Rosenheim Building
(UCLH – Proton Beam Therapy Centre)

Tree Protection Document and Arboricultural Method Statement

July 2014

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Appendix 2	APN 1 "Driveways Close To Trees" Note: Original document is available direct from the Arboricultural Advisory and Information Service (AAIS), Alice Holt Lodge, Wrecclesham, Farnham, Surrey, GU10 4LH, England. Tel. 01420 22022 Fax. 01420 22000
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1.0 Introduction

1.1 Charles Funke Associates (CFA) have been appointed by CAPITA to prepare a tree survey, impact assessment and arboricultural method statement for the demolition of the Rosenheim Building and construction works for the UCLH Proton Beam Therapy Centre (PBT). There are no trees located within the application site boundary. Existing trees are located on Grafton Way and University Street, adjacent to the Rosenheim Building.

1.2 The following method statement is submitted in response to the request by the London Borough of Camden for further information in relation to tree protection measures.

1.3 The purpose of this Tree Protection Document is to detail what actions must be taken to specifically protect Trees T1-T9 and facilitate the demolition the Rosenheim Building and also the construction on the UCLH PBT, following best practice guidelines. The objective is to achieve a harmonious relationship between the trees and any development.

1.4 The original tree survey and arboricultural impact assessment was undertaken by Charles Funke Associates in June 2014, when the trees were in full leaf.

1.5 The Rosenheim Building site lies within the Bloomsbury Conservation Area in the London Borough of Camden. As a consequence of the conservation area designation, any tree over 75mm in diameter at 1.5m above ground level are automatically protected.

1.6 This Protection Strategy has been developed in accordance with contemporary, relevant published guidance in relation to construction near trees. References include:

- National Joint Utilities Group 'Guidelines for the planning, installation and maintenance of utility services in proximity to trees' 1995
- BS 5837: 2012 'Guide for trees in relation to construction'
- BS 3998: 1989 'Tree Work'

1.7 Effective communication and inspection with the relevant parties is critical to making this an enforceable document. Its successful implementation is dependent upon effective supervision and communication with the relevant parties. A provisional timetable of events can be a helpful tool in this regard

1.8 This Document should be read in conjunction with existing tree survey information.

2.0 Development Description

Existing:

2.1 The particular development area is located within a conservation area and is also recognised as an opportunity site within the Fitzrovia Area Action Plan. The Rosenheim Building is a UCLH property. The Odeon site that forms part of the development site lies vacant and has done so since the cinema was demolished.

2.2 There are no trees located within the site boundary. Those trees identified for survey are located within the public streetscene along Grafton Way and University Street.

Proposed:

2.3 The new Proton Beam Therapy Centre (PBT) will be five storeys high above ground level and includes significant basement construction. The proposed building will be constructed to the back of pavement along the site boundary of Grafton Way and Huntley Street.

3.0 Purpose of Document

3.1 The purpose of this document is to ensure that the appropriate procedures and standards are employed to preserve the retained trees during the proposed renovation of the building and proposed new works.

3.2 The information contained within this document is intended to be used, not only as a guide, but also as a fundamental part of contract details for all trade elements within the project.

4.0 Supervision and Reporting (Trees and Protective Fencing)

4.1 It is key to the long-term preservation of the retained trees that effective control of all parts of the development is administered by an agreed mechanism of communication, between Client, Construction personnel, their chosen Arborist Consultants and the Local Authority. The key personnel in this communication are:

Local Authority Tree and Landscape Officer:
London Borough of Camden
Tel: 020 7974 4444

Client Arboricultural Consultant: Charles Funke Associates
Contact: Darran Ritchie
Tel : 01483 426890
darranr@charlesfunke.com

Project Co-ordinator: CAPITA Property and Infrastructure
Contact: Chris Hedges
chrishedges@capita.co.uk

Project Manager (Services Diversions): Ridge PM
Contact: Matt Davis
mdavis@ridge.co.uk

4.2 All personnel using the site including site managers, agents, supervisors, operatives and other relevant personnel are to be informed of the role of the tree protective fences and its importance

4.3 The Client appointed Arboriculturalist will visit site on a regular basis throughout the course of the project. Such inspections are to be recorded and retained with the Principle Contractor for inspection by the Local Authority Tree Officer. Whilst attending site the Client Arborculturalist will also be informed of key project dates and be present at the following key times:

1). At the pre-contract meeting for the start of the construction phases. The Principle Contractor is to ensure the appropriate safeguards are presented to new site personnel at induction.

2). During and on completion of agreed tree surgery works.

3.) On setting out and completion of the erection of the various phases, alterations and re-instatement of protective fencing.

4). On completion of any trial pits within vicinity of tree positions/roots.

5). At Snagging/Practical Completion

The Project Co-ordinator will meet regularly with the Arboriculturalist. The Principle Contractor shall make a representative available as agreed within the Project Co-ordinator Scope Documentation, but particularly at the following times:

1). Erection of the tree protection fencing.

2). During the course of demolition of structures

3). During the installation of utility services and/or underground services.

4). During the dismantling of protective fencing

In Case of Incident:

4.4 In the event of accident or spillage in or adjacent to protected trees, the Project Co-ordinator is to be informed immediately. In the event of spillage the Principle Contractor will action the appropriate personnel to install sand bags outside the line of the tree protection area to actively confine the spillage and measures taken to drain/soak away in a responsible manner to the approval of the Principle Contractor.

4.5 The Client Arboriculturalist is to be informed by the Project Co-ordinator and a joint inspection is to be made and findings recorded. If the severity of the incident warrants, the Local Authority Tree Officer is to be informed in writing. Any remedial action that may be required is to be undertaken following consultation with the Local Authority Tree Officer.

