thomson ecology

121 Canfield Gardens, London, NW6 3DY

Arboricultural Survey,

Arboricultural Impact Assessment

and

Arboricultural Method Statement

For

Nicola McQuaid

Project No.: YMCQ101/001

May 2019

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Project Number	Report No.
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001	10/05/2019	Neil Francis	Iain Waddell	Neil Francis

Contents

1. Summary

1.1.1 DLG Architects are involved in the partial redevelopment of 121 Canfield Gardens, London (see Figure 1).

1.1.2 Nicola McQuaid commissioned Thomson Ecology to undertake an arboricultural survey of trees within and adjacent to the site, and to produce an Arboricultural Impact Assessment (AIA) which discusses the likely impact of the development proposals on the trees at the site, and to compile an Arboricultural Method Statement (AMS) detailing the protection of all the trees at the site. The arboricultural survey was carried out in accordance with BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations'* (BS5837:2012).

1.1.3 All trees were categorised in accordance with the cascade chart for tree quality assessment in BS5837:2012 (see Appendix 2). Trees were given a ranking of A, B or C in descending order of value and assigned one or more subcategories qualifying the basis of that value as either arboricultural, landscape or cultural.

1.1.4 A total of five individual trees were recorded during the survey and listed in the Tree Schedule. The survey recorded three Category A trees, one Category B tree and one Category C tree located within or adjacent to the site (see Figure 2).

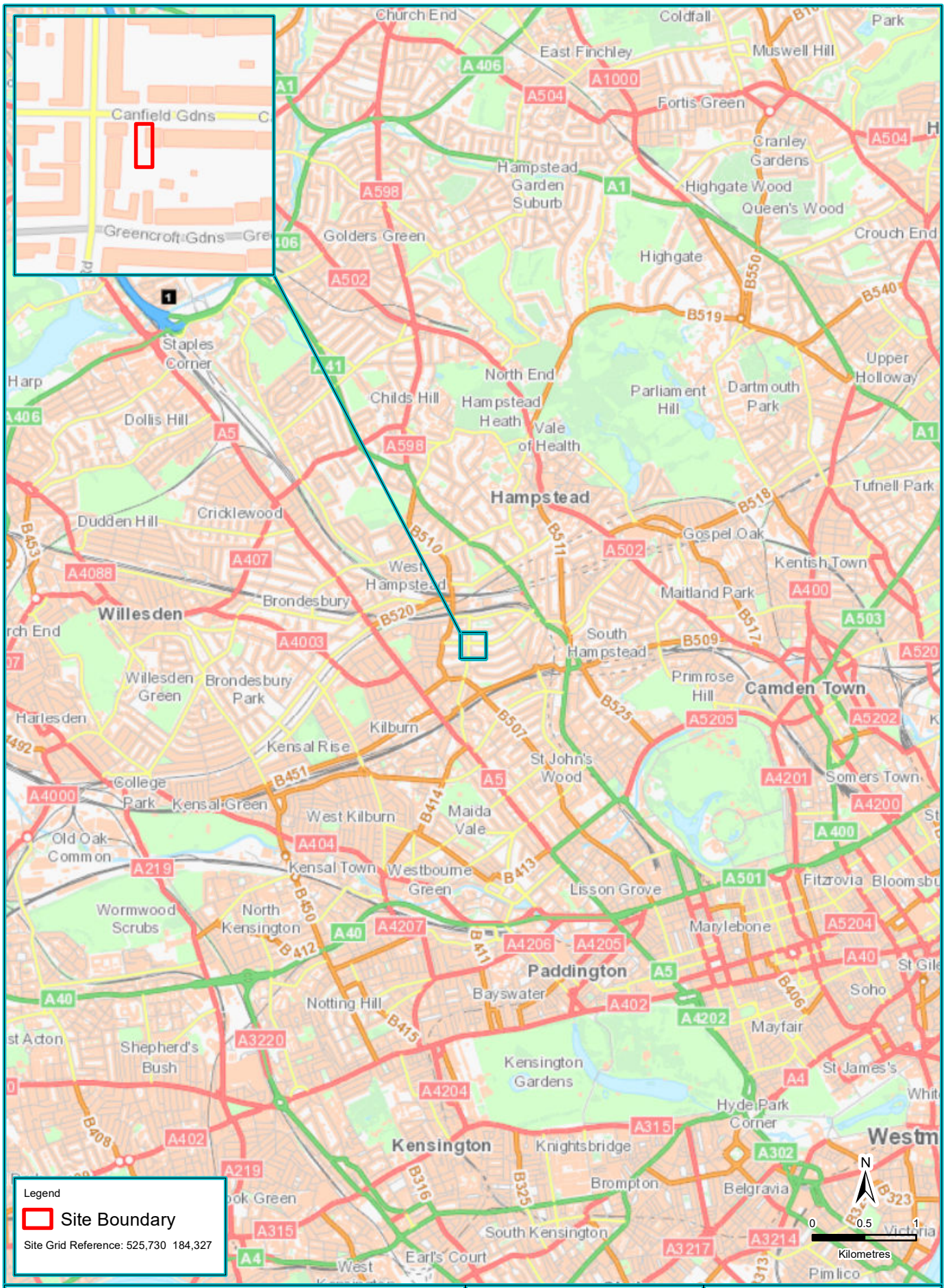
1.1.5 Category A, B and C trees represent a material consideration to development. Concerted effort should be made to retain A and B category trees within the development. Whilst Category C trees should be retained where possible, should not be retained where they would present a serious constraint to development.

1.1.6 A trial pit was excavated within the Root Protection Areas (RPA) of trees T3 and T4. A number of small roots with a diameter less than 25mm were uncovered and one larger root with a diameter of approximately 100mm was uncovered in the top 300mm of the existing ground.

1.1.7 Severance of these roots will result in approximately 4% loss of the total RPA of tree T3 which is considered to be an acceptable level of loss. There should be no long term significant effect on this tree's health.

1.1.8 The AIA concluded that the proposed extension should not have a detrimental effect on any of the trees' health.

1.1.9 The AMS details how the use of tree protection fencing, pile and raft foundations and the retention of paving and hard surfacing during the works will ensure adequate protection for trees that are to be retained during the proposed works.



