany a planning application to the relevant authority

1.2 **Site Details:** Haverstock Hill

1.3 **Documents Provided:** The plans in this report are produced using the following documents:

- **Topographical survey plan**
- **Proposed Site layout Plan**

1.4 **Use of Report:** This report is designed to be used by different sectors, ranging from development; to planning, to construction and not all the information is applicable to every reader. The Summary pages highlight which areas are more applicable to specific users of the report to help target the relevant information to those implementing the necessary instructions.

1.5 **Limitation of the Report**: The trees have been surveyed in accordance with the criteria set in the BS: 5837 (2012).

A full hazard assessment of the trees (including assessment of decay or their defects and their implications) has not been undertaken as this is considered beyond the scope of this report. Any obvious hazards and defects have been identified were relevant in the Tree Survey Schedule (Appendix 1) and appropriate relating works have been recommended. Trees not located within the legal property of the owner have been included and any works would be subject (where relevant by law, Statue and Common) to the owner's permission or legal right of entry to mitigate a legitimate heath and safety concern.

Where appropriate further investigative works have been detailed and recommended within the tree survey schedule. This may include climbing inspections, below ground exploratory investigations and the use of specialist decay detection equipment.

Detailed ecological considerations are also beyond the scope of this report. UK and European Wildlife Legislation may affect the timing and even prohibit the enhancement of works and operations described in this report. Most of the information regarding wildlife can be found in the Wildlife and Countryside Act 1981 & updated 1994. This includes information of wild birds, bats, badgers, some insects and red data species. Bats in particular are afforded particular protection and a specialist is required to determine if bats are

present or may be affected when carrying out tree works. Further information is available from Natural England www.**naturalengland**.org.uk

This document has been produced before planning consent is issued and before specific site orientated logistics can be confirmed. It is accepted that this document may need to be updated and more detailed information added throughout the planning and development process. However this document will be the main documentation for reference in the event of disputes.

1.6 **Statutory Controls**: Trees on or adjacent to this site fall under the jurisdiction of Camden Council. A check with their tree section highlighted a Sycamore located in Eton Place that is equidistant along the boundary wall between Haverstock Hill and Eton College Road as being subject to protection under Tree Preservation Order Number: C 567 2006. T1 and T2 are under the management of the Highways section at Camden Council, but are not subject to protection.

2 Tree Survey

2.1 **Survey Method:** The trees were inspected from ground level using widely accepted Visual Tree Assessment (VTA) as defined in Research for Amenity Tree Series books. Principles of Tree Hazard Assessment and Management by David Lonsdale research for Amenity Trees No.7 being one example

Climbing inspections were not undertaken

No samples, be they soil, tree tissue, suspected pests, diseases or pathogens were taken during the survey. Heights of trees were estimated by eye and crown spreads by physical pacing. Diameters were measured in mm using a diameter tape measure.

Trees were measured at 1.5m from ground level if they consisted of a single stem. Trees present with more than one stem below 1.5m were measured in accordance with BS 5837 (2012).

Any photographs taken on site are done so using a digital camera.

Tools used when appraising trees were a metric diameter tape, binoculars, digital measuring device, hand lens and where appropriate, metal probe, trowel, and engineers mallet.

2.2 **Tree Details:** All the information of the trees surveyed within this report can be found in the tree survey schedule. The trees surveyed have been categorised as set out in BS 5837 (2012). The locations of the trees are shown on the TLP and TPP.

2.3 **Tree Survey Date:** The survey was undertaken on 21st February 2015.

3 Arboricultural Implications Assessment

3.1. **Total Number of Trees Surveyed:** 13 individual trees have been included in the survey

3.2 Tree Removal: Taking into consideration the proposed development scheme and the condition of the trees at the time of survey 1 no individual trees require removal as a direct consequence of this proposal,

3.2.1 Tree Removal: No category A, B and C specimens / groups are to be removed as a direct consequence of this proposal, 1 tree has been highlighted for removal for health and safety reasons (T33) (entirely or partially); the breakdown is shown at table 2 (below).

Table 2: Breakdown of tree removals (Entire & Partial)

Category A	*Category B*	*Category C*	*Category U*
0	0	0	1

3.3 Pruning: Some minor facilitative pruning may be required to T28, T29, T30, T31, T32 and T37 This is to allow the positioning of a piling rig and to allow access to the site (T37).

Photo 1

Photo2

Photo3

3.4 Incursions into Root Protection Areas (RPA's):
There are potential significant incursions by the proposed excavation of the basement and ground floor into 3x individual off site trees as shown T30, T34 and T37. Trial holes were dug by trees located closest to the wall T31 (photo 7) and T33 (Photo 5 & 6) on incursions are yet to be determined by on site investigations (trial holes) to determine the depth of foundations of the boundary wall and the extent of the current hard surface roadway (see table 3, below).

Table 3.: Trees requiring supervised excavation BSEMENT				
Tree No.	***Species***	***Category***	***Activity to supervise***	***Incursion %***
T32	Acer pseudoplatanus	B2	Supervised within the RPA for the construction of the basement	0.6%
T34	Pyrus communis	B2	Supervised within the RPA for the construction of the basement	21.1%

Trees requiring supervised excavation UKPN Cable Trenching				
Tree No.	***Species***	***Category***	***Activity to supervise***	***Nominal potential Incursion %***
T30	Sycamore	B2	Supervised trenching within the RPA	17.8%
T31	Sycamore	B2	Supervised trenching within the RPA	0.7%
T32	Sycamore	B2	Supervised trenching within the RPA	7.5%
T34	Common Pear	B2	Supervised trenching within the RPA	36.2%
T37	Sycamore	B2	Supervised trenching within the RPA	3.4%

Photo 4

Photo 5

Photo 6

Photo 7

3.4.1 These incursions are unlikely to cause damage to roots systems as it is likely that the foundation depth of the boundary wall and the construction of the onsite roadway has restricted the radial development of the root systems of these trees significantly.

3.5 **Tree Protection Measures:** Tree protection measures are necessary to protect trees recommended for retention: details of tree protection are shown on the TPP and are discussed further within the Arboricultural Method Statement (AMS).

3.7 **Overall assessment of impacts:** The overall Arboricultural Impact of the development is considered **low**. T2 is of poor quality with little long-term value to the area though is a highway tree and should be removed and replaced. Trees 28 to T30 will require some moderate facilitative pruning, though the impact to the structure and long-term health is minimal, as the basement design is to be kept outside of the RPAs of these trees it is not believed that root penetration will be impacted upon as root development has been restricted by the foundations of the wall. Demolition of the garage block and resurfacing of the area to match the existing roadway will requires supervision, provided the base is not removed then potential root movement below the base course will not be disturbed. T31 to T34 have recently been heavily reduced as can be seen in the photographs on pages 5 and 6. The Minor pruning works to T37 to allow access is minimal as the tree has been the recipient of pruning to this height over the years. The roadway access is already in place so only minor works may be required to kerb edgings etc. and localised resurfacing of the wearing course of the roadway. It is possible for the trees along the boundary with Eton Place to be retained without significant impact from this proposal. Therefore maintaining the current partial screen afforded by these trees to the neighbours from the proposed development.

4 Arboricultural Method Statement

4.1 **Introduction:** In general, the AMS is used to safeguard the retained trees both on and adjacent to a site during the development process. Any tree protection methods set out in the AMS will be adhered to. These will protect the below ground root systems and above ground stem and crown structures of the trees.

The essential principle is that the area inside the tree protective fencing and any ground protection used are to be preserved and protected at all times throughout the whole duration of the works being carried out.

Any specialist methods, supervision and inspections referred to in this AMS are to be implemented in full to ensure adequate protection and successful retention is maintained.

