13 Kemplay Road, Hampstead

Tree Survey Report

11th April 2016

Client	Kemplay Road Ltd.
Job name	13 Kemplay Road, Hampstead
Report title	Tree Survey Report
File reference	16_1206_Report_NT_GR

	Name	**Position**	**Date**
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Report Contents

1 Introduction

1.1 Site Description

The site is located at 13 Kemplay Road, which is situated in central Hampstead, in the London borough of Camden at approximate postcode NW3 1TA. The site contains a semi-detached residential dwelling with associated garden. There are mature trees present on the site's northern boundary and adjacent to the site's eastern boundary in the neighbouring Rosslyn Hill Chapel car park. There are no Tree Preservation Orders (TPO) associated with the site, although the site is within a Conservation Area (CA).

The land surrounding the site is urban in character, as illustrated in aerial images provided in Appendix 1 and in a site location plan provided in Appendix 2.

1.2 Proposed Works

It is understood that the proposed works are to be the subject of a planning application to Camden Council, the Local Planning Authority (LPA) for the redevelopment of the site. Of relevance to this report, the proposals include a new basement to be constructed in proximity to the existing trees.

1.3 Aims of Study

To inform a planning application, GreenLink Ecology Ltd. was initially commissioned by Kemplay Road Ltd. to undertake an tree survey of the site, in accordance with British Standard (BS) 5837:2012 "*Trees in Relation to Design, Demolition and Construction - Recommendations*".

Subsequent to this initial survey work being completed, a proposed layout was issued to GreenLink Ecology Ltd. which illustrated that the footprint of the proposed new basement would be within the Root Protection Area (RPA) of trees on and adjacent to the site.

In order to assess the incursion into the RPA of the retained trees, GreenLink Ecology Ltd. was commissioned to undertake a detailed survey to determine the extent of root activity in relation to the on-site trees and off-site trees adjacent to the site's eastern boundary. The results of the survey work have informed the amended location and extent of the proposed basement footprint.

The aim of this report is to present the results of the survey work and detail an Arboricultural Implications Assessment (AIA) and an Arboricultural Method Statement (AMS). A Tree Protection Plan (TPP) has also been produced, which accompanies this report as a separate drawing.

This report in no way constitutes a health and safety survey report. Where concerns for tree health and safety exist, the necessary and appropriate tree inspections should be carried out.

2 Methodology

The trees were initially inspected from ground level by experienced consultant arborist Neil Taylor on 20th January 2016 and classified according to their relevant BS category. Measurements were taken in accordance with the recommendations set out in the BS 5837:2012, to establish canopy spreads (plotted to the four compass points) and RPA. The RPA is defined by the formula in paragraph 4.6 from the BS 5837:2012 and may be refined by taking into account constraints to root activity such as buildings, earthworks and hard paving.

On 10th February 2016, an exploratory trench was carefully excavated by hand with the use of an air-spade along the perimeter of the proposed basement within the RPA of the trees, to a depth of circa 600mm. Any roots with a diameter of 20mm or more were recorded and photographed.

On 5th April 2016, the site was resurveyed to take into account an off-site sycamore in the garden of 15 Kemplay Road and a number of small trees in the rear garden of the site, which were identified in consultation feedback from the LPA Tree Officer (TO) for consideration.

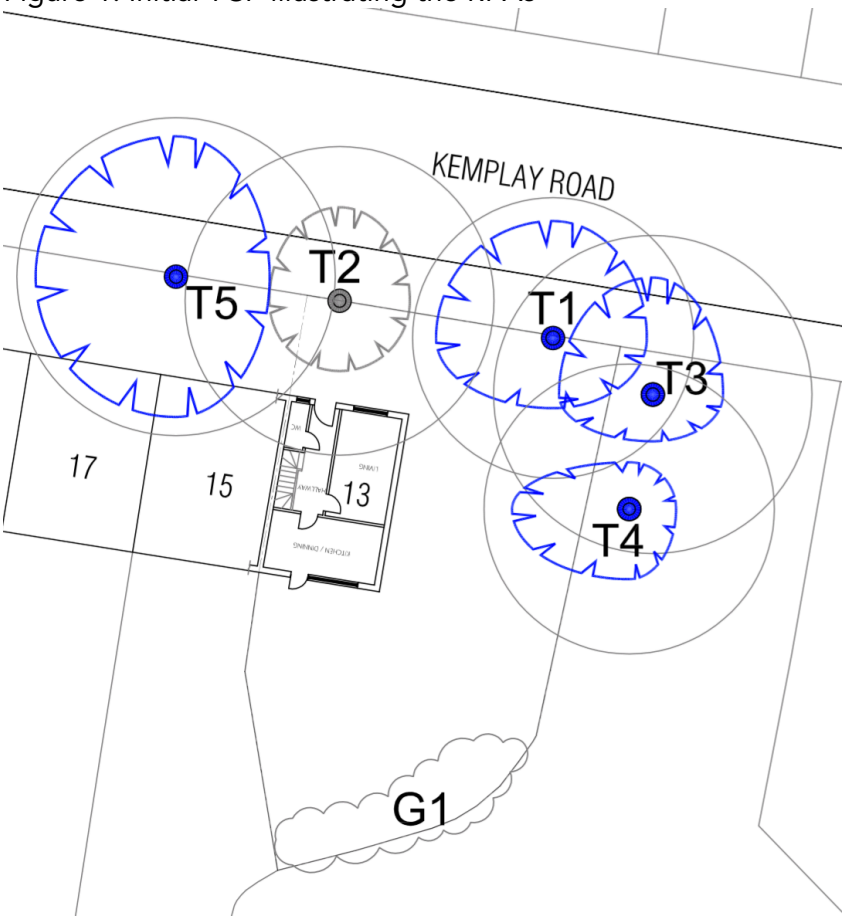
3 Results

The detailed results of the initial tree survey are provided in the TSS (Appendix 3). In summary, the on-site trees include one category B tree, one category C tree and a category C group of small trees/shrubs. Off-site trees include three category B trees, along with two category B trees that are off-site:

- T1 – on-site sycamore "B"
- T2 – on-site sycamore "C" (significant decay)
- T3 – off-site lime "B"
- T4 – off-site lime "B"
- T5 – off site sycamore "B"
- G1 – on-site elder "C"

The initial Tree Constraints Plan (TCP) produced as a result of the initial survey is provided below in Figure 1 and as a separate document ref: 16_1206_TCP_NT_Rev_A that accompanies this report.