Client: Nicola McQuaid		Drawing Ref: YMCQ101/27505/1	
Figure Number: 1		Scale at A4: 1:50,000	
Figure Title: Site Location		Drawn: EA	Checked: TP
		Date: 01/05/2019	Date: 01/05/2019

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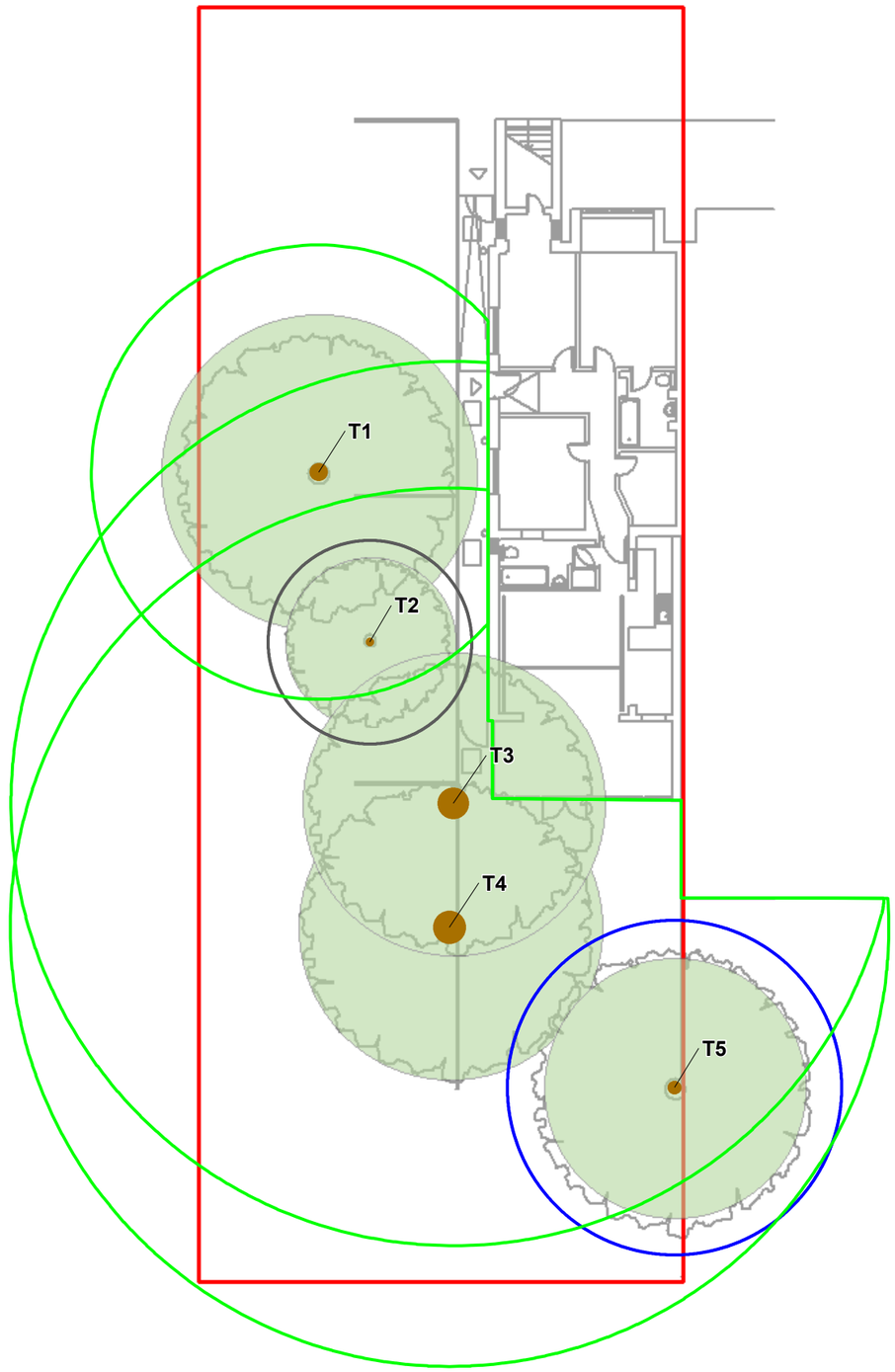

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Metres

Filepath: S:\Leeds\Projects\YMCQ101 - Arboricultural Survey Impact Assessment and Method Statement 121 Canfield Gardens Camden\Mapping\Working\YMCQ101_Fig2_TCP_EA_010519.mxd

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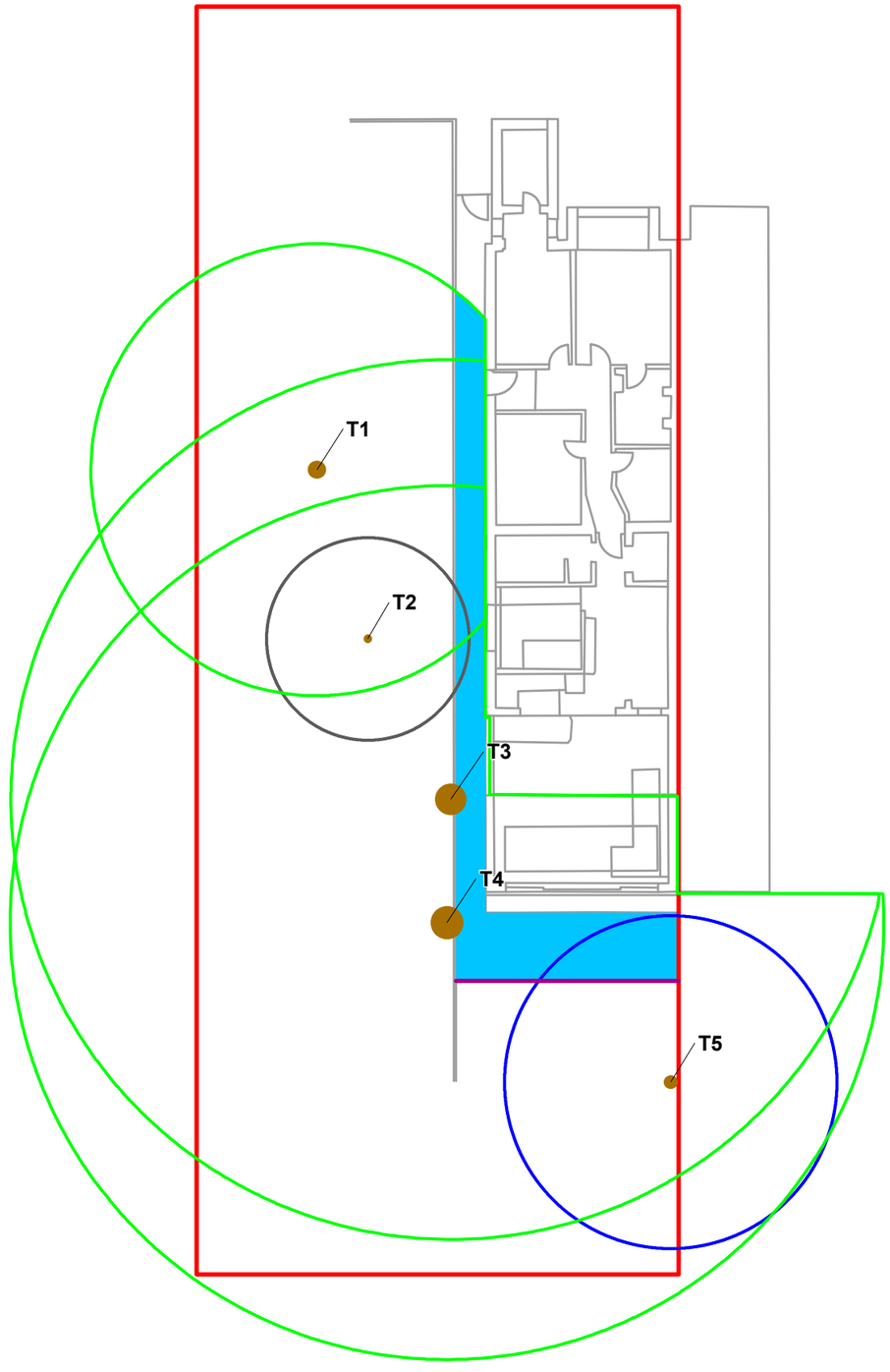
Legend