REFER TO APPENDICES 3 AND 4 FOR SPECIFIC ACTIVITIES DIRECTLY ADJACENT TO TREES AND WITHIN RPAS.

A COPY OF THIS DOCUMENT WILL BE SUPPLIED AND MAINTAINED ON SITE AT ALL TIMES AND MADE AVAILABLE TO ALL SITE PERSONNEL

4.2 **Responsibilities:** All site personnel will be made aware of any key implications of this AMS. It is the responsibility of the developer to ensure that the details of the AMS and any agreed amendments are communicated to site personnel. As of 2005 local planning authorities have powers to serve Temporary Stop Notices if agreed tree protection measures are not carried out. Adhering to this AMS will ensure that such costly time consuming action is avoided.

4.3 **Pre-Commencement Meeting:** A pre-commencement site meeting, involving the Site Manager, the Arboricultural Consultant, the client, developer and LPA Tree Officer is recommended to ensure that all aspects of the tree protection process are understood and agreed. Any potential issues can be discussed at this stage, along with the intended sequencing of events and the level of arboricultural supervision required.

4.4 **Sequencing, Inspection and Supervision**: Sequencing of events and effective arboricultural inspection/supervision are important elements of the tree protection process.

The following recommendations for the sequencing of events help to reduce foreseeable complications and problems from pre-planning to project completion. It is also understood that issues and complications that are unforeseeable will arise but can be limited by following the points below.

All the supervision and inspection recommendations within the AMS must be carried out by a suitably qualified arboricultural consultant to maintain the appropriate level of tree protection.

Sequencing and Inspection Key Stages:

- Consultation with projects managers/architects/contractors prior to seeking planning consent to help limit the amount of constraints resulting for arboricultural factors and maximise site efficiency
- AIA & AMS issued to Site Manager/Building Company/Client
- Pre-commencement site meeting
- AMS to be read by all site personnel to ensure full understanding of the implications. Any queries are to be addressed by the appointed Arboricultural Consultant.
- Recommended tree work operations are to be carried out as specified in the tree survey schedule, preferably before the main contractors start on site
- Proposed project/development to be undertaken
- Supervision of any ground works along the boundary Eton Place, especially T37.
- Any landscaping and tree planting required is carried out

4.5 Summary of Necessary Arboricultural Inspection/Supervision:

Table 4. Summary of Necessary Arboricultural Inspection/Supervision

Activity	Level of Monitoring/Supervision Required
Completion of necessary tree work operations prior to development work starting	Walk round visual inspection to confirm the works have been carried out to an acceptable standard as specific
Demolition of garage	Supervision of the removal of the garage block adjacent to Trees T32 and T33.
Power cable installation	Supervision of the installation to ensure that roots are not impacted upon and that NJUG 4 is followed
Fencing	Periodic inspection of fencing and checking that compliance with AMS is being undertaken when works are within RPAs of retained trees.
Installation new kerb sets by T37	Supervision of the installation to ensure that roots are not impacted upon

4.5.1. In addition to the direct supervision detailed above (at Table 4), telephone contact will be maintained between the Site Manager, Project Manager and the Arboricultural Consultant to ensure that the operation progresses smoothly and that compliance with the AMS is being achieved.

4.5 **Tree Work Operations:** All works will be carried out in accordance with B.S. 3998 (2010): *Tree Work - Recommendations* and current arboricultural industry "Best Practice". Tree works will be carried out by a suitably qualified and experienced Arboricultural Contractor holding the necessary insurance cover. A list of such approved contractors is available from the Arboricultural Association at www.trees.org.uk

If at any time during the development a need for additional tree works is required e.g. to facilitate the proposed works or access for machinery/plant, the Arboricultural Consultant will be contacted to advise on appropriate works and liaise with the LPA as necessary. No works shall be undertaken without the prior approval of the LPA.

Trees to be removed are shown at Table 5 (below) and are also shown with a red cross over the trunk and a red canopy outline on the TPP.

Table 5: works list for contractor

Tree No.	***Species***	***Full / Partial removal***
T27	Acer pseudoplatanus	Prune to boundary wall
T28	Quercus ilex	Prune to boundary wall
T29	Quercus ilex	Prune to boundary wall
T30	Acer pseudoplatanus	Prune to boundary wall
T31	Acer pseudoplatanus	Prune to boundary wall
T32	Acer pseudoplatanus	Prune to boundary wall
T37	Acer pseudoplatanus	Prune to boundary wall

4.6 **Tree Protection Measures:** Tree protection measures are used to ensure that the above and belowground parts of trees are not damaged by construction/ development operations and the soil structure within RPA's of retained trees or planting areas, are safeguarded. The different specifications of Tree Protection Fencing/Barriers all depend on the factors listed below:

- Proximity of operations to retained trees and their RPAs
- Intensity of operations around retained trees and their RPAs
- Type and weight of traffic moving in and around RPAs
- Size, age, physiology and vitality of retained trees

All of the above factors have to be considered when recommending the use of tree protection barriers and ground protection for proposed development. If tree protection measures are necessary, then a specification must be provided which **WILL** be adhered to throughout the development process, unless otherwise directed by the approved arboriculturalist.

Tree Protection Fencing/Barriers: Tree protection fencing will not be required in this project to protect the trees throughout the construction process. The location of the adjacent wall provides the protection required in line with the British Standard.

4.7 **Working inside RPAs:** The trees requiring supervision during excavation of road way works are shown at table 6 (below); the specific areas to be supervised are shown by the bold orange lines on the TPP:

Table 6.: Trees requiring supervised excavation		
Tree No.	***Species***	***Activity to supervise***
T27	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works
T29	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works
T30	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works
T31	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works
T32	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works
T34	Pyrus Communis	Supervised removal of roadway to allow landscaping works
T37	Acer pseudoplatanus	Supervised removal of roadway to allow landscaping works

4.8 **General Site Precautions:** The following points will be observed at all times