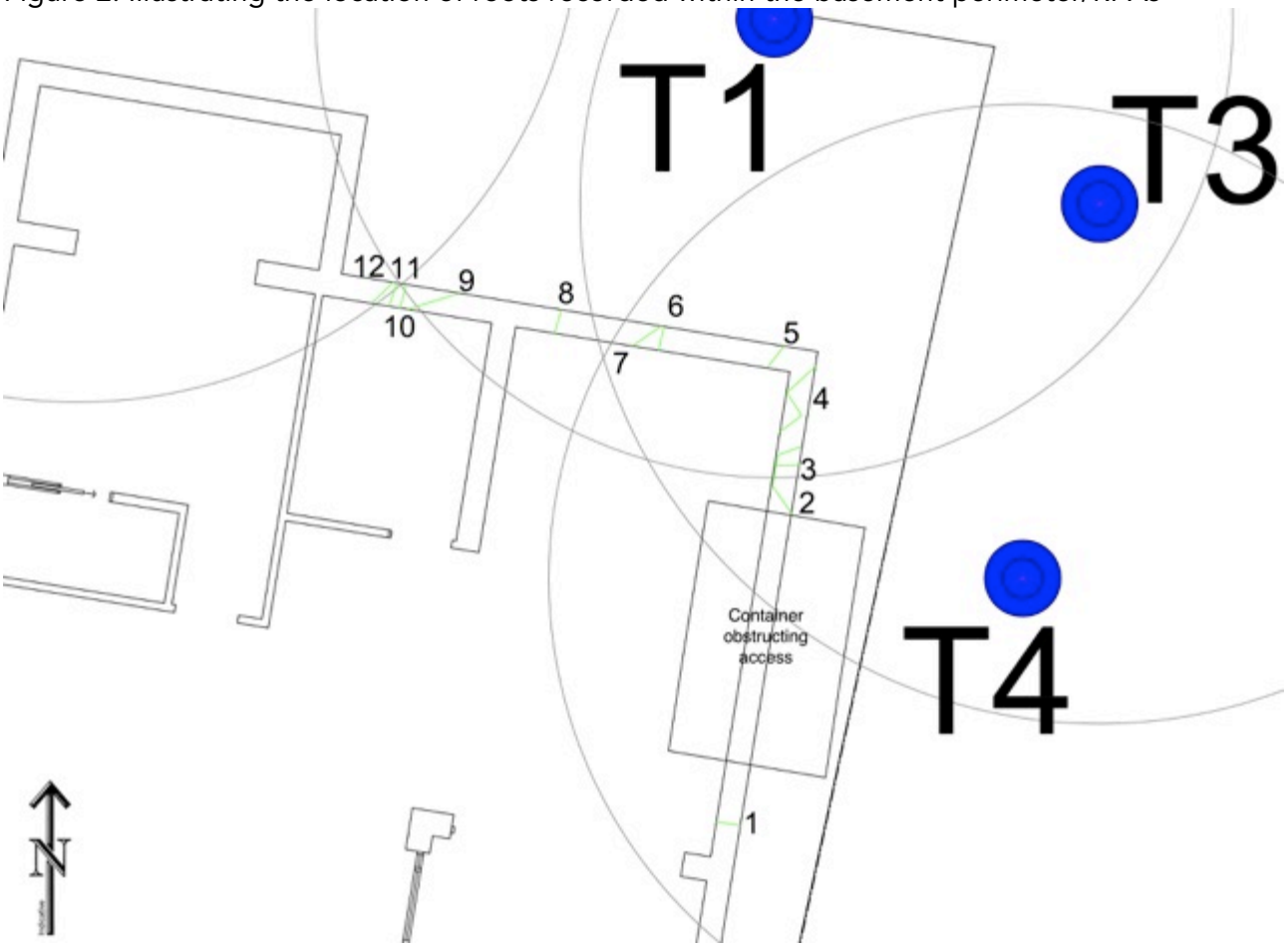
Figure 1: Initial TCP illustrating the RPAs



During the exploratory air-spade excavation work, it was noted that the soil was predominately clay loam that was dark in colour, with more clay recorded as present at a depth of 500mm and below and therefore, it was assumed that the majority of the tree roots would be in the top 600mm.

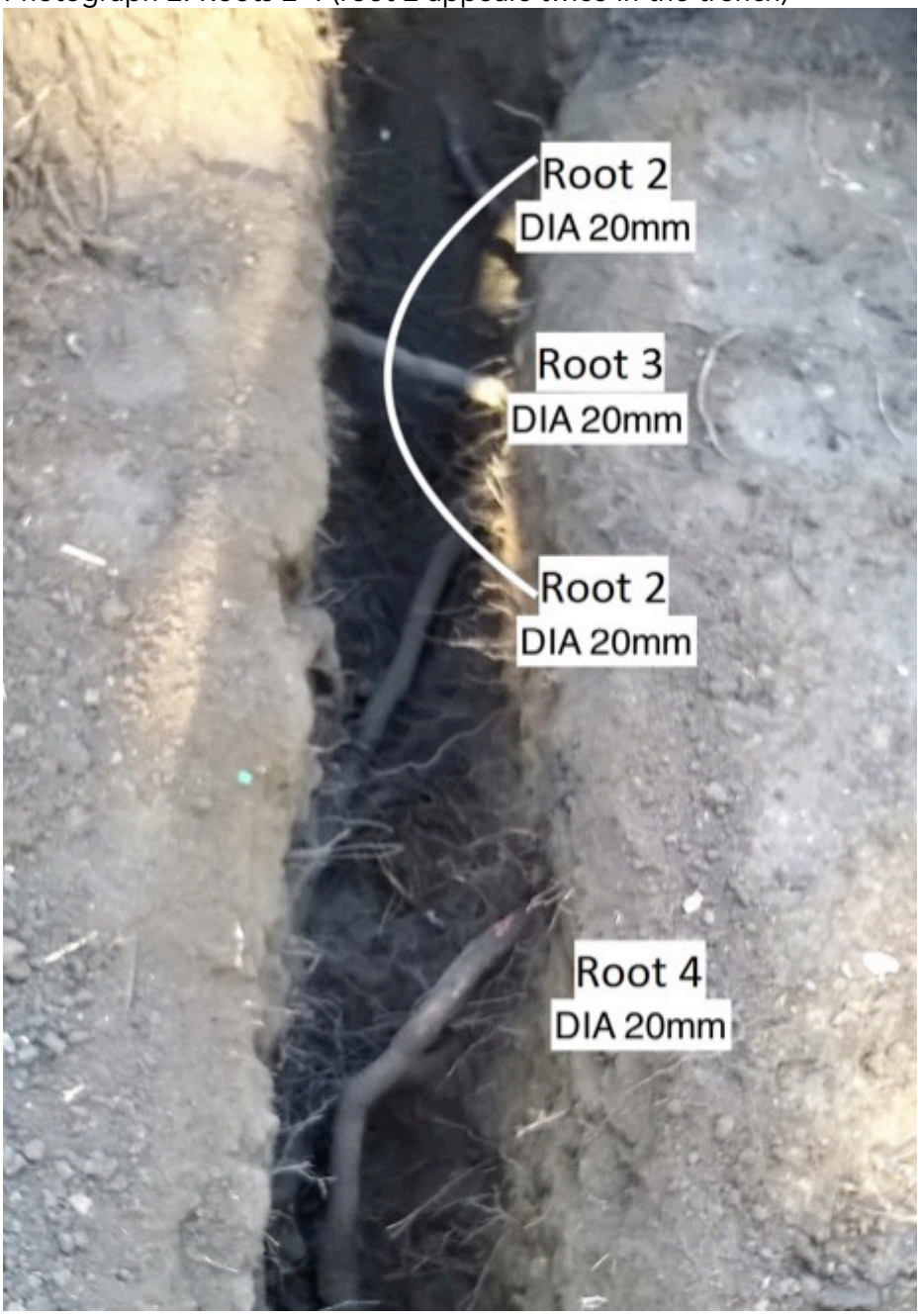
Many roots were identified but only roots with a diameter of 20mm or above were recorded. For the purpose of presenting the results, each recorded root has been assigned a number from 1 to 12 as per the following photographs, which can be cross-referenced with Figure 2 below.