- Root Protection Area of Category 'A' Tree
- Root Protection Area of Category 'B' Tree
- Root Protection Area of Category 'C' Tree
- Tree Canopy Extents
- Tree Stem Location
- Site Boundary

Site Grid Reference: 525,730 184,326

Drawing Ref	YMCQ101/27506/1
Scale at A3	1:200
Drawn: EA	Checked: TP
Date: 01/05/2019	Date: 01/05/2019
Client	Nicola McQuaid
Figure Number	2
Figure Title	Tree Constraints Plan (TCP01)



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Legend

- Tree Protection Fencing
- Root Protection Area of Category 'A' Tree
- Root Protection Area of Category 'B' Tree
- Root Protection Area of Category 'C' Tree
- Tree Canopy Extents
- Tree Stem Location
- Temporary Ground Protection
- Site Boundary

Site Grid Reference: 525,730 184,326

Drawing Ref	YMCQ101/27507/1
Scale at A3	1:200
Drawn: EA	Checked: TP
Date: 01/05/2019	Date: 01/05/2019
Client	Nicola McQuaid
Figure Number	3
Figure Title	Tree Protection Plan (TPP01)

Photograph 1:
Looking north along the line where the proposed extension is to be located adjacent to London plane tree T3.

Photograph 2:
Looking at 2m long trench (500mm deep) showing all roots uncovered during excavation.

Photograph 3:
Looking south along the excavated trench.

Photograph 4:
Looking west at the location of the trench adjacent to T3.

Client: Nicola McQuaid		Drawing Ref: YMCQ101/27520/1	Thomson environmental consultants www.thomsonec.com enquiries@thomsonec.com
Figure Number: 4a		Scale at A4: Not applicable	
Figure Title: Photographs of the Site		Drawn: EA	Checked: TP
		Date: 03/05/2019	Date: 03/05/2019

Photograph 5:
Showing the depth of the trench, 500mm or greater than 500mm.

Photograph 6:
Showing the depth of the largest root at 300mm below ground level.

Photograph 7:
Looking at largest root uncovered which grows from the direction of T3 in a south east direction.

Photograph 8:
Showing the largest root uncovered being 103mm in diameter.

Client: Nicola McQuaid		Drawing Ref: YMCQ101/27521/1	
Figure Number: 4b		Scale at A4: Not applicable	
Figure Title: Photographs of the Site		Drawn: EA	Checked: TP
		Date: 03/05/2019	Date: 03/05/2019

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2. Introduction

2.1 Development Background

2.1.1 DLG Architecture is involved in the development of a site located at 121, Canfield Gardens, London. Proposals are for the construction of an additional bedroom, a study area and additional storage as well as relocating and extending the living/kitchen/dining room to the south of the building. These proposals are hereafter referred to as 'the development'.

2.1.2 The development is located on an approximately 0.052ha area of land (grid reference TQ245864), shown on Figure 1. The area affected by the development is hereafter referred to as 'the site'.

2.1.3 There are a number of trees within the site and adjacent to the site boundary that may be affected by development.

2.1.4 A planning application was submitted and validated in January 2019 with a decision yet to be decided.

2.2 Site Description

2.2.1 The site is located in an area of residential housing in Camden, London. Situated in the rear of 121, Canfield Gardens, the new extension will replace the existing rear extension of the property coupled with an additional area of paving. To the west of this, there is a fence separating the site from the rear gardens of 82-84 Priory Road, Camden, within which are trees T1, T2, T3 and T4.

2.3 Brief and Objectives

2.3.1 Nicola McQuaid commissioned Thomson Ecology Ltd on 15th April 2019 to undertake an arboricultural survey of the site, including a Tree Schedule (see Appendix 1) and a Tree Constraints Plan (TCP) (see Figure 2), and to produce an AIA and AMS including a Tree Protection Plan (TPP).

2.3.2 The objective of the survey and report was to assess the condition of the existing trees on site and any off site trees that might be affected by the development, providing sufficient information to enable decisions to be made on potential design layout and tree retention for the proposed development. The brief was to complete:

- An Arboricultural Survey of trees, within or immediately adjacent to the site, in line with BS5837:2012.
- Liaison with the Local Planning Authority and Tree Officer to determine whether trees on site are subject to a Tree Preservation Order or are covered by Conservation Area restrictions.
- An Arboricultural Report detailing our methods, results and recommendations, including the Tree Schedule and a Tree Constraints Plan, which can be used to inform feasibility studies and design options.

- An Arboricultural Impact Assessment (AIA), based on the proposed site layout, which evaluates the direct and indirect effects of the proposed design on the trees on site, identifies which trees can realistically be retained, and recommends any necessary mitigation to protect those trees.
- An Arboricultural Method Statement (AMS) detailing how retained trees will be protected on site and how any aspect of the development that is within the root protection areas of retained trees will be implemented with minimum impact on the future health of the trees.
- A Tree Protection Plan detailing how retained trees will be protected during development works.

2.3.3 Nicola McQuaid further commissioned Thomson Ecology Ltd on 2nd May 2019 to undertake a trial pit at the site to help determine the depth and extent of tree roots that may be affected by the proposed development works.

2.4 Limitations

2.4.1 The information provided within this report and in the accompanying Tree Schedule covers only those trees that were inspected and their condition at the time of survey.

2.4.2 A full hazard assessment has not been made and therefore no guarantee is given as to the structural integrity of any of the trees onsite.

2.4.3 Measurements for off-site trees have been estimated and therefore may not fully represent the related constraints.

2.4.4 Whilst this report makes general observations on the long term potential of the trees surveyed, trees are dynamic organisms and subject to continual change, thus this report should not be relied upon for the purposes of development for more than 12 months from the date of survey.

3. Methodology

3.1 Desk Study

3.1.1 Records of Tree Preservation Orders (TPOs) existing at the site and Conservation Areas within or adjacent to the site were sought from Camden London Borough Council.

3.2 Tree Survey

3.2.1 All significant trees at the site were assessed for their potential to be affected by the development proposals. Significant trees are defined as those with a trunk diameter of greater than 75mm at 1.5m above ground level according to the survey methodology outlined in BS5837:2012. Off-site or third party trees have been included where it is likely they would influence the development.

3.2.2 The trees surveyed were inspected from ground level only and no internal investigations were undertaken. They were categorised as single trees.

3.2.3 The information recorded for each tree can be seen in Table 1.

Table 1: Information recorded for each tree during survey.