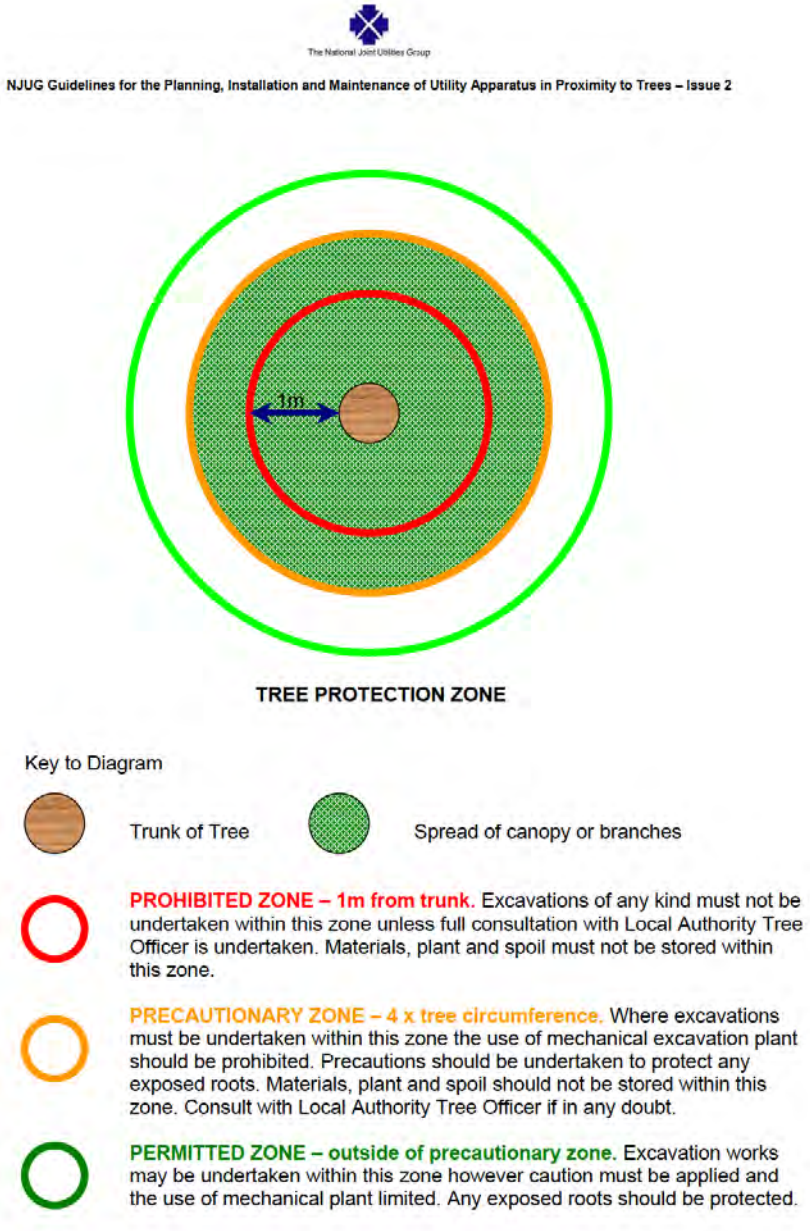
- No fires will be lit within 10m of the canopies of retained trees.
- No access will be permitted inside the tree protection fencing.
- No material, equipment or debris will be stored within the tree protective fencing of RPA's of retained trees.
- Notice boards, telephone cable or other above ground services will not be attached to any part of retained trees.
- Materials that contaminate the soil (e.g. concrete mixings, diesel oil, and vehicle washings) will not be permitted to enter the RPA's of retained trees.
- No materials will be stored in such a fashion that will incur damage of any form to retained trees.
- Vehicles will not be parked within the RPA's of retained trees on site.

4.9 **Underground Services:** Services in developments are often difficult to determine accurately at the initial planning and feasibility stage. Not until service surveys have been carried out can it be guaranteed the location of new service runs or the locations of existing services. Where possible it is beneficial to utilise existing services and if new services are required they should be sited outside the RPAs of retained trees.

If existing services are located within RPAs, new services must be sited through RPAs, or existing services need to be replaced within RPAs, extra care must be taken to limit the amount of disturbance caused. There are a number of trenchless solutions that can be

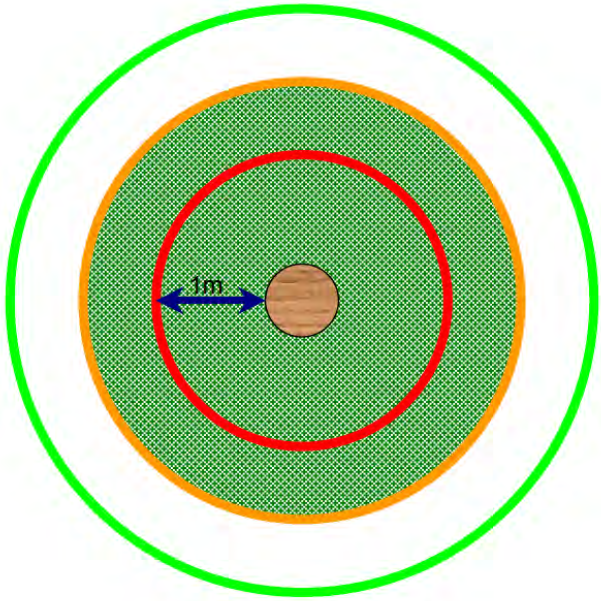
utilised to install services through RPAs, but if these are not viable and excavation is the only possible answer, recommendations for such operations are found in appendix 5.

Service runs have yet to be fully determined though it has been established that UKPN are going to place power cables through the RPAs of retained trees. The building contractor will adhere to Trees and Utilities Volume 4: NJUG Guidelines For The Planning, Installation And Maintenance OF Utility Apparatus In Proximity to Trees (Issue 2) 19th November 2007.



The National Joint Utilities Group

NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2



TREE PROTECTION ZONE

Key to Diagram

Trunk of Tree

Spread of canopy or branches

PROHIBITED ZONE – 1m from trunk. Excavations of any kind must not be undertaken within this zone unless full consultation with Local Authority Tree Officer is undertaken. Materials, plant and spoil must not be stored within this zone.

PRECAUTIONARY ZONE – 4 x tree circumference. Where excavations must be undertaken within this zone the use of mechanical excavation plant should be prohibited. Precautions should be undertaken to protect any exposed roots. Materials, plant and spoil should not be stored within this zone. Consult with Local Authority Tree Officer if in any doubt.

PERMITTED ZONE – outside of precautionary zone. Excavation works may be undertaken within this zone however caution must be applied and the use of mechanical plant limited. Any exposed roots should be protected.

4.10 **Amendments:** Issues may arise on the development site that requires amendments to the previously agreed tree protection details. Any amendments in this AMS will be approved in

writing by the LPA prior to being implemented. Copies of the paperwork relating to any amendments will be communicated by the Arboricultural Consultant to the Client and LPA.

Appendices

The following Appendices are to providing information, specifications and guidelines relating directly to the development report at and also generic information to provide accurate reference for instances when unforeseen operations and alterations to the project are required. If there are any areas of uncertainty direct contact must be made with the appointed Arboricultural consultant.

Appendix 1: Key Terms and Abbreviations

Arboricultural Implication Assessment (AIA): An assessment of the arboricultural impact of the specific proposal on a given area

Arboricultural Method Statement (AMS): Contains references to tree protection information

Arboriculturalist: Person who has through relevant education, education and training, gained expertise in the field of trees and trees in relation to construction

British Standard 5837 (2012): ***Trees in relation to design, demolition and construction - recommendations:*** British Standard document outlining best practice and guidelines for the arboricultural and construction industry in relation to developments.

British Standard 3998 (2010): ***Tree work - Recommendations:*** British Standard document outlining best practice for Tree Works to the arboricultural industry.

Competent Person: Person who has training and experience relevant to the matter being addressed and an understanding of the requirements of the particular task being approached

Construction: Site Based operations with the potential to affect existing trees

Construction Exclusion Zone: Area based on the root protection area from which access is prohibited for the extent of the project.

Root Protection Area (RPA): Layout design tool indicating the minimum area around a tree deemed to certain sufficient roots and rooting volume to maintain the trees viability, and where the protection of the roots and soil structure is treated as a priority.

Service(s): Any above or below ground structure or apparatus required for utility provision e.g. drainage, gas supply, water, ground source heat pumps, soak-a-ways, CCTV, telecommunications, water, electric. Etc.

Stem: Principle above ground structural component(s) of a tree that supports the branches/crown

Structure: Manufactured object such as a building, carriageway, path, wall, Service run, and built or excavated earthworks.

Tree Protection Plan: Scale drawing, informed by descriptive text where necessary, based upon the finalized proposals, showing the trees for retention and illustrating the tree and landscape protection measures.

Veteran Tree: Tree that by recognized criteria, show the features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned.

Appendix 2a: Tree survey schedule Key Terms:

The survey information was recorded on the attached schedule in accordance with the guidance contained within Section 4 of BS: 5837:2012 “Trees in Relation to Design, Demolition and Construction - Recommendations".

Julian Abraham of J A Consulting undertook the tree survey on the 21st of February 2015.