Figure 2: Illustrating the location of roots recorded within the basement perimeter/RPAs

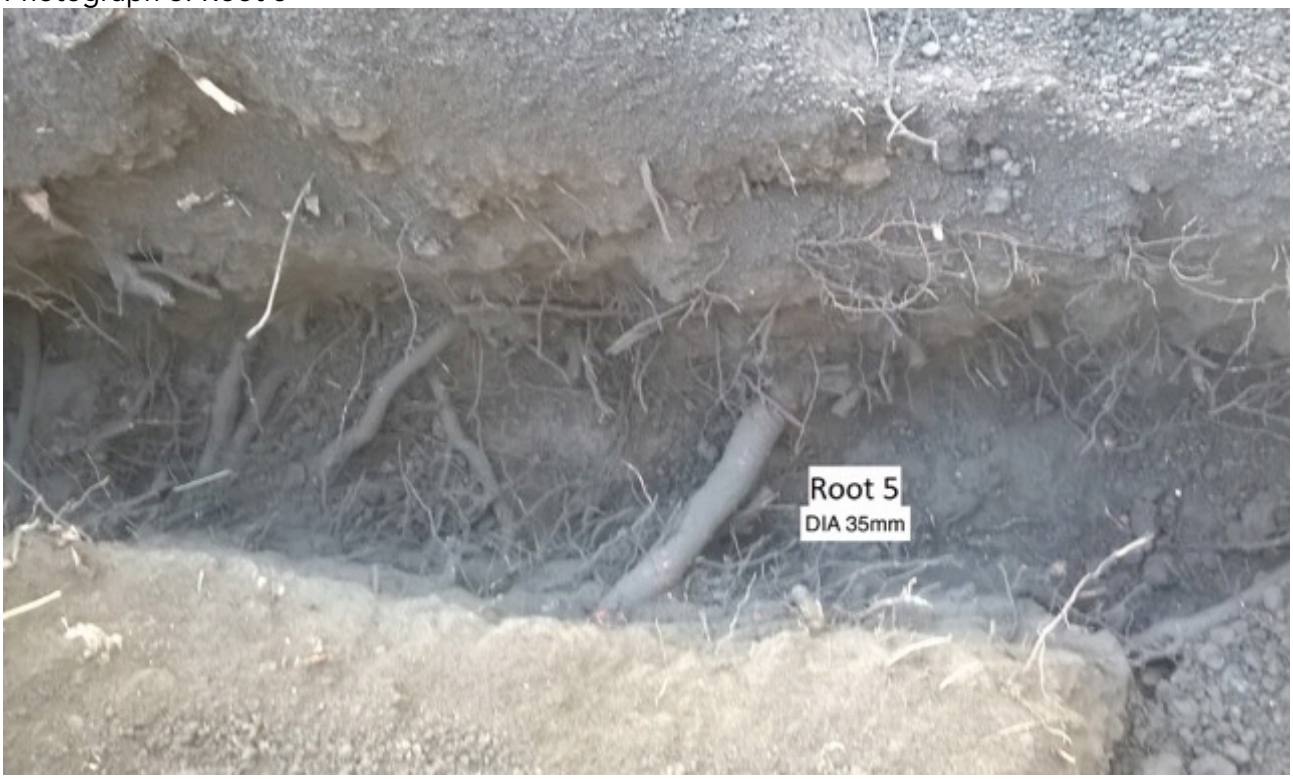


Photograph 1: Root 1

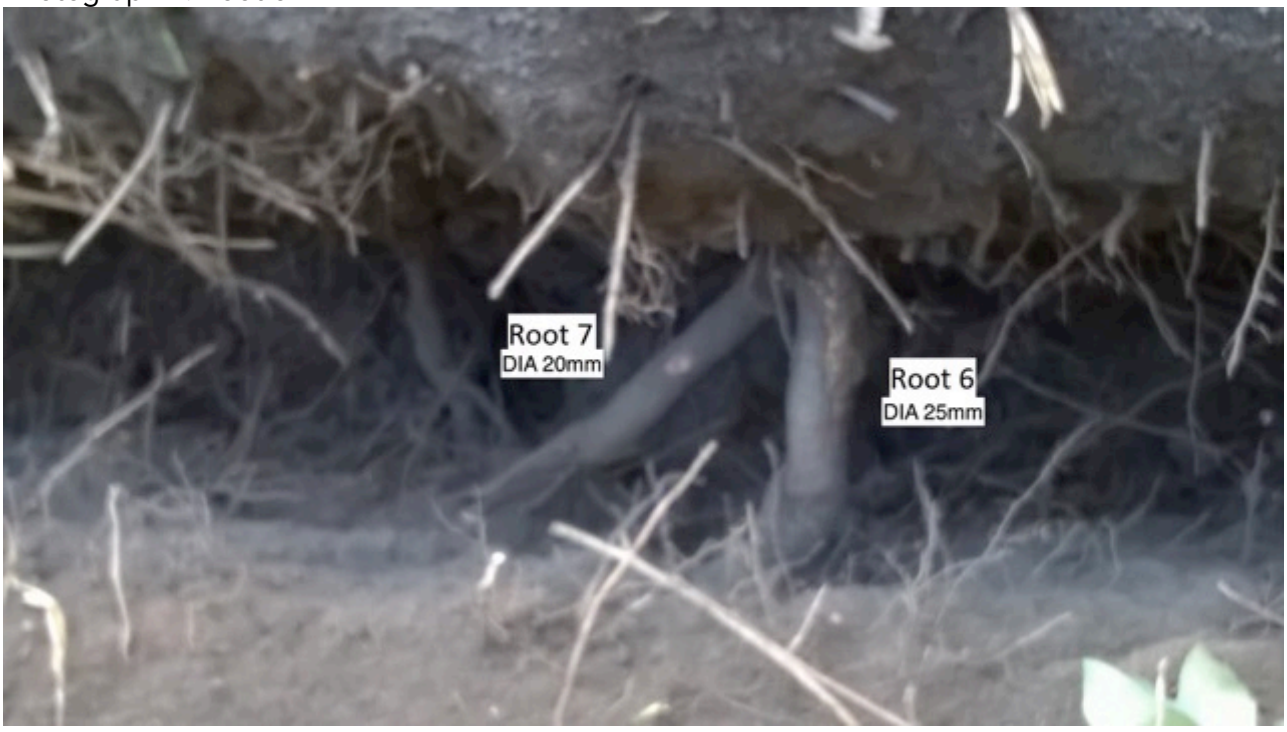
Photograph 2: Roots 2-4 (root 2 appears twice in the trench)