Attribute	Description
Tree No.	Numerical reference given in sequential order starting at number '1', corresponding with the numbers as set out in Figure 2; trees are given the prefix 'T', groups 'G', woodlands 'W' and hedgerows 'H'.
Species	The common names are based upon on site identification and expressed according to *Tree Guide* (Johnson & More, 2004).
Height	Measured approximately from ground level with the aid of a clinometer and shown in metres (m).
Stem Diameter	Diameter measured at approximately 1.5m above ground level. In the case of multi-stemmed trees, measurement is taken of each stem at 1.5m, where there are two to five stems; or a mean stem diameter at 1.5m, where there are more than five stems. Given in millimetres (mm).
Canopy Spread	Maximum branch spread measured in metres from the centre of the trunk in the direction of the four cardinal points of the compass (or an average can be given if branches demonstrate an even spread).
Crown Clearance	Height above ground level of the first significant branch and direction of growth, and the height above ground level of the overall canopy.

Attribute	Description
Age Class	• Young – less than one-third natural life span spent; • Middle-aged – between one-third and two-thirds natural life span spent; • Mature – greater than two-thirds life span completed; • Over-mature – mature, and in an overall state of decline; • Veteran – surviving beyond the typical age range for the species with a high value in terms of conservation and amenity.
Physiological Condition	Overall health, condition and function of the tree in comparison to a 'normal' example of the species of a similar age; e.g. 'good', 'fair', 'poor' or 'dead'. If deemed necessary, these gradings may be elaborated upon in the 'Comments' section.
Structural Condition	The overall structural condition of the tree including the roots, butt, trunk, limbs and their unions, and the presence of any structural defects, decay or pathological defects. • Good - no significant visible structural defects with a form typical for the species; • Fair - a specimen with only minor defects that are easily remedied or of no long term significance; • Poor - significant and irremediable physiological or structural defects that may lead to early or premature decline; • Hazardous - significant structural defects of such a degree that there is a risk of imminent collapse or failure. If deemed necessary, these gradings may be elaborated upon in the 'Comments' section.
Comments	Comments have been made, where appropriate, relating to location, health and condition, structure and form, estimated life expectancy, conservation value and amenity value within the local landscape.
Preliminary Management Recommendations	Tree work that should be undertaken for good arboricultural management, regardless of the requirements of the development.
Estimated Remaining Cotribution	The estimated time, in years, that the tree will provide a safe contribution to the site (i.e. <10, 10-20, 20-40 and >40).

Quality Assessment

3.2.4 During the survey, the trees were assessed qualitatively, categorising the quality and value of the trees based on arboricultural, landscape and cultural (including conservation) features. Each tree was then placed into one of four categories. The four categories can be seen in Table 2. Definitions for these categories can be found in Appendix 2.

Table 2: Quality assessment categories

Category	Description
Category U	Trees in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years.
Category A	Trees of high quality with an estimated life expectancy of at least 40 years.
Category B	Trees of moderate quality with an estimated remaining life expectancy of at least 20 years.
Category C	Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm.

3.2.5 Trees categorised as either A, B or C, were also allocated up to three subcategories. The subcategories chosen for each tree are dependent on the main reasons for selection of the particular category grading. The three subcategories are as follows:

- 1 – Category grading based on mainly arboricultural qualities;
- 2 – Category grading based on mainly landscape qualities; and
- 3 – Category grading based on mainly cultural values, including conservation.

Root Protection Areas (RPAs)

3.2.6 Trees that are selected for retention on the site could be at risk of damage during construction, such as root damage during the excavations for foundations or services or any ground-working for landscaping. Further impacts on the trees may potentially result from vehicle movements and materials storage, including root severance, compaction of the soil and exclusion of air and water to the soil. The risk of tree damage is minimised if construction activities are planned to avoid the roots of trees.

3.2.7 The area of ground adjacent to each tree or group of trees that contains the majority of the roots can be calculated using the equation provided in the BS5837:2012. This Root Protection Area (RPA) is a radius around the tree of 12 times the stem diameter for a single stem. For multi-stemmed trees of two to five stems and greater than five stems, the cumulative stem diameters to be multiplied by 12, are calculated as per the equations in Table 3.

Table 3: Equations for the calculation of the RPA of multi-stemmed trees

Number of stems	Equation
Two to five	$\sqrt{(\text{stem diameter 1})^2 + (\text{stem diameter 2})^2 \ldots + (\text{stem diameter 5})^2}$
More than five	$\sqrt{(\text{mean stem diameter})^2 \times \text{number of stems}}$

3.2.8 The RPA for each tree in the Tree Schedule has been calculated and, where relevant, has been adjusted to take into account site conditions. For example, when a tree is growing in a confined

root space adjacent to an existing building or other solid structure that would restrict root growth in that direction, the RPA has been adjusted accordingly (see Figure 2).

3.2.9 Where the calculated RPA exceeds 707m^2, it has been capped at this figure, as per BS5837:2012. This is equivalent to a circle with a radius of 15m or a square with approximately 26m sides.

Date of Survey

3.2.10 The site was visited and the survey undertaken on 30th April 2019 by Senior Arboricultural Consultant Iain Waddell Tech Cert (ArborA) Dip Arb L6 (ABC) TechArborA.

3.2.11 The trial pit was undertaken on 3rd May 2019 by Senior Arboricultural Consultant Iain Waddell Tech Cert (ArborA) Dip Arb L6 (ABC) TechArborA and Site Supervisor Steve Clark.

Weather Conditions

3.2.12 The weather conditions at the time of survey were dry with sunny spells. Deciduous trees were in bud burst or were in full leaf.

4. Results

4.1 Desk Study

4.1.1 It was confirmed by Camden London Borough Council, via telephone, on 3rd May 2019, that trees T3 and T4 immediately adjacent to the site boundaries are covered by Tree Preservation Order C234 and located within the South Hampstead Conservation Area.

4.1.2 Under the Town and Country Planning (Tree Preservation) (England) Regulations 2012 it is prohibited to cut down, top, lop, uproot, wilfully damage or wilfully destroy; or cause or permit the cutting down, topping, lopping, uprooting, wilful damage or wilful destruction of any tree, or group of trees, subject to a TPO or that is located within a Conservation Area except with the consent of the local authority.

4.2 Tree Survey

4.2.1 Five significant individual trees located within or immediately adjacent to the site boundary were recorded during the survey. A breakdown of categories can be found in Table 4. The locations of all trees, RPAs, retention categories and reference numbers are shown on Figure 2. A detailed description of each tree is given in the Tree Schedule in Appendix 1.

Table 4: Number of significant trees allocated to each retention category.

Tree Category	Number of Trees	Tree Numbers	Total
A	3	T1, T3, T4	3
B	1	T5	1
C	1	T2	1
U	-	-	-
Total	5		5

4.2.2 A list of the criteria used to determine the category and subcategories of the trees can be found in Appendix 2 - Table of Quality Assessment.

Root Protection Areas (RPAs)

4.2.3 The RPAs for the trees and groups surveyed can be seen in Figure 2. The actual RPAs, in m^2, for the individual trees surveyed are shown in Appendix 1.