It is recommended that a full health and safety arboricultural survey be undertaken in order to assess and appraise the condition of all trees on site and the extent of structural defects, fungal decay or pathogenic conditions. It should be noted that trees could decline between the survey date and the time of the development application depending on the extent of time between two.

Tree Ref No:	Sequential reference number of trees or groups of trees commencing at "1". Avenues, woodlands and hedgerows were also recorded on the tree survey
Species	Species listed by common name
Height (m)	Estimated height of canopy rounded up or down to nearest metre.
Stem diameter @ 1.5m (m)	Trunk diameter measured at approx. 1.5m above ground level; or where the trunk forks into separate stems between ground level and 1.5m, measured at the narrowest point beneath the fork, given in millimeters.
Branch Spread (m)	Branch spread taken at the four cardinal points
Crown Clearance	To inform on ground clearance, crown/stem ratio and shading the estimated height of the first significant branch above ground level.
1st Sig Branch	Height and orientation of first significant branch (where orientation is not specified the tree has an even crown break at this height).
Age Class	**Y: Young**: Age less than 1/4 life expectancy **SM: Semi Mature: 1**/4 to 1/2 life expectancy **EM: Early Mature**: 1/2 to 3/4 life expectancy **M**: **Mature:** Over 3/4 life expectancy **OV: Over-mature:** Mature, and in a state of decline **V: Veteran:** tree that, by recognized criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned.
Physiology	• G Good Typical for species and age • F Fair Signs of physiological stress or dysfunction; but not significant enough that the tree may not recover. • P Poor Signs of physiological stress or dysfunction; significant enough that the tree might not recover. • D Dead specimen.

Structure	Structural condition of the tree based on the structure of its roots, trunk and major stems and branches in relation to the presence of any physiological, pathological or mechanical defects. General observations, particularly of structural and or physiological condition (e.g. the presence of any decay and physical defect), and or preliminary management recommendations and potential for wildlife habitats bats, birds, invertebrates, red data species etc. ○ **Good:** No significant structural defects. ○ **Fair:** Significant structural defects; but these are either remediable or do not put the tree at immediate or early risk of collapse. ○ **Poor:** Significant and irremediable structural defects, such that there may be a risk of early or premature collapse. ○ **Hazardous:** Significant and irremediable structural defects, such that there is a risk of imminent collapse.
Value	Assessment of the landscape value of the tree. ○ **Low** ○ **Moderate** ○ **High**
ULE	Useful Life Expectancy: Estimated remaining contribution, in years (<10, 10+, 20+, 40+) 0 No potential (dead trees) <10 Less than ten years 10+ more than ten years 20+ more than twenty years 40+ more than forty years
Comments:	General comments relating to vitality, structure, value and/or recommendations
Category	BS 5837 categorsation: **A** Trees/Vegetation of high quality and value **B** Vegetation of moderate quality and value **C** Trees/Vegetation of low quality and value **U** Those in such a condition that they cannot realistically be retained as living trees for longer than 10 years **1** Trees with mainly arboricultural value **2** Trees with mainly landscape value **3** Trees with mainly cultural / conservation value
RPA radius	Root Protection Area (RPA) as radius (m) from the centre of the trunk
RPA	Root Protection Area (RPA) (m^2)

Appendix 2b: Tree Survey Schedule

Appendix 2b: Tree survey schedule **Client:** CBRE **Site:** Haverstock Hill **Survey Date:** February 2015

Tree No	Species	Height	Diameter (MM)	Canopy Hgt	NESW	Age	Vitality	Structure	Value	Life exp	Comments	Grade	RPA Radius	RPA Area
T1	Horse Chestnut	6	150	3	N: 3 E: 3 S: 3 W: 3	EM	F	F	Low	20	Small tree of little merit and low amenity value	C2	1.8	10.18
T2	False Acacia	9	270	2.5	N: 2 E: 5 S: 4 W: 2	EM	F	F	Low	20	Tree with off set crown of poor structure and low amenity value. Deadwood in crown	C2	3.24	32.98
T27	Sycamore	12	340	4	N: 3 E: 3 S: 3 W: 3	M	F	F	Mod	30	Typical of species close to footway and wall canopy interwoven with adjacent canopies	B2	4.08	52.3
T28	Holm Oak	6	290	2	N: 3.5 E: 3.5 S: 3.5 W: 1	EM	F	F	Low	30	Small tree of low value though reasonable screen, close to wall	C2	3.48	38.05
T29	Holm Oak	6	330	2	N: 3.5 E: 3.5 S: 3.5 W: 2	EM	F	F	Low	20	Small tree of low value though reasonable screen, close to wall	C2	3.96	49.27

Tree No	Species	Height	Diameter (MM)	Canopy Hgt	NESW	Age	Vitality	Structure	Value	Life exp	Comments	Grade	RPA Radius	RPA Area
T30	Sycamore	15	660	3	N: 5 E: 4.5 S: 4 W: 1	M	F	F	Mod	40	Previously reduced tree close to boundary wall	B2	7.92	197.09
T31	Sycamore	15	400	3	N: 4 E: 4 S: 4 W: 4	M	F	F	Mod	40	Close to boundary wall heavily reduced in the past	B2	4.8	72.39
T32	Sycamore	13	440	3	N: 4 E: 4 S: 4 W: 4	M	F	P	Mod	40	Heavily reduced in the past tree close to boundary wall.	B2	5.3	87.6
T33	Sycamore	12	540	2	N: 2 E: 2 S: 3.5 W: 3	M	F	P	Mod	20	Heavily reduced tree close to boundary wall. Tight basal union decay in stem from ground level to 1.5m	U	6.48	131.93
T34	Common pear	6	330	2	N: 3 E: 3 S: 3 W: 3	M	F	F	Mod	30	Typical of species scar and cavity in central stem at 3 and 5 metres	B2	3.96	49.27

Tree No	Species	Height	Diameter (MM)	Canopy Hgt	NESW	Age	Vitality	Structure	Value	Life exp	Comments	Grade	RPA Radius	RPA Area
T35	Wild Cherry	4	150	2	N: 3 E: 3 S: 3 W: 3	SM	F	F	Low	30	Typical young tree of low value	C2	1.8	10.18
T36	Wild Cherry	5	170	1.5	N: 4 E: 4 S: 4 W: 4	SM	F	F	Low	30	Typical young Cherry of low value, some soil build up due to adjacent building works	C2	2.04	13.08
T37	Sycamore	15	560	4	N: 6 E: 6 S: 6 W: 6	M	F	F	Mod	40	Large tree close to wall and adjacent gate pillar	B2	6.72	141.89