Notice of Inspection by Local Authority:

4.6 To ensure that the Local Authority Tree Officer has an opportunity to visit the site at important stages of the development in respect of tree preservation, Council Tree Officers and/or their representatives are to be given notice in writing 5 full working days prior to the date of commencement of any demolition adjacent to retained trees.

4.7 Tree protection must be verified as being in the correct position by the Project Co-ordinator and Arboricultural Consultant. The Local Authority Tree Officer must be given the opportunity to inspect the fencing in-situ.

5.0 Tree Protection Barriers/Fencing

5.1 Barriers, fencing and ground protection must comply with BS 5837:2012, section 6.2. The default specification for protective barriers includes construction using standard scaffold poles and heavy gauge galvanised tube and welded mesh. The fence height should be 2m ht. See *Appendix 1*.

5.2 Notices are to be fixed to the outside of the fencing with words such as

CONSTRUCTION EXCLUSION ZONE

'PROTECTED AREA – NO ACCESS AND NO STORAGE OR WORKING WITHIN THIS AREA'. 'THIS IS A PROTECTED TREES'.

5.3 Tree protection must be verified as being in the correct position by the Project Co-ordinator and Arboricultural Consultant. The Local Authority Tree Officer must be given the opportunity to inspect the fencing and signage in-situ.

6.0 Care During Construction

6.1 In order for tree and root protection measures to be enforceable, all personnel associated with the construction process must be familiar with this document and the principles of tree protection contained herein and the tree protection plans. A copy of the document will be retained on site at all times and the Tree Protection Plans referred to herein shall be displayed in a prominent location in the Principle Contractor's site offices and, if deemed necessary, in the site welfare buildings.

6.2 The fencing shall remain in position at all times and shall only be adjusted to accommodate the sequencing of construction works as agreed between the Principle Contractor and the Client Arboriculturalist. Adjustment of protective fencing must follow the approved sequence. In this instance the protective fencing is scheduled to remain in the location shown on CFA plan 770-PH4-LAN-PLN-003, Appendix 5, for the duration of the demolition and construction works.

6.3 Refer to all current British Standards for protection of trees in relation to construction.

Construction methods:

6.4 Hand Dig only within the Root Protection Areas. Excavation machines shall not be used under any circumstances within the tree root zones or within the precautionary areas.

6.5 Given the urban nature of the RPA and the presence of significant hard landscape and roads, any likely disturbance within the RPA will require supervised excavation/trenching using mechanical means.

6.6 When using 360-degree excavators during construction, at no time is the excavating arm to encroach over the position of the tree protection fence. Operation must always be in a way that avoids contact with lower branches.

6.7 No fires are to be lit on site at any stage during the construction process.

6.8 Tree root investigations to determine the extent of tree roots must be carried out by trial pits or radar scanning. Excavations near trees will affect ground conditions.

6.9 Where tree roots over 25mm are discovered to be in the way of proposed works and there is no possibility of adjusting the proposed layout of the works, permission to remove these roots must be sought from the Local Authority Tree Officer. If approved they must be neatly sawn by hand to the approval of the Arboricultural Consultant.

6.10 Given the presence of significant existing hard standing within the RPA of the trees and that the trees are outside of the site boundary, there is no foreseen requirement for exposing surfaces within the RPA.

6.11 Root barrier membranes must be installed where roots abut new construction works in the ground.

6.12 Mobile and tower cranes and machinery must be located clear from trees. Jib swings are to be limited to prevent over sailing of trees. The sequence of construction processes is shown in clause 13.0 – Programming.

6.13 Delivery vehicles must have site access clear from vulnerable trees for delivery and unloading of materials etc. Site haul roads are to be clearly marked and trees protected from spray or backwash caused by wheel washers etc.

6.14 There is to be no storage of chemicals, diesel or materials around or within the protected root zone of the protected trees identified. All Chemicals, diesel etc. will be stored away from the protected trees.

6.15 The Environmental Protection Act 1990 requires that a trade or business shall take "best practicable means" to prevent dust causing nuisance to the inhabitants of the neighbourhood. Where a site may generate dust appropriate measures to 'damp down' should be taken. This would include lorries leaving site.

6.16 In complying with the above dust levels on site should be kept down to an acceptable level so as not to cause a detrimental effect to the remaining trees retained on and around the site. To achieve the above the following conditions will be applied.

- There will be intermittent sprinkling of water as required to dampen down dust to reduce the chances of dust escaping the confines of the building and hence the site.
- Furthermore, the Principle contractor will use water hoses externally to dampen down and control the dust arising from drilling and breaking out operations carried out during the demolition process, both within and beyond the demolition area, to further reduce the chances of dust escaping from the site.

6.17 There will be intermittent sprinkling of water as required to dampen down dust to reduce the chances of dust escaping the confines of the building and hence the site.

6.18 Furthermore, the Principle contractor will use water hoses externally to dampen down and control the dust arising from drilling and breaking out operations carried out during the demolition process, both within and beyond the demolition area, to further reduce the chances of dust escaping from the site.

6.19 Additional hoses from the water board will be installed to the site if water pressure and flow are proved to be inadequate.

6.20 If additional measures are found to be necessary then works must cease immediately until such time as the required measures have been agreed with the Local Authority and have been actioned to their approval.

6.21 Generators, machinery or vehicles must not be placed where they might expel exhaust fumes on to tree stems or leaves for prolonged periods.

6.22 All the demolition work must be carried out by the approved means, within the hoarded site boundary and not adjacent to the protective fencing of the trees.

6.23 When tree roots are required to be pruned, sharp cutting tools must be used to ensure the minimum damage is caused. Clean cuts can result in the redevelopment of fine roots. Poor untidy cuts can, however, result in root die back and decay.