4.3 Trial Pit

4.3.1 The trial pit uncovered a total of six roots, of which three emanated from tree T3 and three from tree T4. Five of these had a diameter of between 20 and 35mm and are most closely associated with supporting smaller roots used for the uptake of water and nutrients. One other root, growing from tree T3, had a diameter of approximately 100mm and is used to provide support to the tree's structure.

5. Arboricultural Impact Assessment (AIA)

5.1 Introduction

5.1.1 The purpose of the AIA is to assess the likely impact of the proposed development on the existing trees on site and to determine which trees are to be removed or retained during the construction phase.

5.1.2 The protection of retained trees is paramount to their survival during the development process and their consequent long term contribution to the site. The Root Protection Areas (RPAs) identified in the arboricultural survey and Tree Constraints Plan (TCP) should remain protected throughout the development to avoid potential damage, such as:

- Soil compaction;
- Root severance due to excavation;
- Soil coverage with impermeable material;
- Alterations in ground level;
- Leaks and spillages from stored materials; and
- Vehicle and heavy plant collision.

5.2 Documents

5.2.1 This assessment has been based on documents produced by DLG Architects and Mason Navarro Pledge. The details of these documents can be seen in Table 5.

Table 5: Documents upon which this assessment has been based

Originator	Reference No.	Title
DLG Architects	4276 03	Design and Access Statement
DLG Architects	4276 (EX) 001 00	Existing Lower Ground Floor Full Plan
DLG Architects	4276 (DE) 001 01	Proposed Demolition Plan Extract
Mason Navarro Pledge	4276 (D) 002 01	Proposed Lower Ground Floor Plan Extract

5.3 Tree Removals

5.3.1 No trees require removal in order to facilitate this development.

5.4 Trees to be Retained

5.4.1 Of the trees surveyed, five are to be retained and protected throughout development.

5.4.2 The RPAs of the retained trees should be protected by fencing to the specification laid out in BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations*'. The specification of this fencing is detailed in Section 6.6.1 of the AMS and an illustrated example can be seen in Appendix 3 and 4. The area protected by the fencing shall be known as the Construction Exclusion Zone (CEZ).

5.4.3 As an access route for machinery will be required within the RPAs of trees T1, T2, T3 and T4, ground protection will be used to protect the integrity of the RPAs and prevent soil compaction and root damage. This ground protection should be constructed to the specification outlined within Arboricultural Practice Note 12 '*Through the Trees to Development*', but will designed by an engineer to ensure that the required level of load spreading is achieved, dependent on the vehicles likely to use it.

Shading

5.4.4 Trees T3 and T4 are located to the west of the proposed extension and will therefore cast shade during the majority of the day. However, as this is a small extension and the crowns of the trees are approximately 5m above ground level, the shade cast should not significantly affect the amount of daylight entering the new living room.

5.5 Trees Works

5.5.1 No trees require maintenance works prior to the erection of protective fencing. If future works are identified as part of the development, they should be undertaken in accordance with British Standard BS3998:2010 Recommendations for Tree Work (BS3998:2010).

5.6 Demolition Work within RPAs

5.6.1 The existing extension is due to be demolished. In order to avoid soil compaction in trees T3 and T4's RPAs, the existing paving should be retained whilst this is undertaken and machinery used in the demolition footed on the paving. Where possible, a 'pull back' or 'top down' approach should be used.

5.7 Construction Work within RPAs

5.7.1 The proposed extension encroaches into the RPAs of trees T3 and T4. To mitigate against the potential root severance of traditional trench foundations, pile and raft foundations will be employed in this area. These should be designed by a structural engineer and installed as set out in Section 6.9 of the AMS.

5.8 Services and Utilities

5.8.1 Drawings of underground services are not available at this time. Therefore, it is not possible to identify any specific potential impacts associated with the site at this stage.

5.8.2 Where existing services situated within RPAs require upgrading, care must be taken to minimise any disturbance, and where feasible trenchless techniques are to be employed, and only where necessary should manual excavation be considered.

5.8.3 If new services are to be introduced into the site they should be located outside of the RPAs where they will not interfere with tree roots. Final positions of any proposed services should be verified and approved by an arboricultural consultant and the Local Authority Tree Officer before implementation.

5.8.4 If service installation is required within RPAs then the guidelines within National Joint Utilities Group publication '*Guidelines for the planning, installation and maintenance of utility services in proximity to trees*' (NJUG 4, 2007) should be adhered to.

5.9 Post Development Management

5.9.1 Trees T1, T2, T3 and T4 are located in the rear gardens of neighbouring properties and are therefore not the responsibility of the owner of 121, Canfield Gardens. As such, a tree management system is not required by the applicant.

5.9.2 Tree T5 should be regularly checked for evidence of structural of physiological problems, although this does not necessarily need to be done by a person with a formal qualification in arboriculture. Guidance on the level of tree management required can be found in the National Tree Safety Group publication, '*Common sense risk management of trees*' (NTSG, 2011).

5.10 New Planting

5.10.1 As there will be no tree removals, and the development is located within an area with limited

5.11 Conclusion

5.11.1 There should be no harm caused to any trees planned for retention by these proposals subject to the erection of protective fencing furnished with tree protection notices, ground protection and the use of pile and raft foundations.

6. Arboricultural Method Statement (AMS)

6.1 Introduction

6.1.1 The purpose of this AMS is to demonstrate how work will be undertaken on the site to avoid an unacceptable impact on, and provide an adequate level of protection for, the retained trees.

6.1.2 This AMS sets out the tree protection required to facilitate the proposed development, and should not be read as a definitive engineering or construction statement for this site. Matters relating to construction or engineering detail should be referred to a qualified structural engineer for further information and specification.

6.1.3 This AMS is to be used in conjunction with the Tree Protection Plan (TPP01) in Figure 3.

6.2 Documents

6.2.1 This AMS has been based on documents produced by DLG Architects and Mason Navarro Pledge. The details of these documents can be seen in Table 6.

Table 6: Documents upon which this assessment has been based

Originator	Reference No.	Title
DLG Architects	4276 03	Design and Access Statement
DLG Architects	4276 (EX) 001 00	Existing Lower Ground Floor Full Plan
DLG Architects	4276 (DE) 001 01	Proposed Demolition Plan Extract
Mason Navarro Pledge	4276 (D) 002 01	Proposed Lower Ground Floor Plan Extract

6.2.2 The relationship between the trees and the proposed development are shown on the Tree Protection Plan (TPP01), (see Figure 3) which is based on the Tree Constraints Plan (TCP01) and the drawings detailed in Table 6.

6.3 Supervision

6.3.1 As the there is no requirement to work within the RPAs of the retained trees, there should be no need for any part of the construction phase to require arboricultural supervision.

6.3.2 However, any changes to the nature and sequence of works specified in this AMS regarding the retained trees should be agreed with an arboricultural consultant at least 48 hours before their realisation.

6.4 List of Contacts

6.4.1 The list of contacts within Table 7 should be used as reference if any deviations from, or issues with, any part of this AMS arise.