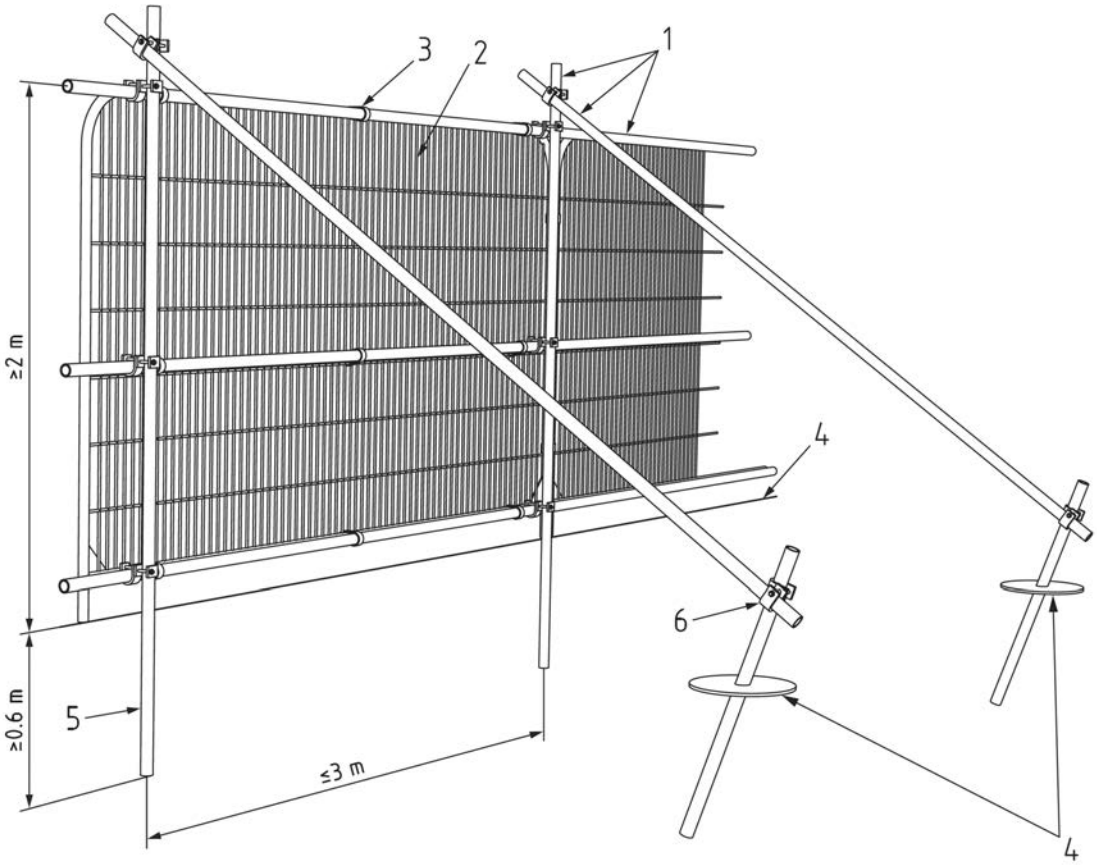
Appendix 3: Tree Protection

BARRIERS/FENCING

A.3.1 All barriers/fencing agreed for the development must be installed prior to any works starting on site and ideally in conjunction with the erection of the site security. All barriers/fencing must stay in place until the all works on site are finished or as agreed by the consultant arboriculturalist and/or planning authority.

A.3.2 Default Specification:

The default specification consists of a vertical and horizontal scaffold framework that is well braced to resist impacts from vehicles and construction site operations. The specification recommended in the current BS 5837 states the vertical tube should be spaced at maximum intervals of 3m and should be driven securely into the ground. Once in place weld mesh or similar (Heras panels) will need to be securely fixed to the scaffold framework. The diagram shows three horizontal scaffold poles, one at the top, one in the middle and one at the bottom. In most cases only two horizontal poles are necessary, leaving out the middle pole.



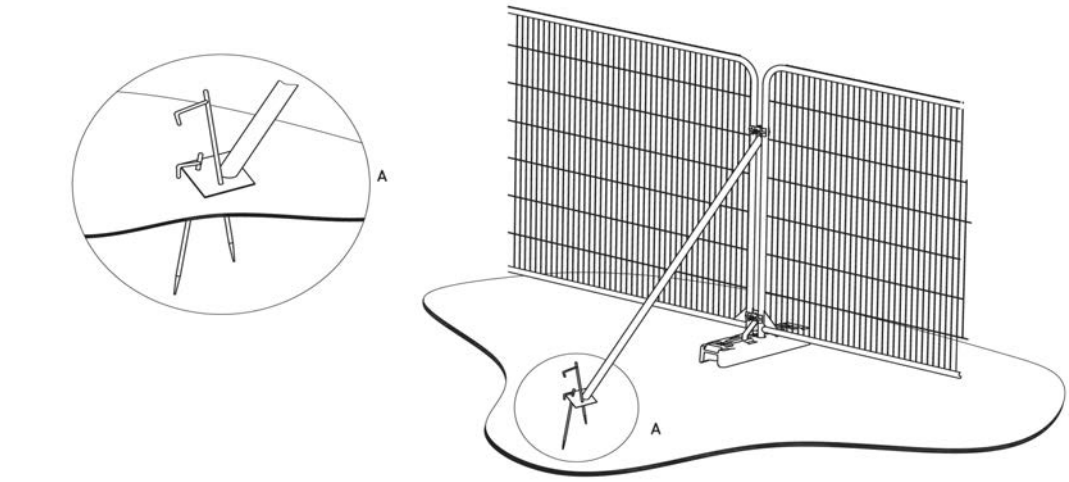
Key

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

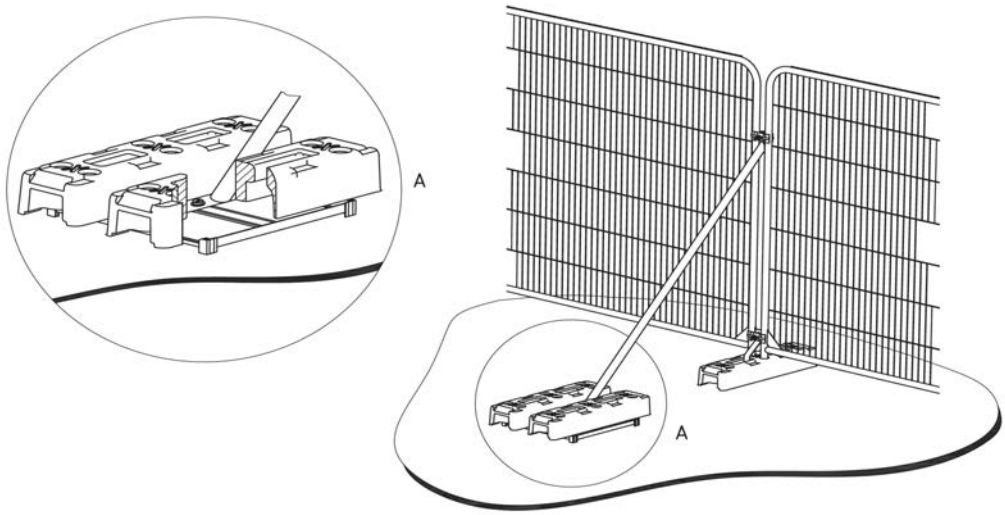
A.3.3 Alternative Specification:

Where the site circumstances and associated risk of damaging Root Protection Areas and/ or above ground structures does not necessitate the default specification for tree protection barriers, alternatives can be as appropriate. Below are two examples of alternative specifications that are recommended but will need to be authorised by the relevant planning authority.

Both the specification a) and b) consist of 2m tall weldmesh panels (e.g. Heras panels) that sit in rubber, resin or concrete feet. The panels need to be secured to each other with a minimum of two anti-tamper couplers installed so that they can only be removed from the inside (RPA side) of the fence. The couplers need to be spaced at least 1m apart and should ideally be uniform throughout the fence. The fencing needs to be supported with 45˚ stabilizing struts attached at a minimum of every other panel. Where ground conditions permit the stabilizing struts need to be secured to the ground with suitably sized ground pins to prevent them from moving if struck (diagram a). Where ground conditions consist of hard surface or do not permit the installation of the ground pins, the stabilizing struts need to be secured to a block tray as shown on diagram b) or attached to temporary supports se A.4.5.



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

A.3.4 Signage

All tree protection fencing needs to have signs attached at 4-6m intervals. Below are examples of the signage that needs to be attached to the tree protection barrier.

Above: Three examples of tree protection fencing signage ranging from a simple sign *(left)* attached with zip ties to more in-depth signs *(middle & right)* explaining the limitations and legal protection status of the trees being protected.