Photograph 3: Root 5

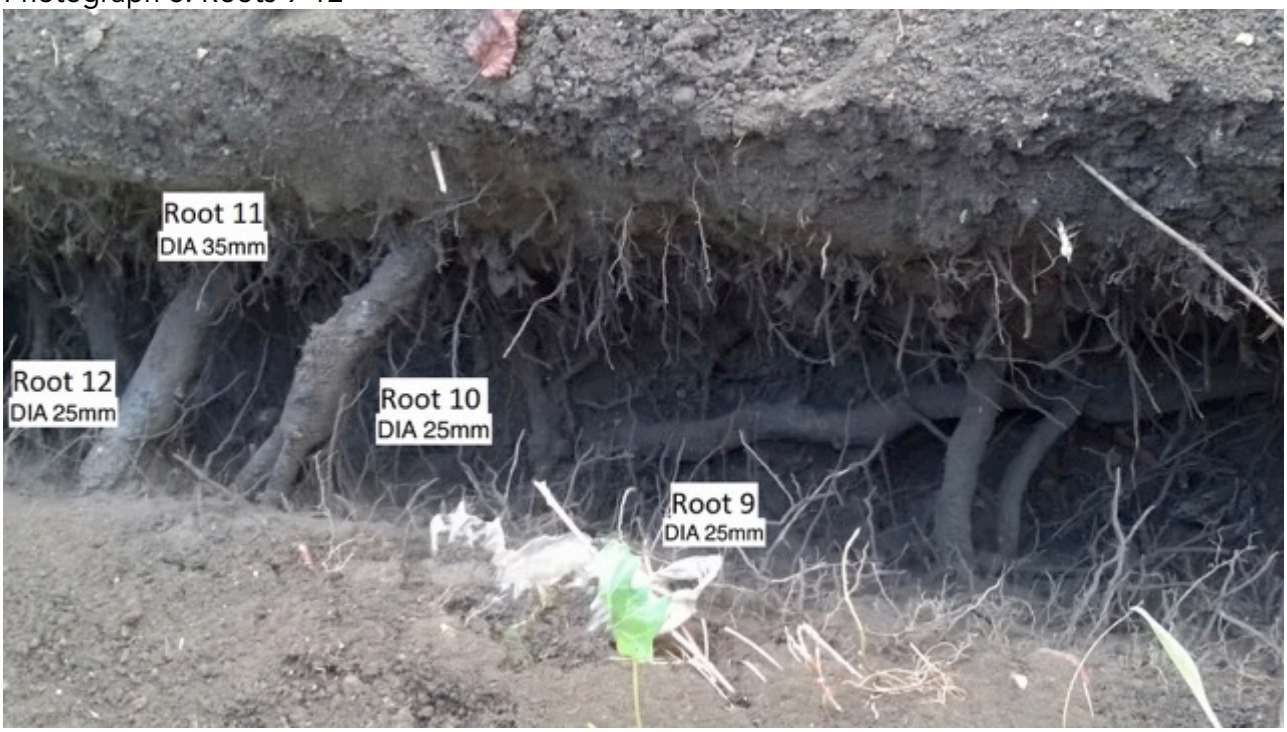


Photograph 4: Root 6-7



Photograph 5: Root 8

Photograph 6: Roots 9-12



4 Analysis

The detailed exploratory work utilising the air-spade was partially constrained by the lack of full access due to the presence of a metal container in the eastern part of the site within the RPA of T3 and T4 (illustrated in Figure 2). However, given the relatively consistent results throughout the trench, this is not considered to have significantly constrained the survey.

As described in a following section, T2 has significant decay at the base and as such, should not be a constraint to development. Therefore, potential impacts to this tree in relation to the proposed works are not considered relevant.

In relation to T1 and T3-4 and the exploratory root investigations, of the twelve roots identified in Section 3, the majority (10) have a diameter of 25mm or below and two roots have a diameter 35mm.

Paragraph 7.2.3 of BS 5837:2012 states that: "*Roots smaller than 25mm diameter may be pruned back, making a clean cut with a suitable sharp tool (e.g. bypass secateurs or handsaw), except where they occur in clumps. Roots occurring in clumps or of 25 mm diameter and over should be severed only following consultation with an arboriculturist, as such roots might be essential to the tree's health and stability*".

The majority of the roots found are 25mm or below which indicates they can be pruned if necessary in accordance with the BS. However, two of the roots found on the northern flank of the proposed basement line are above 25mm in diameter and considering the limited rooting space of T1, these roots are considered to be significant and should therefore be retained as detailed in a subsequent section.

To minimise the impact of the proposed works on the trees, it is recommended that the excavation line of the northern flank is moved one metre south from the current position, which will ensure that a total of 5.5m^2 of available rooting space can be retained. The wall of the ground floor can continue along the line of the exiting dwelling as the foundation can be cantilevered from the basement wall.

Although the presence of the container in the eastern part of the site meant that the entire perimeter of the basement could not be investigated. Given the presence of roots to the north of the container, it can be assumed that roots will be present underneath. Moving the proposed basement line west by one metre will mean only 12% of the rooting space of T4 will be lost to enable the proposed basement. Given the existing soil conditions, this is deemed acceptable. As above, the wall of the ground floor can be cantilevered from the basement wall.

5 Arboricultural Implications Assessment (AIA)

5.1 Methodology

The AIA uses the information obtained in the tree survey to identify areas where the proposed construction may be at odds with accepted standards, in terms of a tree's requirements for space in which to maintain existing roots and shoots, and space for future growth.

The quality and relative importance of each tree is illustrated as a coloured polygon. The colour used relates to the BS categories as follows: A - green, B - blue, C - grey and U - red (see accompanying drawing ref: 16_1206_TPP_NT_GR_Rev_A). In general, the design process will try to retain A and B category trees. Proposed construction will therefore normally be excluded from the RPA of A and B category trees. Red trees are discounted as they are recommended for removal.

Details of the trees surveyed are given in the TSS (Appendix 3). The juxtaposition of the proposed development in relation to existing tree locations are shown on the accompanying TPP drawing, ref: 16_1206_TPP_NT_GR_Rev_A.

The AIA considers existing site conditions and the effect that they may have on the development of the surveyed trees root systems. Hard structures such as building and paved roads and paths can influence the root activity of trees by reducing the availability of both moisture and nutrients.

5.2 Assessment

Refer to the accompanying TPP drawing, ref: 16_1206_TPP_NT_GR_Rev_A, for the relationship between the proposed development and the trees adjacent to the site.

The following tree will be removed to enable the proposed development:

- T2 - to enable the demolition of the existing dwelling and construction of the replacement.

The following tree will require pruning prior to the construction of the proposed development:

- T4 - crown lift to clear 5 metres over site

The following trees will be affected by excavations for the proposed basement. Excavations will be carried out in accordance with the methodology outlined in section 6.3 below:

- T1, T3 and T4

The following trees will be affected by the construction of new hard surfacing within the RPA. The area of the proposed hard surface that is within the RPA will be constructed in accordance with the 'no dig' principles outlined in APN12 and utilise a cellular confinement system such as Cell Web as a sub base. Refer to Section 5.3 below for details:

- T1, T3 and T4

6 Arboricultural Method Statement (AMS)

6.1 Methodology

The AMS provides the means by which retained trees can be protected throughout development.

The excavation of foundations for hard surfaces on sites where trees are present may result in root damage and removal. Where root loss is likely to occur it is important that a method of construction that minimises the impact on tree roots is used.

6.2 Demolition within the RPA of Retained Trees

The demolition of the existing dwelling will be outside of the RPA of all retained trees. Tree protection fencing as shown on the accompanying TPP, ref: 16_1206_TPP_NT_GR_Rev_A, will be installed prior to demolition taking place and all material will be removed from site using the space between western extent of the RPA of T1 and the western boundary.

6.3 Construction within the RPA of Retained Trees

Where the construction of the proposed basement is within the RPA of a retained tree, the top 600mm of excavation is to be carried out by hand under the supervision of an arboriculturist. Any roots encountered will be pruned in accordance with current best working practise. Once the roots have been pruned, sheet piles can be driven into the trench and excavation can continue in accordance with the building contractor's method statement.

Construction of the new hard surface for the proposed paving in the front garden will only take place once the construction of the new dwelling is complete and will incorporate the principles set out in Arboricultural Advisory and Information Service guidance note APN12 and utilise a cellular confinement system, such as cell web, as a sub base. Guidance on the form of construction necessary to avoid root damage and loss is provided in the form of an extract of the Cell Web Product brochure for their cellular confinement system at Appendix 4. The extent and nature of hard paved surfaces within the RPA of retained trees will determine the level of construction required. The installation of the hard surface should proceed in the following order:

- Kill ground vegetation and gather dead organic matter. Care must be taken to select a herbicide that will not affect tree roots.
- Remove major projections such as stumps and rocks. Stumps must be removed with a stump grinder so as to minimise ground disturbance.
- Fill major hollows with sharp sand.
- Lay geotextile membrane over the soil and pin into place
- Lay cellular confinement system (such as Cell Web) as specified by engineer and pin into place.
- Fill the cellular confinement system with a 'no fines' aggregate to engineer's specification. Work must be carried out progressively so that any machinery used only moves on the laid surface.
- Install haunched kerb on existing ground level or timber sleeper as specified by landscape architect or engineer.
- Lay geotextile membrane over filled cellular confinement system.

- Lay finished surface as specified by landscape architect or engineer. If the installed hard surface covers more than 20% of the RPA or is more than three meters in width, a porous surface will be required. Porous wearing courses include resin bonded grave, large aggregate asphalt, perforated concrete or pavers/slabs laid on a dried bed and dry grouted.