Table 7: List of contact details for relevant parties

Name	Job Title	Organisation	Contact Email	Contact Number
Neil Francis	Head of Arboriculture	Thomson Environmental Consultants	Neil.francis@thomsonec.com	0113 2473784 07824 692620
Iain Waddell	Senior Arboriculturist	Thomson Environmental Consultants	Iain.waddell@thomsonec.com	01483 466054 07825 626053
-	Planning Arb Officer	Camden London Borough Council	planning@camden.gov.uk	0207 9744444
Kennedy Lupindula	Associate Director	Mason Navarro Pledge Ltd	kl@mnp.co.uk	01462 632012 07738 725010
Alex Clough	Architect	DLG Architects	a.clough@dlgarchitects.com	0207 6201236

6.5 Tree Removals and Pruning

6.5.1 There is no requirement for tree removal or tree pruning for any of the trees on site.

6.6 Protective Fencing

6.6.1 Temporary fencing will be erected as indicated on the Tree Protection Plan (TPP01) in Figure 3. The specification for this fencing will be in accordance with the recommendations given in BS5837:2012 '*Trees in Relation to Design, Demolition and Construction – Recommendations*' (BSI, 2012). It will comprise 2.0m high mesh fencing (Heras type panels are a simple, readily available solution) attached to a scaffold framework. Support scaffolds will be attached to the scaffold framework as necessary at an angle of 45 degrees on the side of the trees and anchored by further scaffold poles carefully firmed into the ground. The vertical scaffold tubes will be spaced at a maximum interval of 3m.

6.6.2 A diagram illustrating an example of the protective fencing can be seen in Appendix 3 and 4.

6.6.3 Clear signs will be attached at 4m intervals along the fencing stating 'Tree Protection Area – Keep Out'. These should be outward facing and weather protected and maintained for the duration of the works. A suitable sign can be seen in Appendix 5.

6.6.4 The area protected by the fence shall be known as the Construction Exclusion Zone (CEZ).

6.6.5 The following principles must be maintained within the CEZ:

- Existing ground levels shall not be altered;
- No excavation shall occur to avoid root severance;
- No plant or vehicles shall enter the CEZ;
- Impermeable surfacing shall not be laid down over soil ('capping');

- No materials, fuels or chemicals shall be stored within any of these areas;
- No fires to be lit where flames may reach within 5m of the CEZ;
- No structures or fixtures of any kind shall be fastened in any way to the trunks of the retained trees;
- No drainage or irrigation pipes shall be installed within the RPAs of the retained trees; and
- Any unwanted vegetation shall be removed by hand.

6.6.6 The fencing shall remain in place until soft landscape operations require its full or partial removal. No other construction activity will take place within those areas formerly protected by the fence.

6.7 Ground Protection

6.7.1 The main site access route is proposed to pass through the RPAs of T1, T2, T3 and T4. To protect the integrity of these RPAs and still allow the route to be utilised, ground protection will be needed. As the route is to be used by a piling rig, the exact specification of this protection will need to be designed by an engineer and may involve the use of proprietary systems or reinforced concrete slabs to accommodate the likely loading. The final design of this ground protection should be submitted to the LPA prior to the commencement of works.

6.7.2 Paving slabs in the RPAs of trees T3 and T4 that do not require removal to allow the demolition of the existing extension and the construction of the new one, should be retained as existing ground protection. It is not envisaged that they will be sufficiently robust enough to support the weight of the piling rig and other construction plant and additional protection should be installed in line with the structural engineer's recommendations.

6.8 Removal of Hard Surfaces within the RPA

6.8.1 An area of existing paving within the RPAs of trees T3 and T4 requires removal as part of the development. To prevent damage to any underlying roots this will be removed by hand. Due to their relatively small size and weight, it is not imagined that machinery will be necessary to remove these.

6.8.2 Only those slabs requiring removal to create the necessary footprint of the new extension and a suitable working space shall be removed. The others shall remain in situ as ground protection during the works.

6.9 Demolition within RPAs

6.9.1 During the demolition of the existing extension, the paving in trees T3 and T4's RPAs should be retained and machinery used in the demolition footed on the paving. Where possible, a 'pull back' or 'top down' approach should be used and the fabric of the building allowed to fall within the footprint of the existing extension. Any hard surfacing covering the ground within the footprint of the extension should be retained whilst this is done to avoid damaging underlying roots or the soil structure.

6.10 Construction within RPAs

6.10.1 Where the building footprint overlaps the RPAs of trees T3 and T4, mini-pile and raft foundations shall be used to prevent root damage. Approximately six mini-piles with anti-heave protection will be installed and a 300mm thick, reinforced concrete slab laid on top. A void will be left under the slab.

6.10.2 As the foundations of the existing extension consist of a piled raft construction, any differential settlement between the two structures should be minimal.

6.10.3 Exploratory bore holes shall be hand-dug to a depth of 1m to ensure that the larger diameter root uncovered during the trial pit excavation is not present. If roots of over a diameter of 25mm are encountered the hole shall be back-filled with the excavated material and a new exploratory hole dug. Roots under a diameter of 25mm may be pruned under the supervision of an arboriculturist.

6.10.4 Although the use of a piled raft foundation will minimise the impact on the trees' roots, there will be a small loss in the total area of the RPAs which should be considered as tolerable. Despite a reduction in the volume of roots, the trees will compensate for this by reducing shoot growth and directing their resources to new root production. In a relatively short time period, this will rebalance the root:shoot ratio and the growth pattern of the trees will return to normal. Pruning of roots should not be carried out when reserves of energy in the tree are low, typically in mid to late spring, after leaf emergence and rapid shoot growth.

6.11 Services and Utilities

6.11.1 All underground services and drainage routes shall be located so that no excavations are required within the RPAs of the retained trees.

6.11.2 In the event that an incursion into an RPA is unavoidable, the installation shall comply with the methods and guidelines detailed in *Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees* NJUG 4 (2007). If this does occur, then an arboricultural consultant shall be consulted before any works commence within the RPA to agree the methodology for the excavation.

6.12 Landscaping

6.12.1 The plans provided do not show any landscaping with the RPAs of the retained trees. However, if any is to be undertaken post-construction, the principles of the CEZ (as detailed in Section 6.6.5) should still be adhered to with particular reference to level changes, root severance and 'capping' with impermeable materials. If impermeable surfaces are to be laid within the RPA of any of the retained trees then they should not cover greater than 20% of the area.

6.12.2 It is suggested that an area of mulch be added to the base of the trees should any soft landscaping take place. An area of $1m^2$ and 5-10cm depth of shredded bark, bark chips or well-composted green waste to conform to PAS 100 (BSI, 2005) is suggested. Mulch should not be spread so that it is piled against the base of the tree.

6.13 Sequence of Works

6.13.1 A logical sequence of events is to be observed as shown in Table 8.

Table8: Sequence of works.