7.0 Tree Protection and Utilities

7.1 UCLH have commissioned a Utilities Assessment Report to investigate the extent of the underground utility services in the local area surrounding the site. It highlights all known utilities located within a three metre vicinity of the proposed basement piling line. The drawings detail each utility and the extent to which they need to be relocated / diverted. This report investigates the major utilities and their impact on the proposed re development of the site.

7.2 As part of the development proposal a number of services will require diversion. This information has been fed in to the design process. The location of trees which require protecting has been acknowledged.

7.3 It is recommended that an up to date CAT scan is undertaken to clearly identify all existing services that are routed within and around the site boundary and protected trees. This will detail the precise location of known services and also highlight any previously unidentified utilities.

7.4 Where appropriate, existing service routes will be utilised, negating the requirement for new trenches. Where this may be required, all excavations within the protective zone of the trees on site or located on adjacent property, will be carried out in accordance with the guidance provided in NJUG 10 (See *Appendix 3*).

7.5 Utility operators will be required to prepare detail designs of any trench layout, sufficient for the approval of The London Borough of Camden.

7.6 A series of trial holes will be required on Huntley Street and Grafton Way to establish a zone within the existing carriageways, where sufficient space is

available to locate the diverted services. Trial holes will also be required on Tottenham Court Road and University St. footways to establish if sufficient space is available for the installation of diverted services.

7.7 These trials holes will also inform the location of tree root spread within the RPA and determine any tree protection measures and constraints that may apply to the re-location of utilities.

7.8 Particular attention must be highlighted to the fact that all trenches within the tree protection zones must be hand dug and all roots encountered over 25mm in diameter must not be damaged or cut unless prior agreement with the tree officer is sought beforehand. Guidance covering backfilling must be followed.

7.9 This element of work will be factored into the development programme as works of this nature notoriously take time to organise and implement. Diversions of services are carried out regularly. There are tried and tested procedures in place that will inform the detailed discussions with the respective utility suppliers.

8.0 Tree Protection and Storage of Materials

8.1 The fenced and secure site compound and holding area will be located within the site and away from the RPAs.

8.2 All materials for construction purposes must be carefully stored outside the enforced tree protection area. The proposed area for materials to be stored is typically a bunded compound.

8.3 The Principle Contractor will confirm the presence of any and/or location of any silo or mixing facilities to be used on site for the manufacture of concrete. All concrete deliveries will be confirmed by the Principle Contractor.

9.0 Tree Surgery Works and Felling

9.1 All tree works must be done in accordance with the British Standard Recommendations for Tree Work BS 3998: 1989. Climbing irons or spikes must not be used whilst pruning trees. Trees to be removed shall be felled in a sectional manner. Falling pieces are to be controlled by way of lowering and guiding ropes if required, to prevent contact and damage to trees designated to be retained on site.

9.2 Due to the protected status of trees located within the conservation area any intended works to trees/shrubs must be brought to the attention of the planning services at least 6 weeks before carrying out any intended works including pruning work and felling/removing.

9.3 A tree works application form must be completed and sent to the planning sevices. The form should clearly identify:

- the tree's location
- the exact extent of proposed works

- reasonable explanation as to why the works are necessary

10.0 Landscaping Works within Root Protection Area (RPA)

10.1 Given the protected status of the trees, an investigation of the extent of the main root spread should be carried out within the proposed RPA. This should be undertaken during the first dig operations under the supervision of the Client Arborist Consultant.

10.2 It is recommended that trial pits be prepared in order to confirm actual site conditions, such as root spread, water table, soil type and presence of utilities. These will then be used to confirm the detail of the infrastructure layout.

10.3 Removal of existing hard surfacing and the formation of new hard surfacing will be undertaken by hand, in order to reduce compaction and disturbance of the ground. Re-instatement of paving will be to existing levels.

10.4 There is no soft landscaping proposed within the RPAs.

11.0 Dismantling Protective Fencing

11.1 Final dismantling of the fence will be on completion of the construction and Practical Completion of the landscape works. This must be administered by the Project Managers.

11.2 A minimum of seven days notice will be given to the Council Tree Officer prior to the dismantling of the protective fencing.

12.0 Construction Traffic Access

12.1 Site access will be from Grafton Way.

12.2 Protective fencing should be installed in the approved location around trees prior to the commencement of construction access and in accordance with *Appendix 1* of this document and with BS 5837, 2012. It shall remain in place until completion of the construction and Practical Completion of the landscape works. Any relocation of this fencing will require approval from the tree officer and Arboricultural Consultant.

12.3 Adequate turning and unloading areas will be located away from protective fences to prevent accidental damage.

12.4 As existing hard surfaces exist over the RPA's there is no known requirement for protective 'Geo-web' and aggregate sub base over exposed surfaces.

13.0 Programming

13.1 The methodology of this Tree Protection Strategy follows a logical sequence of events. Any proposed revisions to this Tree Protection Strategy must be communicated via the approved route to the Council Tree Officer for their approval.

13.2 The phasing indicated in this document sets out the intended construction sequence. The sequence of construction phases (post planning approval) are outlined as follows:

Stage 1 Pre-Contract Meeting.

Stage 2 Construction: Installation of protective fencing.

Stage 3 Enabling/Demolition works.

Stage 4 Construction: Main Build Works

Stage 5 Construction: Installation of Proposed Infrastructure Services.

Stage 6 Removal of all protective fencing and sign off

13.3 The relevant approvals notices must be obtained before any tree surgery works can commence on trees to remain.

13.4 There are no tree works required in order to facilitate demolition/construction. The tree survey report CFA-770-0013 makes a series of recommendations based upon good tree husbandry/management.

13.5 Due to the protected status of the trees any intended works to trees/shrubs must be brought to the attention of the planning services before any works including trial investigations, pruning work and felling/removing.