Where the proposed new hard surface is to be installed on the existing soft landscape, allowances will be made for the increase in level which can be graded out across the hard landscaped area.

No materials or spoil are to be stored within the RPA of a retained tree.

In order to avoid damage to the retained tree, the tree surgery work identified in the accompanying TSS will be carried out prior to the occupation of the site by the building contractor. The work will be carried out in accordance with BS 3998:2010 "*Recommendations for Tree Work*".

6.4 Services

The proposed locations of service runs is not known at this stage but are likely to utilise the existing services on the site. Where this is not achievable, the section of service run which passes within the RPA of a tree will be hand dug in accordance with 'broken trenches' described in NJUG 4 Section 4, an extract of which can be found in Appendix 5. This will ensure that tree roots are not damaged during the installation of the service.

All root pruning will be agreed beforehand with the named arboriculturist in consultation with the LPA Arboricultural Officer. All root pruning will be in accordance with current best working practice. All routes for overhead services will aim to avoid the trees. Where this is unavoidable any tree work will be agreed prior to commencement with the LPA Arboricultural Officer.

If the conditions are suitable on site and there is sufficient space, underground services may cross the RPA if a low impact method is used. Such low impact methods include: moleing, directional drilling and thrust boring. It is important that all entry and exit pits remain outside of the RPA and the services are installed at a sufficient depth (at least 600mm) so as to avoid the tree rooting system.

6.5 Tree Protection

All trees that are to be retained will be protected by the use of a tree protection barrier erected in the location shown on the accompanying TPP drawing, ref: 16_1206_TPP_NT_GR_Rev_A. The fence will consist of "Heras" type panels, or similar, braced at appropriate intervals and secured to keep in place. The tree protection barrier will be erected prior to the occupation of the site by the building contractor and will only be removed once the construction phase is complete.

Where off-site trees require protection, the site hoarding will provide a suitable barrier between the site and the tree.

Where specified on the accompanying TPP drawing, ref: 16_1206_TPP_NT_GR_Rev_A, the ground between the tree protection barrier and the building will be protected by geotextile fabric and side butting scaffold boards or thick plywood fit for purpose on a compressible layer (e.g. 100mm layer of woodchip over a geotextile membrane). A single thickness of boarding laid on the soil surface will provide sufficient protection for pedestrian load. The boarding will be left in place until the building works are complete.

6.6 Site Monitoring and Supervision

The process of reporting to the client and LPA/Tree Officer will be by emailing the checklist form at Appendix 6. Site monitoring is to be at a frequency agreed and approved by the LPA. It will involve a site visit by the arboriculturist at selected intervals to ensure that the appropriate tree protection measures, as detailed in the approved drawings and method statements, are continually adhered to.

6.7 Compensatory Measures

To offset the loss of T2, a suitably sized native species of tree will need to be planted as part of the landscape scheme for the site, in accordance with BS 8545:2014 "*Trees: from nursery to independence in the landscape - Recommendations*".

7 Conclusion

GreenLink Ecology was initially commissioned by Kemplay Road Ltd. to carry out a tree survey at 13 Kemplay Road, Hampstead. A detailed root survey was subsequently conducted to determine the extent of root activity from trees on and adjacent to the site.

The results of the tree survey indicate that the trees within the survey area vary in terms of quality and contribution to the amenity value within the local area.

During the root survey, a total of twelve roots were recorded (only roots with a diameter of 20mm or more were considered), ten of which where 25mm in diameter or less and two were 35mm in diameter.

The results of this detailed survey have guided the amendments of the proposed plans, moving the proposed line of the basement south by one metre and west by one metre, which has enabled a significant volume of rooting area to be retained whilst allowing for the construction of the proposed basement.

One tree (T2) will be need to be removed to enable the proposed development, which has significant basal decay and has a relatively short predicted safe useful life expectancy of ten to twenty years. A replacement tree will be planted as part of the landscape scheme for the site, to offset this loss.

Through the specified tree protection measures and construction methodologies, it will be possible to minimise the impact of the proposed development on the retained trees within and adjacent to the site.

Overall, there are no known over-riding arboricultural constraints which would prevent the proposed development from going ahead, subject to the protection measures and construction methodologies specified within this report being correctly implemented.

8 Disclaimer

This report has been prepared for the exclusive use of the commissioning client and associates. Unless otherwise agreed in writing by GreenLink Ecology Ltd., no other party may use, make use of or rely on the contents of the report.

GreenLink Ecology Ltd. has exercised due care in preparing this report. It has not, unless specifically stated, independently verified information provided by others. No warranty, express or implied, is made in relation to the content of this report and GreenLink Ecology Ltd. assumes no liability for any loss resulting from errors, omissions or misrepresentation made by others.

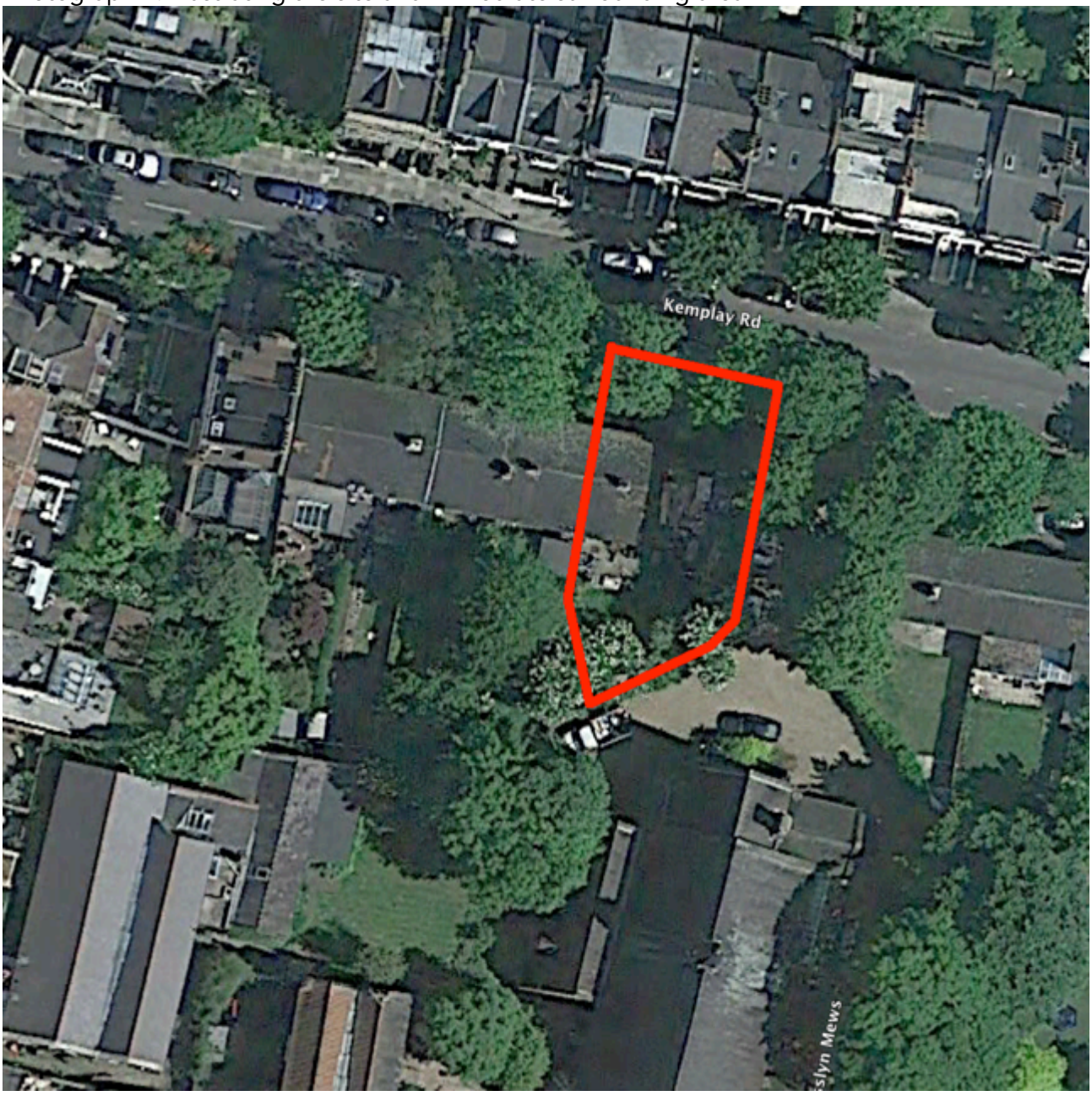
Any recommendation, opinion or finding stated in this report is based on circumstances and facts as they existed at the time that GreenLink Ecology Ltd. performed the work.