A.3.5 Below: Three pictures with examples of tree protection fencing installed using stabilizing struts, *(bottom left, upper left, upper right)* and two example of timber posts erected in tarmac to support the fencing *(bottom middle, bottom right)*

A.3.6 Ground Protection

Ground protection is required during the development process to protect the retained trees Root Protection Areas from construction operations. This can be where permanent working space is needed or temporary access is justified within the RPA, which would involve setting back the tree protection barrier.

Where possible existing hard surfaces within RPAs need to be utilised or retained for as ground protection rather than being removed during demolition operations. Where tree protection barriers are set back from the perimeter of the RPA exclusion zone exposing unmade ground to construction damage, new temporary ground protection will be installed prior to construction starting.

Below are some general specifications for ground protection based on the type and weight of traffic

A.3.7 Pedestrian Access

For pedestrian traffic ONLY a single thickness of scaffold board (40mm) or wooden boarding is to be laid on a minimum of 100mm deep woodchip, which is laid upon a geotextile membrane.

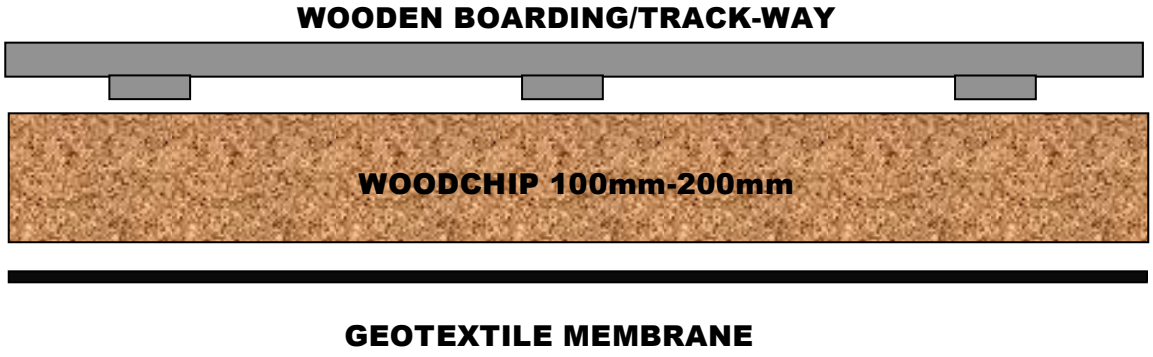
A.3.8 Small Plant Up To 2 Tonne (2000kg)

For small plant machinery with a gross weight of up to 2 tonne (2000kg), interlinking polyethylene or aluminium track way needs to be laid on a minimum of 150mm deep woodchip that is laid upon a geotextile membrane

A.3.9 Regular Traffic and Plant Up To 3.5 Tonne (3500kg)

Where heavy traffic is expected from pedestrian to vehicular with a gross weight of up to 3.5tonne, interlinking aluminium or metal track way must be used over a minimum layer of 200mm deep woodchip that is laid upon a geotextile membrane.

A.3.10 Simple Diagram of Generic Ground Protection



Appendix 4: Working in Root Protection Areas

A.4.1 **Root Protection Area (RPA):** *Layout design tool indicating the minimum area around a tree deemed to certain sufficient roots and rooting volume to maintain the trees viability, and where the protection of the roots and soil structure is treated as a priority.*

A.4.2 **Prevention of detrimental impact to RPAs**: In most instances the RPA will need be completely isolated from construction and development operations using tree protection barriers and ground protection. This is the most reliable way to ensure the preservation of the RPA and retain it completely undisturbed. The RPAs of the trees to be retained have been shown diagrammatically on the Tree Protection Plan along with accurate location of any tree protection measures.

However some operations will require specific works to be carried out in the RPA and anyone entering the RPA must follow the guidelines below to ensure the minimal amount of disturbance is afforded at all times. Any operations in the RPA need to accord to the principle that the tree and soil structure takes priority. This will help retain and preserve healthy, valuable trees in the landscape and development but also prevent costly and potentially dangerous situations from occurring during and after the works has been completed.

A.4.3 **The two main instances where these guidelines for entering and working must be followed are:**

1. **Removal of existing surfaces/structures and replacing those with new surfaces, structures, landscaping.**
2. **Preparation and installation of new surfacing, structures, landscapes.**

Most of the other operations can utilise some form of ground protection to prevent or reduce the impact on the RPA.

A.4.4 **Excavations within the RPA and root retention:** Any excavations carried out within the RPA must be done so by hand using spades, forks and trowels, taking care to limit the amount of damage caused to the outer bark and woody structure of the roots. The fork should be used to loosed the soil in the excavation area and help locate any substantial roots (25mm-100mm diameter). A trowel can then be used to remove the soil from around the roots taking care as to not damage the bark.

Once the roots have been exposed, those that are to be removed (any roots up to a diameter of 25mm) can be done using sharp secateurs or a handsaw. Any roots above 25mm diameter, where possible, need to be retained and protected from drying out and temperature extremes by wrapping or covering them in a suitable material e.g. hessian, spare membrane material, plastic. This wrapping needs to be removed before any back filling takes place. Some roots over larger areas of excavation can be displaced where possible to bend round any new structures or pipework whilst remaining intact. Roots with a diameter of 25m-100mm should only be cut in exceptional circumstances and after consultation and roots above 100mm should only be cut after consultation with the appointed arboriculturalist. Alternatively compressed air to displace the soil is always preferable and more affective especially over larger areas or to remove soil quicker while keeping roots intact. This may be part of the specification and would be included within the Arboricultural Method Statement.

A.4.5 **Arboricultural Supervision:** All works being carried out within the RPA must be carried out with great care and be supervised by a qualified arboriculturalist to ensure that the contractors understand the need to minimalize any detrimental impact on the retained root system. This is done through properly briefing staff undertaking works before the work commences, along with regular site inspections and signing the work off when completed.

A.4.6 **Removal and Demolition of Structures and Surfaces:** As with all operations carried out within the RPA exceptional care must be taken to ensure any detrimental impact on the roots and soil structure are kept to an absolute minimum.

Where any structure is being demolished (above or below ground) within the RPA additional barriers are recommended to protect the remaining RPA and above ground stem and branch structures. Where there are no hard surfaces or they are due to be removed from within the RPA, plant machinery should operate from outside the RPA providing there is a long enough reach. Where this is unfeasible ground protection must be used to prevent soil compaction from plant machinery conducting the demolition operations.

Plant machinery can be used to assist in the removal of existing hard surfaces in the breaking and levering up of the surface pieces but must be situated on the existing hard surface or ground protection. Preferably hand held Kango's (concrete breakers) are to be used to break up any existing hard surfaces that are to be removed and the pieces can them be moved either by hand or loaded into plant machinery (360 bucket). This method reduces the risk on damage to retained roots situated below the hard surface. Once the sub soil and any roots are exposed any further excavation must be carried out by hand as stated Section A.5.4. If no further excavations are required the exposed soil/roots/ground needs to be protected either by tree protection fencing, ground protection of the installation of a new suitable load bearing surface.

Where possible any suitable load bearing hard surface already existing within the RPA should be retained during demolition. This prevents any additional damage to the underlying soil structure by allowing the surface to support the plant machinery and falling material. Where the hard surface in the RPA is due to be removed, where possible it should remain in situ for as long as possible.

Before any demolition process takes place it should be determined whether any access facilitation pruning is required to provide clearance and prevent physical damage between the plant machinery and tree structures. In some situations working space can be provided by temporarily tying back tree branches. Both tying and pruning need to be specified by a qualified arboriculturalist and ideally follow the guidelines set out in BS 3998 2012 Tree Work Recommendations.