13.6 A tree works application form must be completed and sent to the planning sevices. Your form should clearly identify:

- the tree's location
- the exact extent of proposed works
- reasonable explanation as to why the works are necessary

13.7 Allow up to six weeks for planning services to consider your application.

Stage 1 Pre Contract Meeting

13.8 A pre-contract meeting shall be held on site prior to the commencement of any construction works. Parties attending the pre-contract meeting shall include, amongst others, the Client's Arboriculturalist and Landscape Consultant, Principle Contractor, Client, Principle Contractor's Project Co-ordinator. The Local Authority Tree Officer shall be made aware of and invited to attend the meeting should he/she wish to do so.

13.9 The methods of tree protection outlined in this document will be fully discussed at this meeting, so that all aspects of their implementation and sequencing are

made clear to all parties. Any clarifications or modifications to this statement shall be recorded and circulated to all parties in writing.

13.10 The Principle Contractor must be fully conversant with the details and requirements outlined in this document.

13.11 The Principle Contractor is responsible for ensuring that new site personnel understand and comply with the Tree Protection constraints outlined in this document.

13.12 Copies of supplementary Method Statements, as required to proceed with the works, will be supplied to all relevant site personnel who have control over any aspect of excavations within the Root Precautionary Areas of the trees to be retained. The contractor will provide adequate instruction on its implementation for all relevant staff. This instruction will be carried out by or to the approval of the arboricultural consultant.

13.13 The Principle Contractor will issue a construction sequence and programme. Durations and dates are dependent upon when planning permission is granted. Below is the sequence of works as understood at the time of application;

- Overall Demolition programme July 2014 – February 2015
- Construction Programme to be confirmed post demolition

Stage 2 Construction: Installation of protective fencing.

13.14 The position of the protective fencing is shown on the Tree Protection Plan CFA drawing 770-PH4-LAN-PLN-003, in *Appendix .5.* Trees T1 – T5 will have specific tree protection measures installed prior to demolition/construction works.

13.15 It is determined that trees T6 – T9 do not require specific tree protection fencing given their distance from the demolition works and the absence of any site access on University Street. This status will be monitored with particular reference to utilities re-location requirements during construction that may impact upon the RPA.

13.16 Seek approval that fencing is installed in the correct location as per approved drawings.

13.17 On completion of installation of protective fencing, approval will be sought to carry out any tree surgery works to all identified trees.

Stage 3 Enabling/Demolition Works

13.18 Refer to section 6.0 Care During Construction.

13.19 The RPA no construction exclusion zone will be limited to protection of the immediate tree trunks.

13.20 There must be no oversailing of the protective fencing. This must be monitored closely by the Principle Contractor.

13.21 Demolition and scaffold erection. Soft strip out of the building and asbestos removal.

13.22 Demolition of the building floor by floor, top down carried out from within the hoarded, secure site boundary. There is no anticipated oversailing of the protected trees.

13.23 The scale of enabling/demolition works warrants the air to be sprayed down during demolition. There will be localised nuisance of dust and noise that will need to be managed in line with considerate construction.

Stage 4 Construction: Main Build Works

13.24 The tree protection measures will remain in their approved location throughout construction.

13.25 The construction method and programme is to be determined post demolition (February 2015 onwards) and a method statement will be issued to London Borough of Camden prior to the commencement of construction or groundworks.

13.26 Site access is from Grafton Way. The access management of vehicles on Grafton Way in relation to the protection of trees must prevent physical/mechanical damage to tree trunk or canopy from either turning, stopping or unloading.

13.27 The components of this tree protection strategy include protection against mechanical damage to the structure of the tree above and below ground, protection of the soil surface against compaction and protection of the soil against contamination from construction materials. The contractor must not be instructed to commence works until such time that all protection measures are in place and have been inspected and signed off as secure by the Client Arboriculturalist.

13.28 Tower crane positions in relation to trees:

- All tower crane positions will be located as far away as possible from protected trees within the constraints of the site.
- The protected trees will not be affected during the installation of any tower cranes.
- The proposed siting of the tower cranes and the methodology for installation and dismantling will be submitted to the London Borough of Camden prior to starting works. This information will be submitted as an addendum to this document prior to commencement of the works.
- The method statement will identify the proposed crane locations, the type of crane to be used, the extent and swing of boom and the lateral and vertical restrictions on movement.

13.29 Refer to section 6.0 Care During Construction.

Stage 5 Construction: Installation of Proposed Utilities Services.

13.30 Refer to section 7.0 tree protection and utilities.

13.31 Construction of the proposed utilities diversions/installations requries access in to the RPA's along Grafton Way. There are substantial existing services corridors within proximity to the trees, given their urban street tree location.

13.32 The Arboricutural consultant and Engineer have co-ordinated services to minimise impact upon trees. The agreed services corridors are included on the Reach Active Utility Assessment drawings. Reduced of these drawings are included in Appendix 7. The Arboricultural consultant must be informed of any deviation from these agreed plans.

13.33 A joint inspection by the Client Arborist and Principle Contractor is required in order to determine the agreed methodology for proceeding with services installation.

13.34 In all cases, reference should be made to the UCLH commissioned Reach Active Utilities Assessment Report, as well as the NJUG in Appendix 3, when determining the methodology for proceeding with the services installation.

Stage 6 Removal of all protective fencing. Sign off.

13.35 Protective fencing to the existing trees shall only be removed on completion of all building works.

13.36 Once protective fence is removed inspect existing trees for stress and/or damage.

13.37 Seek Practical Completion sign off from Arborist and Landscape Consultant. Monitor landscape and existing trees for 24 months post completion.

14.0 Appendices

Please see overleaf.

APPENDIX 1 Protective Barriers/Fencing

on retained hard surfacing or it is otherwise unfeasible to use ground pins, e.g. due to the presence of underground services, the stabilizer struts should be mounted on a block tray (Figure 3b).