Nothing in this report constitutes legal opinion. If legal opinion is required the advice of a qualified legal professional should be secured.

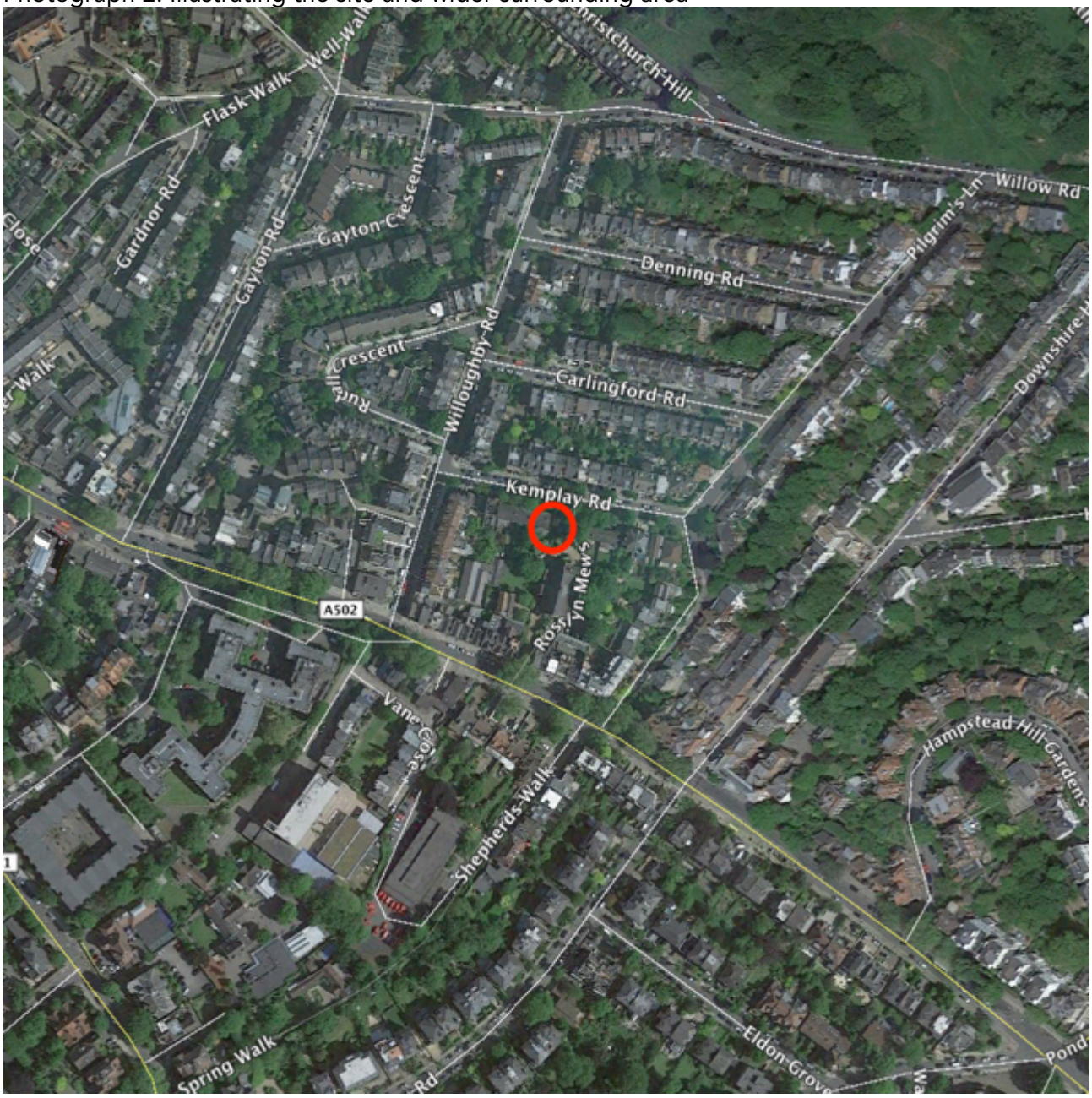
9 Appendices

Appendix 1: Aerial images illustrating the approximate site location

Photograph 1: Illustrating the site and immediate surrounding area



Photograph 2: Illustrating the site and wider surrounding area



Appendix 2: Site location plan

Appendix 3: Tree Survey Schedule

Project:	13 Kemplay Road, NW3	BS 5837 2012 Trees in relation to design, construction and demolition- recommendations	Surveyed by	NAT	GreenLink Ecology Ltd
Ref:	16_1206_TSS_NT_Rev_A		Weather	Clear and bright	
Date:	05.04.16		Tagged	No	
Client:	Kemplay Road Ltd				

				Canopy Spread											
Tree No.	Species	Height (m)	DBH (mm)	N	E	S	W	Stems	Height of crown clearance	Age class	Physiological condition problems/comments	Structural condition	Preliminary management recommendations	Estimated remaining contribution years	BS category
T1	sycamore (Acer pseudoplatanus)	18	601	5	4	3	5	2	2	M	Good - previously reduced	Good	None	20-40	B2
T2	sycamore (Acer pseudoplatanus)	17	550	4	3	3	3	1	6	M	Good - previously reduced	Fair - significant decay at base	Investigate extent of decay	10-20	C1
T3	common lime (Tilia x europaea)	18	570	5	3	2	4	1	4	M	Good - minor dead wood. Off site	Good	None	20-40	B2
T4	common lime (Tilia x europaea)	18	520	2	2	3	5	1	3	M	Good - minor dead wood. Off site	Good	None	20-40	B2
T5	sycamore (Acer pseudoplatanus)	16	570	6	4	6	6	1	4	M	Good - minor dead wood. Off site	Good	None	20-40	B2
G1	elder	Up to 6	Varied							Y-MA	Good -boundary group	Good	None	20-40	C1

Appendix 4: Extract from the Cell Web product brochure

CellWeb

Tree Root Protection System



CellWeb Tree Root Protection System provides a flexible and permeable solution for protecting tree roots while creating a strong stable surface for traffic.

With increased urbanisation and more redevelopments of existing properties, the need to be mindful of the impact on the surrounding environment is more important than ever.