Debris to be removed from within the RPA must be done so across existing hard surface or temporary ground protection so as to prevent compaction of the soil structure. If possible the material can also be lifted out of the RPA using suitable machinery preferable with a long reach.

Where trees are standing adjacent to structures that need to be removed, the demolition should be undertaken inwards within the footprint of the existing building, often referred to as ***'top down, pull back'***

Where underground structures are present within RPAs and will become redundant it is preferable to leave the structures in situ rather than remove them that could cause considerable root damage. Where hard surface is schedule for removal within RPAs care must be taken to not disturb the root structure that could be present underneath it. Hand held tools or carefully supervised machine work can be utilised to remove the surface. This should be working backwards away from the retained trees and not moving over the newly exposed ground.

A.4.7 **New Structure Guidelines:** All new structures being proposed in the RPA have the potential to cause damage to root structures and alter the ground conditions. The age and maturity of the trees will affect the viability and type of incursion into the RPA available. Younger trees are more robust and adaptable to changes in their environment where as mature and Veteran trees tolerate very little disturbance to their soil and root structures. When constructing inside RPAs the goal is to minimalise the amount of soil disturbance/compaction and retain a good level of gaseous and water exchange. Constructing above ground using pile and beam construction limits the amount of disturbance to the soil and root structure that reduces the adverse effect on physiological processes. Most solutions need to be well thought out and are a combined effort and communication of ideas between the engineer, architect and arboriculturalist

A.4.8 **Light Weight Structures e.g. Sheds, Small Storage:** Small structures with relatively small foundations that spread the load bearing can be constructed straight onto the surface without the need for any excavations. A certain amount of ground levelling is permitted but only to the top 50mm of the soil to fill in any undulations to provide a level surface. Anything above the 50mm will need to be raised up above the existing ground level to achieve the desired surface. Any ground works that are required must be carried out with great care so as not to damage retained tree roots but small roots below 25mm can be severed with a sharp saw or secateurs. A membrane will be required between the ground and the bottom of the foundation to prevent leeching of potentially harmful chemicals materials e.g. cement into the soil. Frames can be constructed and fixed onto the ground using stakes from which the foundation can be produced. But there are recommendations for the amount of RPA that can be covered.

New permanent hard surfacing should not exceed 20% of any existing un-surfaced ground within the RPA

A.4.9 **Fencing, Posts, and Small Piers:** Generally the construction of most fencing that doesn't require a strip or wall foundation can be installed with having very little impact on the soil and root structure. It is acceptable to dig small holes up to 300mm x 300mm for the installations of posts or piers so long as the digging is carried out carefully and by hand as directed in A.5.4 or preferably by compressed air. Any roots up to 25mm in diameter may be severed using a sharp saw or secateurs, but if possible the hole being dug could be widened or moved to enable retaining the root(s) whole. Any roots 25mm+ should be retained where possible but may be severed after consulting the appointed arboricultural consultant; further guidelines have been explained above in section A.5.4. Ideally holes should be dug as far away from the main stem as possible where larger diameter roots are less likely to be encountered and less damage will occur. When installing posts or piers in the RPA the smallest feasible hole possible must be used when excavating for the foundations of the posts to reduce the impact to the RPA.

A.4.10 Buildings, Walls, and Bridges on New Foundations: Most conventional foundations are done by producing a strip of concrete dug into a trench in the ground. This is not acceptable practice in RPA with the potential to cause large amounts of damage to root systems causing decline in the trees health and can make the tree structurally unsound. Small diameter piles supporting beams or cast flooring are permitted within the RPA's, as they will reduce the potential damage to root structure. But before any piling is carried out suitable ground protection must be put down to prevent soil compaction from the piling rig leaving gaps in the ground protection for the pile locations. Hand excavations need to be carried out in the location for each pile down to a depth of 700mm to establish whether there are any substantial roots in the pile location. If substantial roots are discovered (25mm+) the appointed arboricultural consultant can make a decision whether the root can be severed or if the pile location has to be moved. The supporting beams connecting to the piles cannot be lower than the existing ground level resulting in the need for further excavations. The beams should be constructed off site allowing them to be lowered in to position without the need to be casted in the RPA.

A.4.11 Services: New services and service runs should where possible be sited outside the RPA of retained trees to prevent unnecessary damage to root structures. Sometimes there is the need to upgrade existing services that requires excavation but this can cause extensive damage and render the trees structurally unsound. This should be a last resort and all decisions need to be in conjunction with the consulting arboricultural consultant. If new services need to be run through RPAs then the guidelines in section A.5.4 must be followed.

A.4.12 New Surfaces Guidelines: The installation of new surfaces within the RPA can be very damaging to the root structure and soil conditions. Excavations required for the laying of new sub bases and level grading can both cause extensive root damage to retained trees. Excessive soil level alterations and new surfaces can change the condition of the soil and the environment the roots survive in altering moisture content and the ability for gaseous exchange. Ideally any new surface needs to be permeable to allow moisture transfer and allow the continuation of gaseous exchange, be constructed above existing ground levels and load bearing where the load is spread evenly over the surface to help prevent compaction of the soil. Having these qualities helps enable structures and surfaces to be constructed in RPA while having continued successful retention of valuable trees. Younger trees are more adaptable to changes and construction of new surfaces within the RPA and can coped with the pressures whereas mature and veteran trees do not and often severely decline. Mature and veteran trees should not have any new surfaces installed in their RPAs, as their ability to cope with the change is poor.