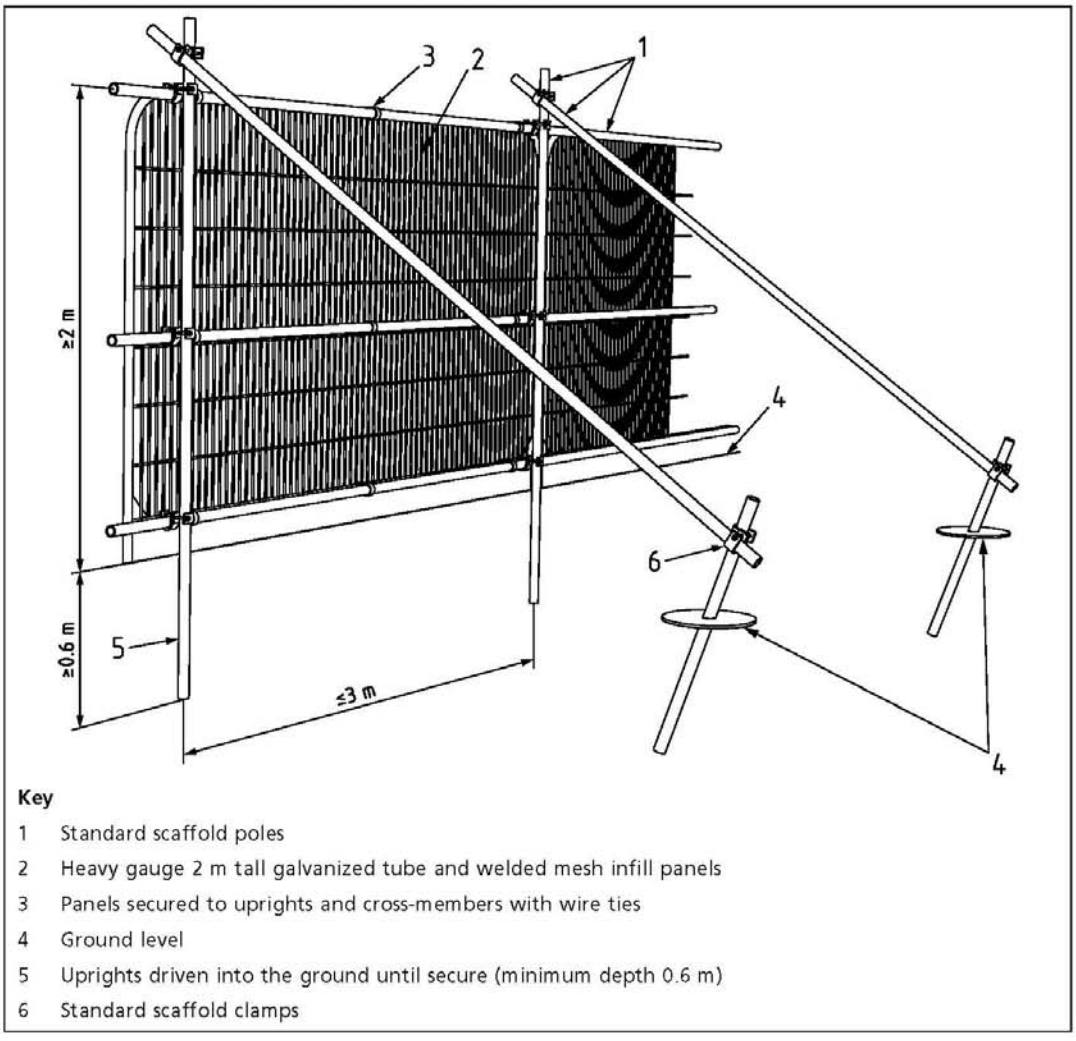
NOTE 1 Examples of configurations for steel mesh perimeter fencing systems are given in BS 1722-18.

NOTE 2 It might be feasible on some sites to use temporary site office buildings as components of the tree protection barriers, provided these can be installed and removed without damaging the retained trees or their rooting environment.

6.2.2.4 All-weather notices should be attached to the barrier with words such as:

"CONSTRUCTION EXCLUSION ZONE – NO ACCESS".