Stage	Event	Arboricultural Supervision required
Stage 1	Prestart meeting with Camden London Borough Council Tree Officer, site manager and relevant construction staff. This will include site induction for all personnel.	Yes
Stage 2	Carry out any necessary tree pruning operations to enable access and siting of site compound building and materials storage.	No
Stage 3	Install ground protection and materials storage facility.	No
Stage 4	Install Protective Fencing in the position shown on Figure 3, to the specifications given in Section 6.6.	No
Stage 5	Site visit by arboriculturist to sign off the installed fencing and ground protection. Further regular visits will be undertaken by the arboriculturist.	Yes
Stage 6	Complete main construction phase of development.	No
Stage 7	Complete all the landscaping.	No
Stage 8	Removal of all machinery from site.	No
Stage 9	Dismantle protective fencing by hand and remove from site.	No
Stage 10	Arboricultural assessment of retained trees on site to confirm their health post development.	Yes

7. Bibliography

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7.1.4 British Standards Institution (2005) *Publicly Available Specification 100 (*PAS 100:2005*).* BSI, London.

7.1.5 HM Government. The Town and Country Planning (Tree Preservation) (England) Regulations 2012. London: Office of Public Sector Information (OPSI).

7.1.6 Lonsdale, D. (1990) *Principles of Tree Hazard Assessment and Management*. The Stationery Office, London.

7.1.7 Matheny, N. & Clark, J.R. (1998) *Trees and Development.* ISA, Champaign, IL.

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7.1.10 National Joint Utilities Group (NJUG) (2007) *Guidelines for the planning, installation and maintenance of utility services in proximity to trees*. NJUG, London.

7.1.11 National Tree Safety Group (2011) *Common Sense Risk Management of Trees* Forestry Commission, Edinburgh

7.1.12 Patch, D. & Holding, B. (1996) Arboricultural Practice Note 12*: Through the Trees to Development*. Arboricultural Practices Notes.

7.1.13 Robertson, J, Jackson, N & Smith, M (2006) *Tree Roots in the Built Environment.* The Stationery Office, London.

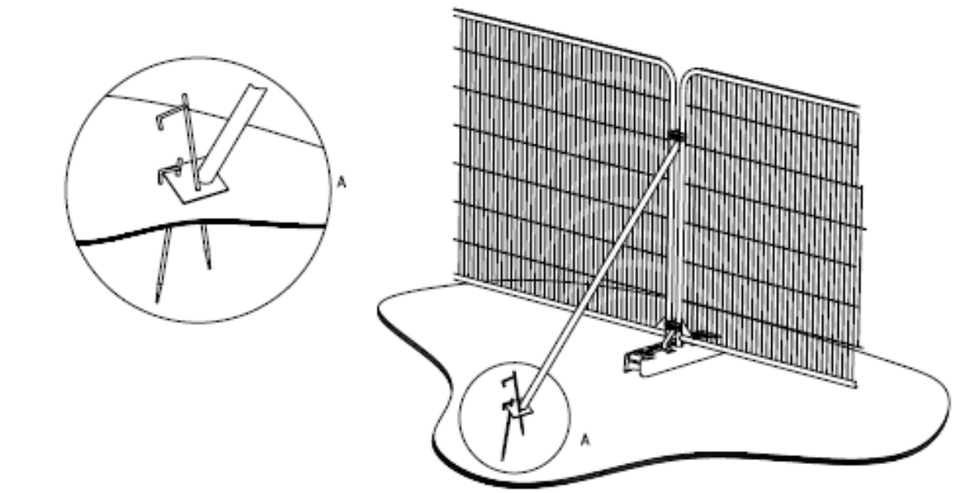
Appendix 1 - Tree Schedule

Tree/ Group No.	Species	Height (m)	Stem Diameter (mm)	Canopy Spread (m) N	E	S	W	Height of Lowest Limb and Direction (m)	Crown Clearance (m)	Age Class	Estimated Remaining Contribution (years)	Condition Physiology	Structure	Comments	Preliminary Management Recommendations	BS Category	RPA (m^2)	RPA Radius (m)
T1	horse chestnut; ***Aesculus hippocastanum***	16	600	5.2	5.2	5.2	5.2	3W	3	Mature	20-40	Good	Good	Estimated stem measurement as there was no access to the neighbouring garden	-	A1;2	163	7.2
T2	Malus sp.	11	280	2.8	2.8	2.8	2.8	2W	2	Middle-aged	10-20	Good	Fair	Stem measurement was estimated as there was no access to neighbouring garden	-	C1	35	3.4
T3	London plane; ***Platanus*** x ***hispanica***	16	1050	5	5	5	5	5N	5	Mature	> 40	Good	Good	Has been reduced in the past	-	A1;2	499	12.6
T4	London plane; ***Platanus*** x ***hispanica***	16	1100	5	5	5	5	4S	5	Mature	> 40	Good	Good	Has been reduced in the past	-	A1;2	547	13.2
T5	small-leaved lime; ***Tilia cordata***	10	460	4.3	4.3	4.3	4.3	2.5W	3	Middle-aged	20-40	Good	Good	-	-	B2	96	5.5

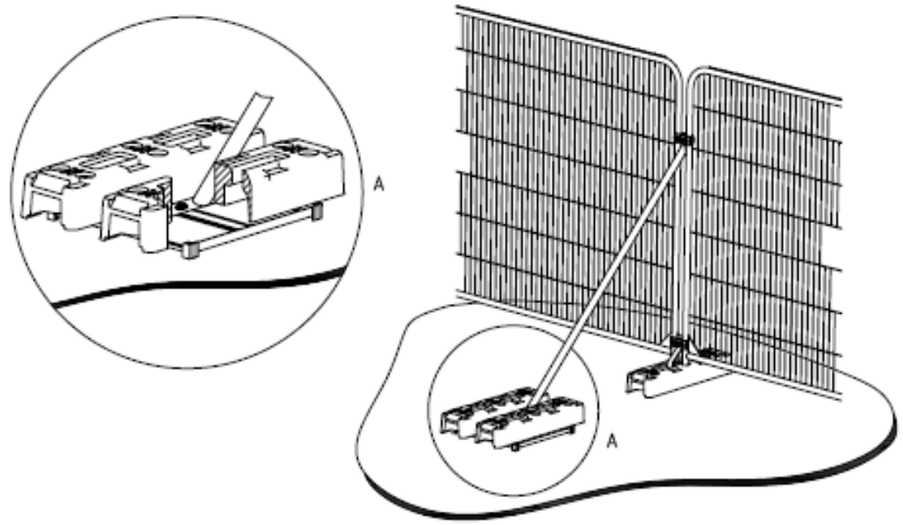
Appendix 2 – Table of Quality Assessment

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have serious, irremediable, structural defects, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which might be desirable to preserve			DARK RED
	1 Mainly arboricultural values	**2 Mainly landscape values**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or of formal or semi-formal arboricultural features (e.g. the dominant and/or principle trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	MID BLUE
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	GREY