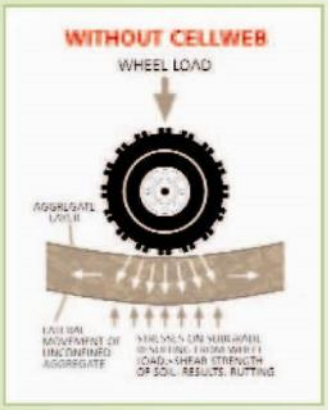
The demand for building site access, driveways and parking around existing trees can have a potentially fatal impact on the tree if carried out incorrectly. Tree preservation orders (TPO's) ensure that trees are not wilfully damaged. However the need for vehicle access over and around tree roots can still cause the following problems:

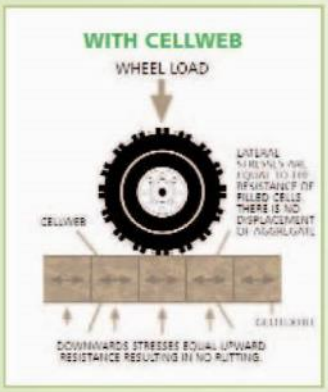
Problems:

- Compaction of subsoils (especially by construction traffic) causing oxygen and nutrient depletion
- Creating an impermeable surface that prevents water reaching the roots
- Changes in ground level and water table
- Damage caused during excavation
- Contamination of the subsoil

By using CellWeb Tree Root Protection System you can avoid these problems and ensure the tree's long-term future. BS 5837:1991 (revised 2005) and APN 1 provide information for the protection of trees during the construction process, and CellWeb is a well-established solution that conforms to these guidelines.

Product features

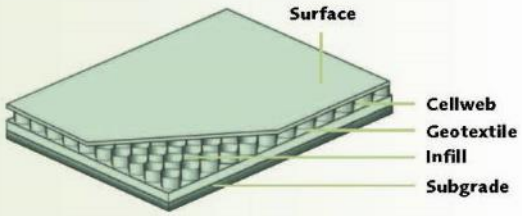




Cellweb's patented design with its unique cellular structure and perforated cell walls reduces the vertical load pressure on tree roots and prevents damage. With clean granular materials as infill, air and moisture can reach the roots to encourage healthy growth.

With no-dig solutions being the preferred option of most Arboricultural Consultants and Tree Officers, CellWeb is ideal as only the surface vegetation need be removed. As well as avoiding disruption to the roots this reduces installation time and saves money.

What's more CellWeb also cuts down the depth required for the sub base – in most cases by 50% for further cost savings. CellWeb also significantly reduces surface rutting, increasing the long-term performance of the finished surface.



Using CellWeb for tree root protection gives you these benefits:

- Reduced depth of excavation required
- Preventing the compaction of subsoils
- Preventing oxygen and nutrient depletion
- Environmentally sound
- Quick, easy and cost-effective installation
- Free technical support available

CellWeb gives you the cost-effectiveness you need at the same time as helping to preserve trees.

Geosynthetics Ltd is a leading dis

Please call
01455 617 139
or email sales@geosyn.co.uk
for further information.

Wide product range

Large stock holding

Next day delivery

Access road for the National Lake District Parks Authority.

Site before construction pictured above.

CellWeb during installation.

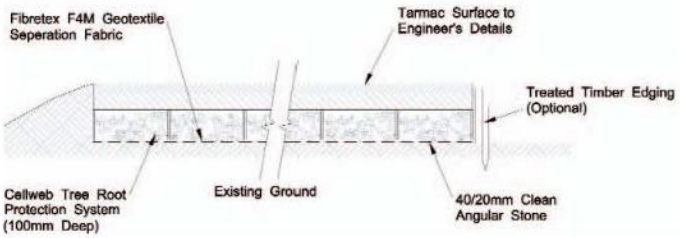
Final surfacing.

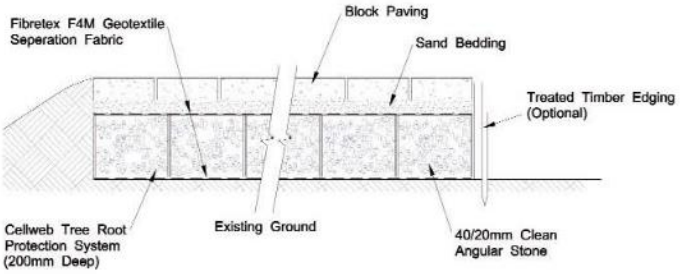
Final surfacing

The CellWeb Tree Root Protection is totally confined within the clean stone sub base, therefore you can choose whichever surface materials are most appropriate for your installation. Some materials are more suitable than others and serious consideration should be given to the porosity of the surface for continued healthy growth of the tree. An ideal surfacing are DuoBlocks: a grass reinforcement and gravel retention system. Geosynthetics can supply these systems for a visually attractive surface that also has the advantage of being fully porous.

Loose or bonded gravels can be used as an alternative hard landscaping and CellWeb can also be used with block paviors whose porous joints will permit moisture and air transfer to the roots. Where planning allows, porous asphalt is yet another possible surfacing treatment.

Call our sales office on 01455 617 139 for more information.





Appendix 5: Section 4, extracted from NJUG 4

4. HOW TO AVOID DAMAGE TO TREES

This section gives general guidance on methods of work to minimise damage to trees. The local authority (or for privately owned trees, the owner or their agent), should be consulted at an early stage prior to the commencement of any works. This will reduce the potential for future conflict between trees and apparatus.

4.1 Below Ground

Wherever trees are present, precautions should be taken to minimise damage to their root systems. As the shape of the root system is unpredictable, there should be control and supervision of any works, particularly if this involves excavating through the surface 600mm, where the majority of roots develop.

4.1.1 Fine Roots

Fine roots are vulnerable to desiccation once they are exposed to the air. Larger roots have a bark layer which provides some protection against desiccation and temperature change. The greatest risk to these roots occurs when there are rapid fluctuations in air temperature around them e.g. frost and extremes of heat. It is therefore important to protect exposed roots where a trench is to be left open overnight where there is a risk of frost. In winter, before leaving the site at the end of the day, the exposed roots should be wrapped with dry sacking. This sacking must be removed before the trench is backfilled.

4.1.2 Precautions

The precautions referred to in this section are applicable to any excavations or other works occurring within the Prohibited or Precautionary Zones as illustrated in Figure 1 – 'Tree Protection Zone'.

4.1.3 Realignment

Whenever possible apparatus should always be diverted or re-aligned outside the Prohibited or Precautionary Zones. Under no circumstances can machinery be used to excavate open trenches within the Prohibited Zone.

The appropriate method of working within the Precautionary Zone should be determined in consultation with the local authority (or for privately owned trees the owner or their agent) and may depend on the following circumstances;

- the scope of the works (e.g. one-off repair or part of an extensive operation)
- degree of urgency (e.g. for restoration of supplies)
- knowledge of location of other apparatus
- soil conditions
- age, condition, quality and life expectancy of the tree

Where works are required for the laying or maintenance of any apparatus within the Prohibited or Precautionary Zones there are various techniques available to minimise damage.

Acceptable techniques in order of preference are;

a) Trenchless

Wherever possible trenchless techniques should be used. The launch and reception pits should be located outside the Prohibited or Precautionary Zones.
In order to avoid damage to roots by percussive boring techniques it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the equipment with materials other than water (e.g. oil, bentonite, etc.) must not be used when working within the Prohibited Zone. Lubricating materials other than water may be used within the Precautionary Zone following consultation and by agreement.

b) Broken Trench - Hand-dug
This technique combines hand dug trench sections with trenchless techniques if excavation is unavoidable. Excavation should be limited to where there is clear access around and below the roots. The trench is excavated by hand with precautions taken as for continuous trenching as in (c) below. Open sections of the trench should only be long enough to allow access for linking to the next section. The length of sections will be determined by local conditions, especially soil texture and cohesiveness, as well as the practical needs for access. In all cases the open sections should be kept as short as possible and outside of the Prohibited Zone.

c) Continuous Trench - Hand-dug
The use of this method must be considered only as a last resort if works are to be undertaken by agreement within the Prohibited Zone. The objective being to retain as many undamaged roots as possible.

Hand digging within the Prohibited or Precautionary zones must be undertaken with great care requiring closer supervision than normal operations.

After careful removal of the hard surface material digging must proceed with hand tools. Clumps of roots less than 25mm in diameter (including fibrous roots) should be retained in situ without damage. Throughout the excavation works great care should be taken to protect the bark around the roots.