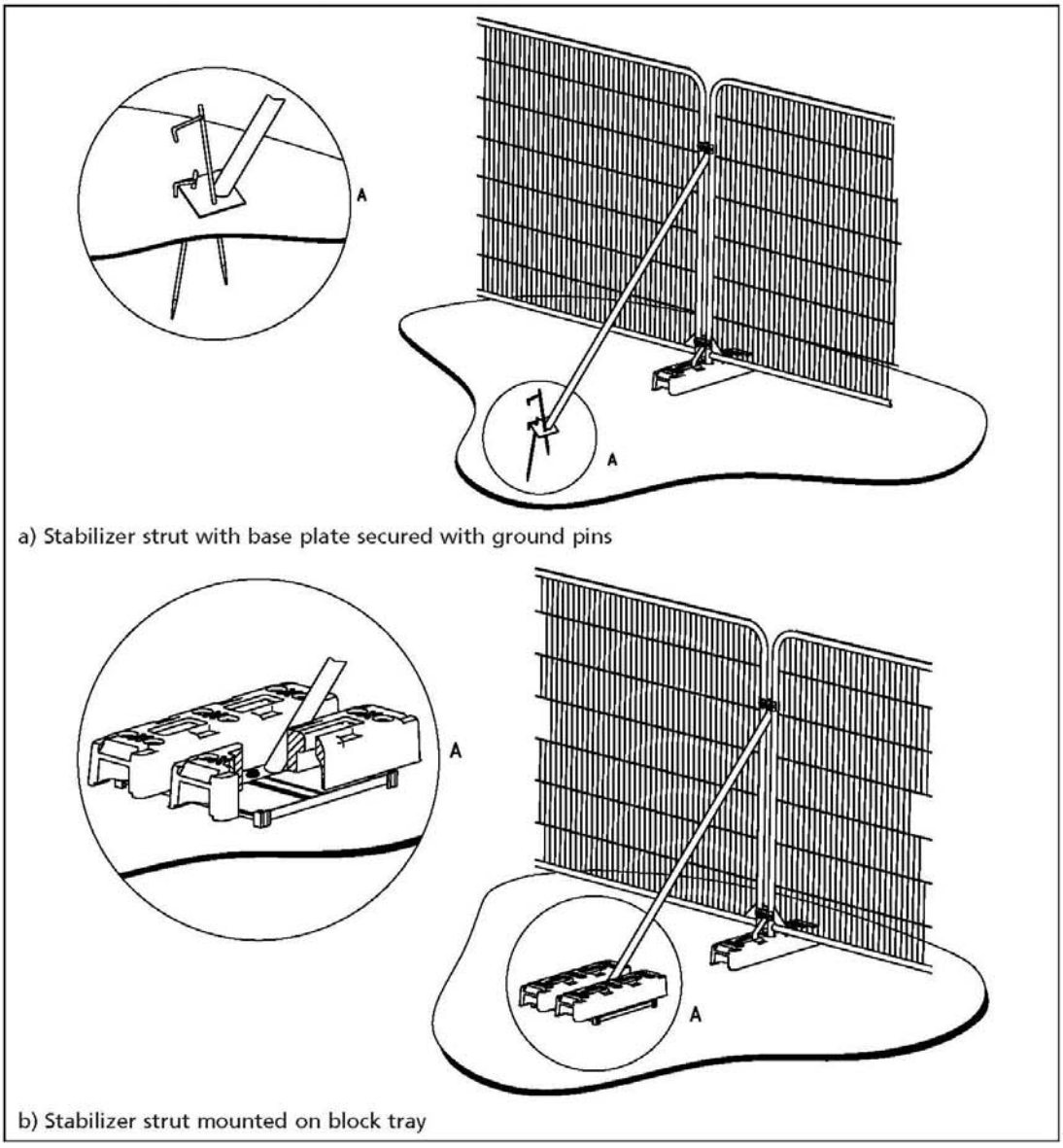
Figure 2 **Default specification for protective barrier**



Key

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

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



a) Stabilizer strut with base plate secured with ground pins

b) Stabilizer strut mounted on block tray

6.2.3 Ground protection during demolition and construction

6.2.3.1 Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier. In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed during demolition. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate.

APPENDIX 2

Trees in focus
Practical Care and Management

APN 1

Arboricultural Practice Notes

Driveways Close to Trees

Derek Patch and Martin Dobson

Arboricultural Advisory and Information Service

Summary

The majority of tree roots are in the upper metre of soil and they may spread outwards in any direction a distance equal to the tree's height. Any disturbance of the ground within the root spread of a tree can damage its roots which may severely injure the tree. Damage to roots will interrupt the supply of water necessary to keep the tree alive and may cause decline in vigour, dieback or even death of the tree. It may also be made unstable and pose a threat to the safety of people and property. Development of a site, including construction of access routes, driveways and parking areas can result in substantial root severance of trees. Techniques for the construction of access drives, which may avoid or lessen the damage caused to trees, are described.

Trees: A Cause of Conflict

Development may sometimes be hampered or prevented because of the presence of trees on a site. Local authorities and residents may wish to see trees preserved whilst developers seek permission to build close to them - often ignorant about the damage this may cause to trees. Even developments such as access drives and parking areas can threaten existing nearby trees.

Traditional driveway construction (excavation and backfilling with a compactable load-bearing sub-base material) can seriously damage tree roots. Such damage occurs because of a lack of understanding that roots mainly grow outwards from a tree's trunk, near to the soil surface, rather than downwards. Where there is a significant risk of damage to trees by root severance during construction, local planning authorities may sometimes refuse permission for installation of an access driveway or parking area close to trees - especially if the trees are subjects of Tree Preservation Orders.

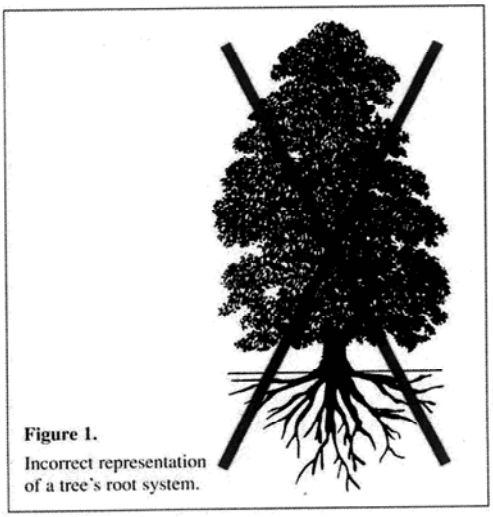


Figure 1.
Incorrect representation of a tree's root system.

However, if root severance can be avoided during construction, development may be more easily accepted. A technique is described below which should reduce the risk of significant damage to tree roots while enabling access and parking for light vehicles to be constructed close to trees.

Where Do Tree Roots Grow?