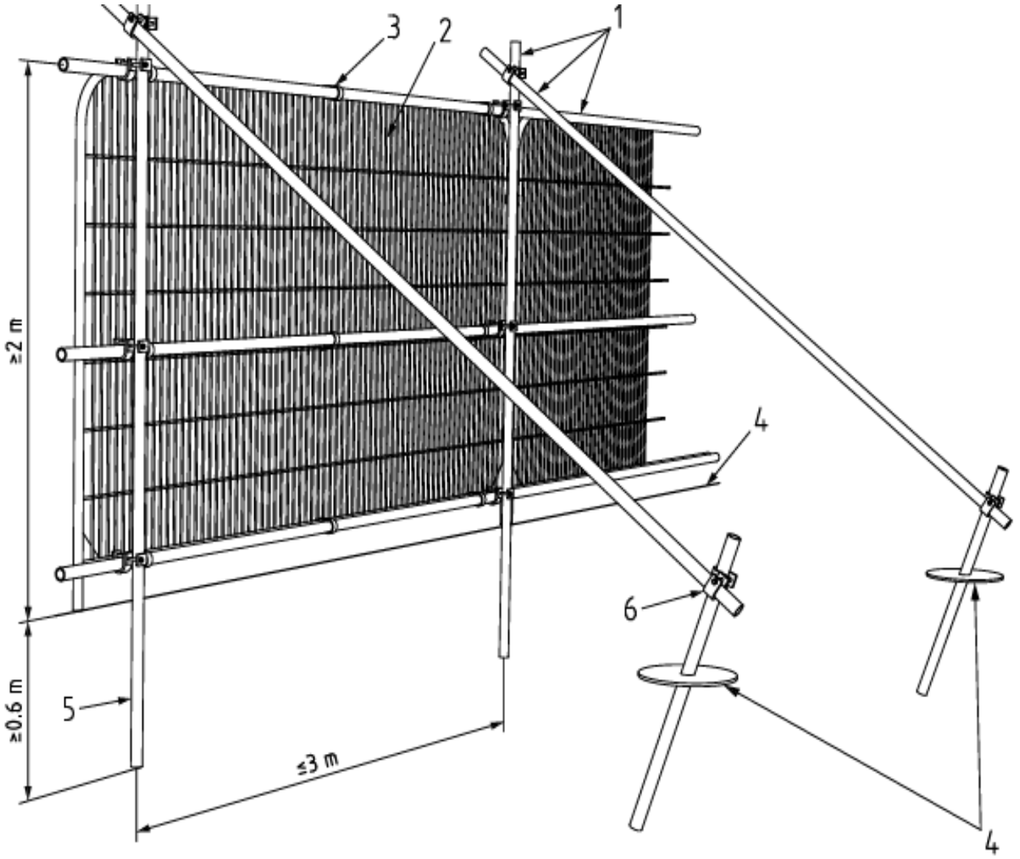
Appendix 3 - Example of Protective Fencing



a) Stabilizer strut with base plate secured with ground pins



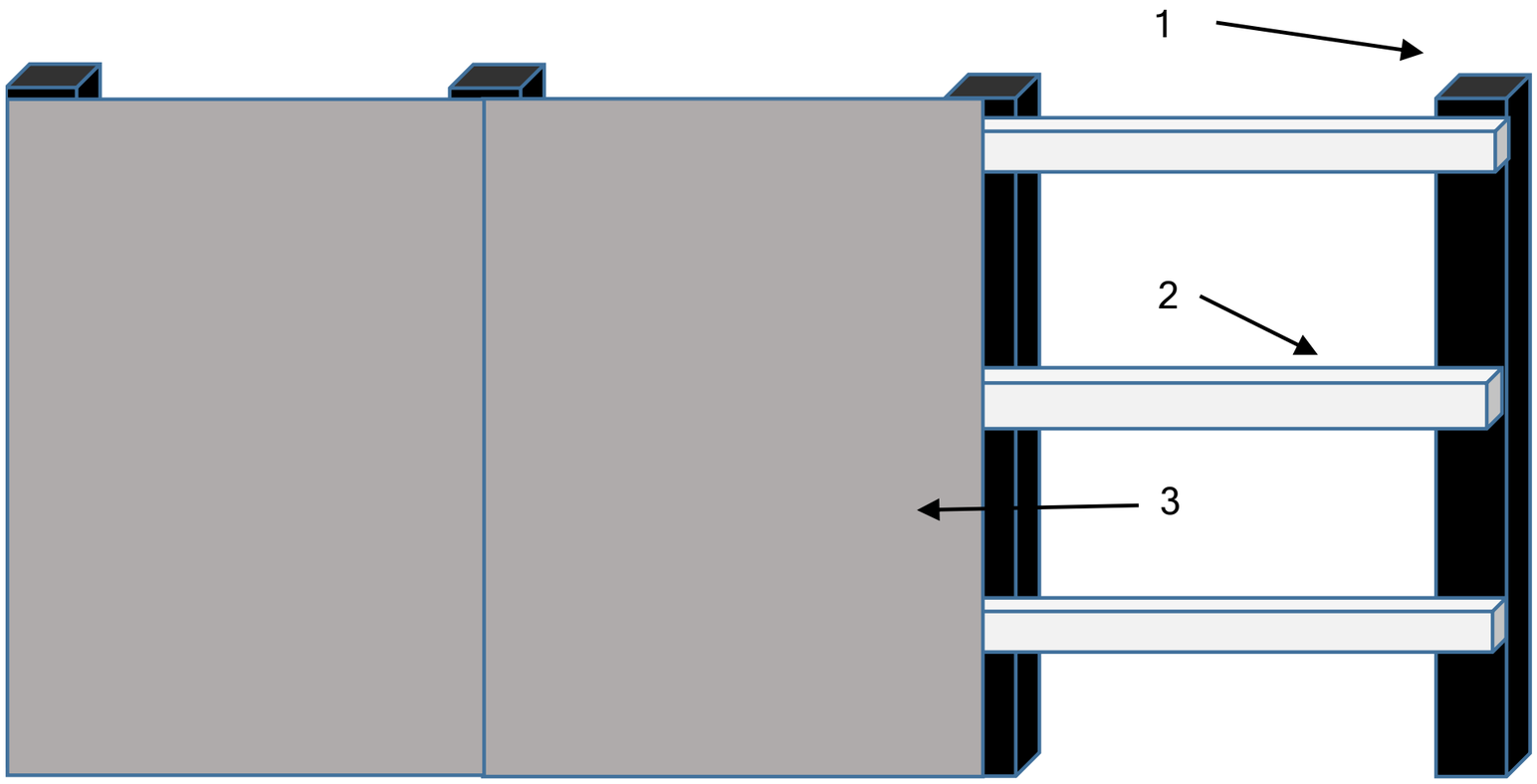
b) Stabilizer strut mounted on block tray



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

Appendix 4 – Example of Protective Fencing



1. 100mm x 100mm timber posts at 1.2m centres

2. Three 100mm x 50mm timber rails

3. 12mm WBP Virola hardwood through plywood framed panels

Appendix 5 – Tree Protection Fencing Notice