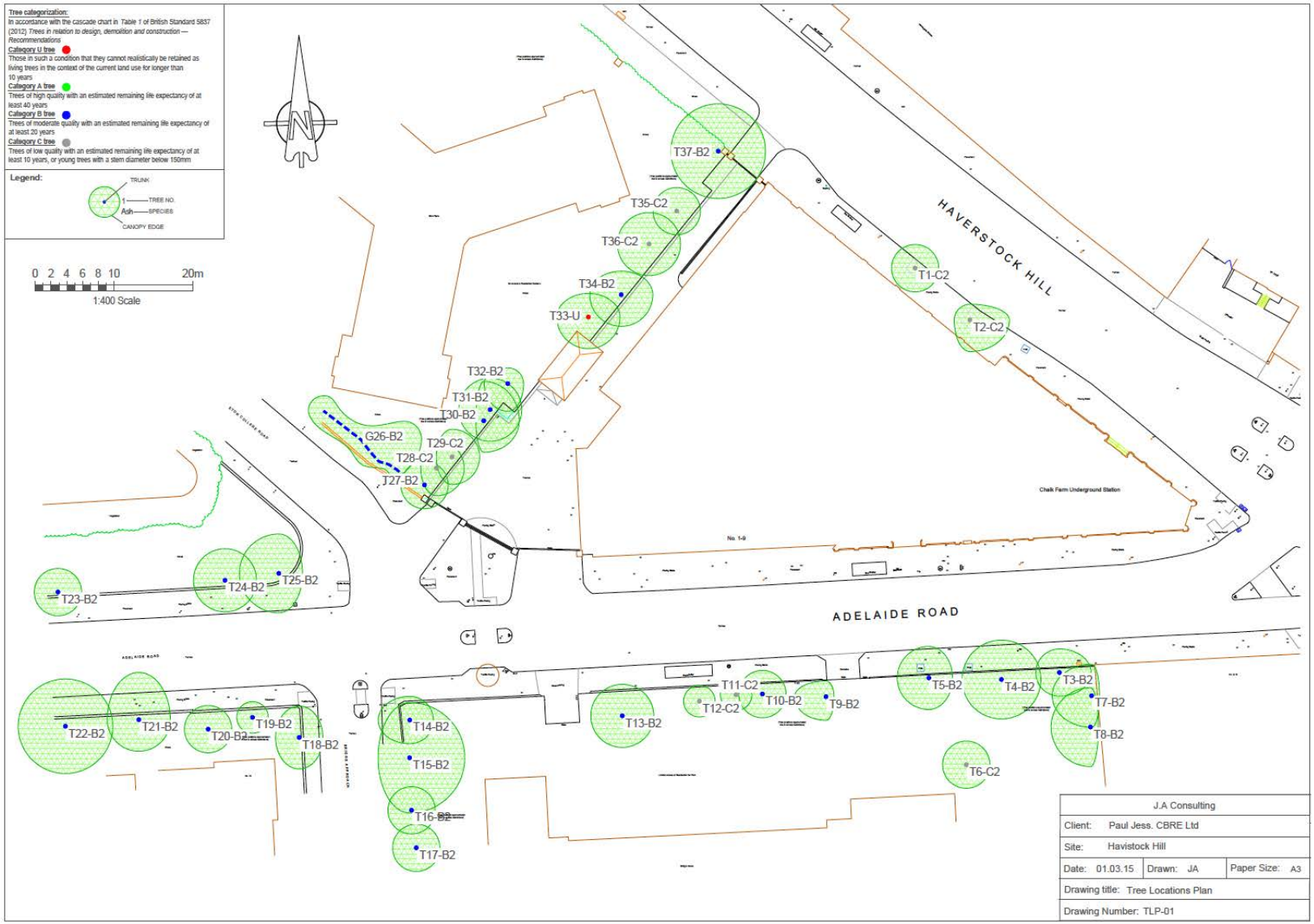
A.4.13 Providing Sufficient Grading for New Surfaces: Determining the depth of roots within any soil and RPA is difficult and can only be achieved by careful excavation of the topsoil. All surfaces proposed inside the RPA need to ideally be of a no dig construction which prohibits excavation, but this is often unfeasible as the ground us usually undulating. Limited ground movement and excavations are permitted if they are carried out with care to prevent any damage to the retained root systems. Ideally the ground should be raised up to provide a suitable level surface using a granular aggregate like angular stone or sharp sand. If done under supervision it is acceptable to allow the removal of the topsoil and turf to a depth of no more than 50mm that normally doesn't damages the roots. However if there are a large number of surface roots already showing prior to any soil removal there can be no excavation and the ground level must alternatively be raised. If during the grading of the soil roots of a greater diameter of 25mm are encountered the consultant arboricultural consultant will need to make an evaluation as to whether the damage is preventable and or

acceptable before proceeding. At no point can the graded surface be compacted to provide a finish as this will disrupt the soil structure and have a damaging effect of the roots within it. The final level of the proposed surface must also be considered and discussed prior to starting any works to establish whether the proposal is practical and useable once completed.

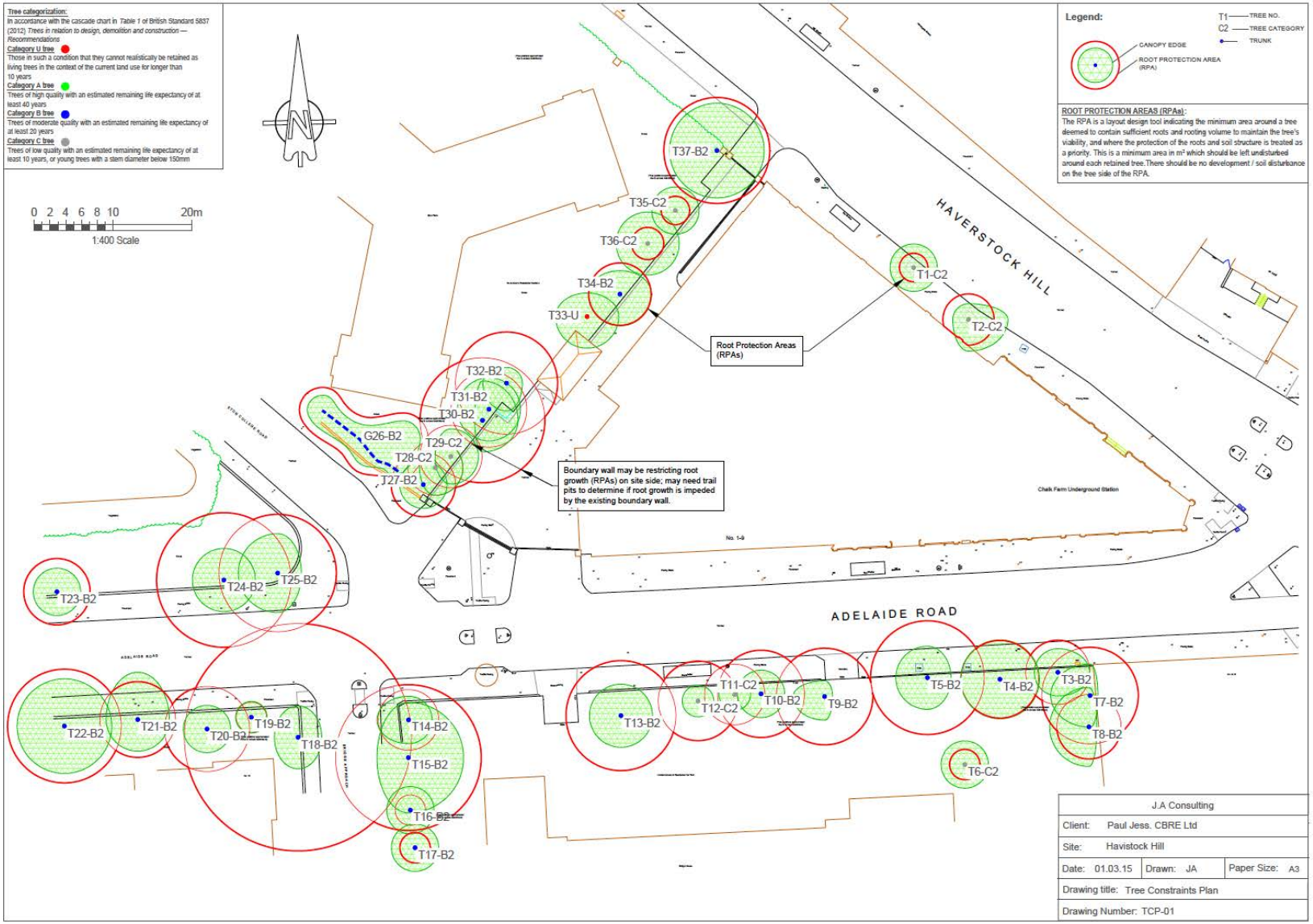
A.4.14 **Installing Base and Top Layers:** Once a suitably level base has been created without damaging the retained roots, a load spreading construction is required to prevent the compaction of the soil structure beneath. Normally this can be achieved by installing a cellular confinement system that is filled with an angular no fines aggregated to help support and distribute the calculated load over a wider area and limiting soil compaction. This enables a finishing layer of permeable tarmac, block paviors, grasscrete, or gravel to be laid on top depending on the desired usage of the surface. Alternative options are to use of preformed concrete slabs that can be laid directly onto the surface but they cannot be laid on top of any form of strip foundation that has a high potential for root damage.

A.4.15 **Retention of Existing Surfaces:** Where possible it is preferable to install new surfaces over those already existing, limiting the potential damage to any underlying root system. This can provide a suitable sub base without the need for excavation and without the need for special supervision and precautions. Care will only be needed if roots are lifting or protruding through the existing surface.

Appendix 5: Tree Locations Plan



Appendix 5: Tree Constraints Plan



Appendix 6: Tree Constraints Plan Showing Potential Incursions