Survival of a tree depends on its roots being able to absorb enough water from the soil to sustain the foliage (an estimated 1,000 litres per day in summer for a fully grown forest tree in a rural area) and on developing a strong root system capable of keeping the tree upright in autumn and winter gales. To achieve this the tree's roots must exploit a very large volume of soil. However, the assumption that these requirements are met by a system of roots

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growing predominantly downwards (Figure 1), and that anchoring roots are very thick and descend into the soil for many metres (like the base of a lamp post) is incorrect. In reality tree roots:

- grow more or less parallel with the soil surface rather than vertically (Figure 2)
- are usually relatively shallow - most of a tree's roots are in the upper metre of soil
- usually radiate outwards from a tree for a distance equivalent to at least the tree's height (which for a mature tree may be 20 m or more)
- can be 30 cm or more in diameter at the base of the trunk
- sub-divide and taper rapidly as they extend out from the trunk
- are only 2-3 cm in diameter, and often much less at 3-4 m distance from the trunk

The small woody roots (those less than 3 cm diameter) taper very little but they may spread out for long distances. Smaller, non-woody roots (sometimes described as white, feeder, fibrous or absorbing roots) grow outwards and usually upwards from the woody roots and subdivide to exploit the better aerated surface soil. They (and the fungi associated with them - called mycorrizas) are the principal absorbers of moisture and nutrients.

Most roots (both thick and fine) are situated close to the soil surface, forming a shallow layer less than 1 m deep, but some small roots (usually only a few mm in diameter) may reach 2 m or more deep.

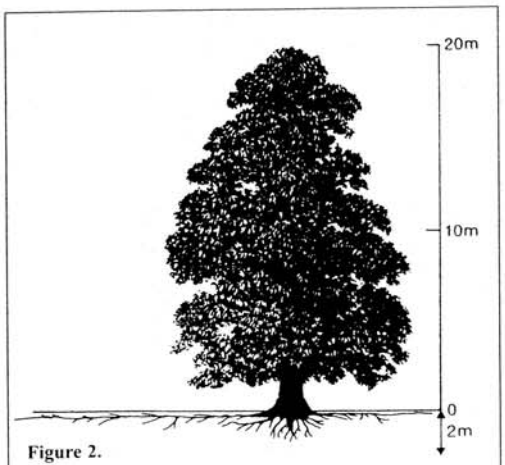


Figure 2.
Trees have a relatively shallow but wide spreading root system.

Roots and the Soil

Roots are living and like all plants and animals must have oxygen to survive. Without oxygen roots are unable to function properly or grow, and when they are starved of oxygen for prolonged periods, they die.

Both oxygen and water are held in the pores between the soil particles. Where the pores are large (e.g. in coarse or sandy soils) the soil will generally be freely draining and well-aerated, but where the pores are small (e.g. in heavy clays or soils which have been compacted) they may be full of water and have a poor supply of oxygen.

Most trees that have been growing undisturbed on a site for many years will have developed an extensive root system with the roots growing where the soil conditions are most favourable. There will be a balance between the development of the crown (which demands water) and the roots (which supply it). Any sudden alteration of the soil conditions within the tree's rooting area (a circle of radius equal to the tree's height) will therefore upset this balance. For example, repeated passages of machinery will 'squeeze' the soil closing up the pores (causing compaction - especially in the upper levels) and so reducing the amount of oxygen available to roots and preventing them from growing through the soil. Placing soil or other materials over the roots of a tree will impede air movement into and out of the soil and consequently reduce the availability of oxygen to the roots. The effect on the tree is usually progressive shoot and branch dieback until a new balance has been reached between the reduced capacity of the damaged root system to absorb water and the demands of the leaves. If damage is progressive or so severe that such a balance cannot be achieved, the tree will ultimately die.

Excavations - even stripping the topsoil - within the rooting area will sever a large number of roots. Once the excavation is a metre deep nearly all of the roots growing in that direction will have been cut. The tree may then either be unable to absorb sufficient water to sustain the foliage and dieback will occur, or anchorage will be so reduced that the tree is unsafe and has to be severely pruned or felled. The closer these operations are to the trunk the greater the damage inflicted on the tree. Nevertheless,

healthy trees are generally able to withstand the loss of some roots (a maximum of about 20% of the rooting area) without noticeable adverse effects.

Development Near Trees

British Standard BS 5837: 1991 *Guide for Trees in Relation to Construction* recommends that on construction sites the soil around a tree should be left undisturbed for a distance from the trunk equivalent to the branch spread, or half the tree's height, whichever is the greater (Figure 3). This is a *protected zone* in which any activity which could damage roots should be avoided. This often means that construction within this area is prohibited.

However, if the guidelines set out below are followed, installation of access driveways and parking for light vehicles should be possible without significant permanent damage to adjacent trees. Nevertheless, expert arboricultural advice may need to be sought to determine whether this technique is suitable for particular sites. In addition, the health of trees should be professionally assessed, as old and declining trees may be less able to withstand even this sympathetic construction.

Engineering Needs

Roads, footpaths and parking areas must be built with a firm, stable base. Engineers usually achieve this by excavating the soil to a depth of about 0.5 m, compacting the base if necessary, and backfilling with an inert material that can be compacted. The edges of the excavation act as the supporting formation and kerbs or edging boards may be used to retain the surface material. However, such excavations will sever roots and should be avoided, particularly within the protected zone.

It should be possible to construct an adequately supported access drive, and retain trees, if a no-dig system of construction is adopted within the protected zone.

Protection *and* Construction

For the roots to be retained undamaged there must be no excavation, soil stripping or site grading within the protected zone - in other words, NO DIGGING. This means that construction will have to be above the existing ground level. Passage of vehicles across the unprotected soil surface must also be avoided, especially when the soil is wet, as this will cause breakage of surface roots, soil compaction and consequently reduced soil aeration. Surviving roots may not be able to grow through the compacted soil. It is essential therefore that all but the immediate area of the development is protected from construction operations by fencing as recommended in BS 5837.