All roots greater than 25mm diameter should be preserved and worked around. These roots must not be severed without first consulting the owner of the tree or the local authority tree officer / arboriculturist. If after consultation severance is unavoidable, roots must be cut back using a sharp tool to leave the smallest wound.

4.1.5 **Backfilling**

- Any reinstatement of street works in the United Kingdom must comply with the relevant national legislation (see: **Volume 6 – 'Legislation and Bibliography'**). In England this relates to the requirements of the code of practice – 'Specification for the Reinstatement of Openings in Highways' approved under the New Roads and Street Works Act 1991. Without prejudice to the requirements relating to the specification of materials and the standards of workmanship, backfilling should be carefully carried out to avoid direct damage to roots and excessive compaction of the soil around them.

- The backfill should, where possible, include the placement of an inert granular material mixed with top soil or sharp sand (not builder's sand) around the roots. This should allow the soil to be compacted for resurfacing without damage to the roots securing a local aerated zone enabling the root to survive in the longer term.

- Backfilling outside the constructed highway limits should be carried out using the excavated soil. This should not be compacted but lightly "tamped" and usually left slightly proud of the surrounding surface to allow natural settlement. Other materials should not be incorporated into the backfill.

4.1.6 Additional Precautions near Trees

- Movement of heavy mechanical plant (excavators etc.) must not be undertaken within the Prohibited Zone and should be avoided within the Precautionary Zone, except on existing hard surfaces, in order to prevent unnecessary compaction of the soil. This is particularly important on soils with a high proportion of clay. Spoil or material must not be stored within the Prohibited Zone and should be avoided within the Precautionary Zone.

- Where it is absolutely necessary to use mechanical plant within the Precautionary Zone care should be taken to avoid impact damage to the trunk and branches. A tree must not be used as an end-stop for paving slabs or other materials nor for security chaining of mechanical plant. If the trunk or branches of a tree are damaged in any way advice should be sought from the local authority tree officer / arboriculturist.

See TABLE 1 –'Prevention of Damage to Trees Below Ground' below for summary details regarding causes and types of damage to trees and the implications of the damage and the necessary precautions to be taken to avoid damage.

TABLE 1 - Prevention of Damage to Trees Below Ground

Causes of Damage	Type of Damage	Implications to Tree	Precautions
Trenching, mechanical digging etc.	Root severance	• The tree may fall over • Death of the root beyond the point of damage • Potential risk of infection of the tree The larger the root the greater the impact on the tree.	Hand excavate only within the Precautionary Zone. Work carefully around roots. Do not cut roots over 25mm in diameter without referring to the local authority tree officer. For roots less than 25mm in diameter use a sharp tool and make a clean cut leaving as small a wound as possible.
Trenching, mechanical digging, top soil surface removal etc.	Root bark damage	• The tree may fall over • If the damage circles the root it will cause the death of the root beyond that point • Potential risk of infection of the tree The larger the root the greater the impact on the tree.	Do not use mechanical machinery to strip the top soil within the Precautionary Zone. Hand excavate only within the Precautionary Zone. Work carefully around roots. Do not cut roots over 25mm in diameter without referring to the local authority tree officer. For roots less than 25mm use a sharp tool and make a clean cut leaving as small a wound as possible.
Vehicle movement and plant use. Material storage within the precautionary area.	Soil compaction & water saturation	Restricts or prevents passage of gaseous diffusion through soil, the roots are asphyxiated and killed affecting the whole tree.	Prevent all vehicle movement, plant use or material storage within the Precautionary Zone.
Top-soil scouring, excavation or banking up.	Alterations in soil level causing compaction or exposure of roots.	Lowering levels strips out the mass of roots over a wide area. Raising soil levels asphyxiates roots and has the same effect as soil compaction.	Avoid altering or disturbing soil levels within the Precautionary Zone.
Use of herbicides.	Poisoning of the tree via root absorption	• Death of the whole tree • Death of individual branches Damage to leaves and shoots.	The selection and application of herbicides must be undertaken by a competent person in accordance with COSHH regulations.
Spillage of oils or other materials.	Contamination of soil	Toxic and asphyxiation effects of chemicals, oils, building materials (cement, plaster, additives etc.) on the root system can kill the tree.	Never store oils, chemicals or building materials within the Precautionary Zone or within the branch spread of a tree, which ever is the greater.
Placement or replacement of underground apparatus.	Various	Death of all or part of the tree.	Effective planning and liaison with local authority tree officer, taking into consideration the position of trees, and their future growth potential and management

4.2 Above Ground

4.2.1 Damage by Pruning

Trees (including shrubs and hedges) can be damaged by inappropriate or excessive pruning. Reference should be made to the Energy Networks Association (ENA) document "Engineering Technical Report 136 Vegetation Management near Electricity Equipment – Principles of Good Practice" (see section 8 – 'Other Useful Publications') or appropriate company specific documentation for guidance on pruning.

See TABLE 2 – 'Prevention of Damage to Trees Above Ground' below for summary details regarding causes and types of damage to trees and the implications of the damage and the necessary precautions to be taken to avoid damage.

TABLE 2 - Prevention of Damage to Trees Above Ground

Causes of Damage	Type of Damage	Implications for the Tree	Precautions
Impact by vehicle or plant Physical attachment of signs or hoardings to the trunk Storage of materials at base of tree Rubbing by winch or pulling cables	Bark bruising, bark removal, damage to the wood, damage to buttress roots, abrasion to trunk	Wounding with the potential for infection ultimately resulting in death of all or part of the tree. Structural failure of the tree	Surround the trunk with protective free-standing barrier. Exclude vehicles, plant or material storage from the Precautionary Zone. Ensure sufficient clearance of cables or ropes.
Impact by vehicle or plant Rubbing by overhead cables	Bark damage to branches, breakage and splitting of branches, abrasion to branches	Structural failure of the branch. Wounding or loss of a branch with the potential for infection ultimately resulting in death of all or part of the branch or tree.	Exclude vehicles, plant or material storage from the Precautionary Zone. Ensure sufficient clearance of cables or ropes. All pruning should be carried out in accordance with BS3998 *(prune affected branches to give appropriate clearance from cables)*
Inappropriate siting of overhead apparatus, such as CCTV, lighting fixtures and communications masts and dishes.	Inappropriate pruning, unnecessary tree removal	Severely pruning tree to acquire line of sight signal for communications dish etc.	Effective planning and liaison with local authority tree officer / arboriculturist, taking into consideration the position of trees, and their future growth potential and management.
Lack of forethought in design and location of apparatus and services entries on new developments	Complete tree removal	The tree is removed unnecessarily	Agree the location and installation of services at the design stage. Consideration should be given to the creation of dedicated service routes wherever possible.
Use of herbicides	Poisoning of the tree via absorption through bark, leaves and shoots	Death of the whole tree, death of individual branches, damage to leaves and shoots	The selection and application of herbicides must be undertaken by a competent person in accordance with COSHH regulations.

Appendix 6: Programme of Site Monitoring

13 Kemplay Road, Hampstead
Site Monitoring Form

To be completed by the named arboriculturist and emailed to the client and tree officer at the completion of each operation.

Arboriculturist……..……..

Client……..……..

Project Manager……..……..

Tree Officer……

(The above to be filled in with names and contact numbers)

OPERATION	TIMING	DATE	COMMENTS
Pre-commencement meeting or contact with project/site manager.	Before any works or pre-works on site, including demolition and storage of materials		
Spot check of specified pruning works	Before demolition begins		
Spot check of fencing and ground protection measures	Before demolition begins		
Supervision of excavations for basement	Before installation of sheet piles		
Spot check of no dig hard landscape in front garden	Following completion of construction phase		
Completion of development	Once all construction activity has been completed		