No-Dig Construction

Successful retention of trees even when adopting a no-dig method, particularly within the protected zone, depends upon the condition of the tree(s), which should be assessed by a qualified arboriculturist, and on adherence to three simple rules:

- roots must not be severed
- soil must not be compacted
- oxygen must be able to diffuse into the soil beneath the engineered surface

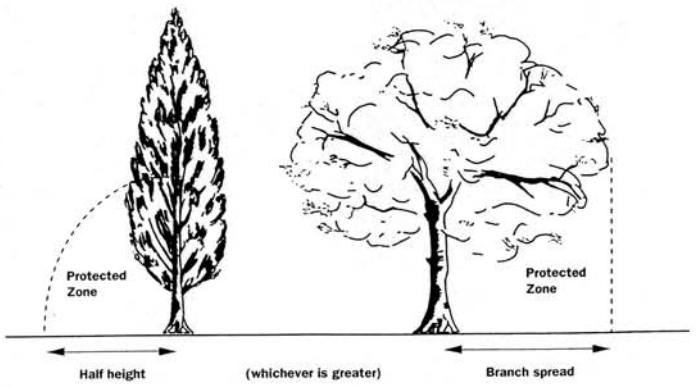


Figure 3.
Distance from a tree which constitutes the protected zone in which roots should be protected - i.e. no digging.

Our ref: 770/0014

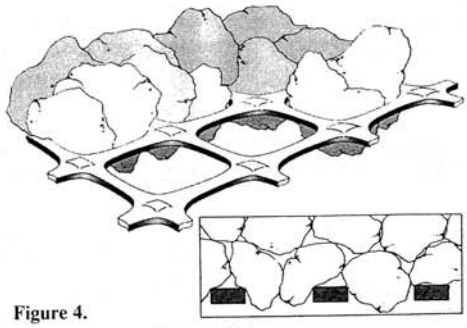


Figure 4.
The mechanism of interlock between aggregate and geogrid.

Meeting the Engineering Needs

Damage to trees can only be avoided if the construction embraces the above principles and (within the protected zone) is no more than 4 m wide.

Construction should incorporate two main components: a ***geogrid*** and an ***aggregate sub-base.*** Geogrids are high tensile strength synthetic grids designed to support roads on soft ground. When placed on the geogrid, appropriate granular sub-base material penetrates the mesh, but is unable to pass through it, forming a positive interlock (Figure 4). This interlock between aggregate and geogrid provides a reinforced platform and efficient load spread into the underlying ground. A suitable geogrid*/aggregate combination will prevent rutting of the ground beneath the construction.

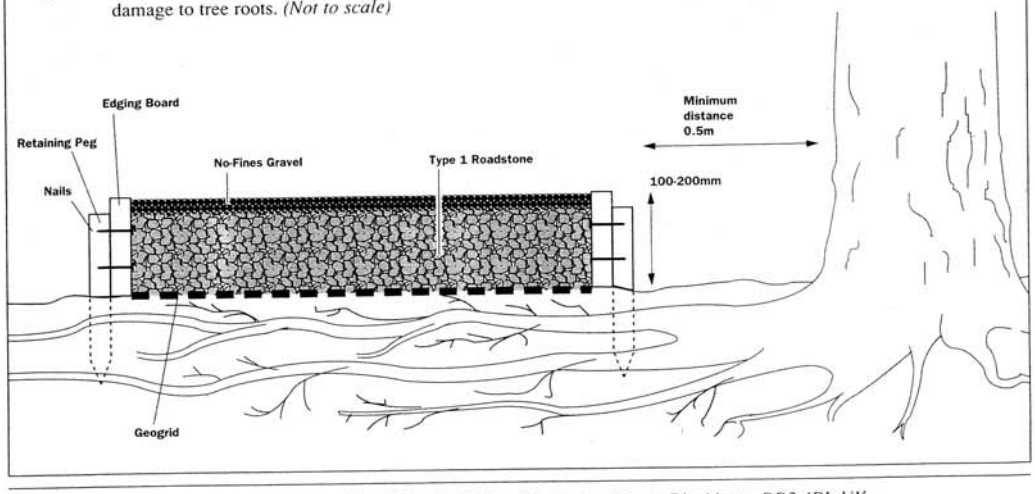
Granular sub-base material Type 1, as specified by the Department of Transport (Department of Transport, 1991; clause 803) is the recommended aggregate. This has a relatively low fines content which means that even when it is compacted it should be freely draining and will allow oxygen to diffuse into the soil.

For site-specific prescriptions and materials specifications advice may be sought from a qualified geotechnical or civil engineer.

Putting the Principles into Practice

- Construction should ideally be undertaken between May and October when the ground is driest and least prone to compaction, and in dry weather.
- Kill ground vegetation using a translocated herbicide such as glyphosate†. Gather up the dead organic material - this will prevent the build up of anaerobic conditions beneath the construction which might otherwise occur as vegetation begins to decompose.
- Remove major protrusions such as rocks and tree or shrub stumps (stumps should be ground out rather than excavated to minimise soil disturbance).

Figure 5. Diagram of a 'no-dig' method for constructing access drives and parking near to trees in order to minimise damage to tree roots. *(Not to scale)*



* For example, Tensar SS30, manufactured by Netlon Ltd, New Wellington Street, Blackburn, BB2 4PJ, UK.

† Care must be taken to select a herbicide which does not damage the roots of desirable vegetation that may be in the treated area. Always read the product label before use.

- Fill major hollows with sharp sand.
- Lay the geogrid directly onto the soil over the whole of the driveway/parking area.
- If necessary, construct an edging with boards attached to pegs driven into the ground through the geogrid. Pegs should be long enough to give sufficient support for the construction.
- Cover the geogrid with a minimum of 100 mm of aggregate. This should not be tipped straight onto the geogrid, but should be placed at one end and then pushed onto the grid so that machinery moves on the spread sub-base, not directly on the geogrid and not on the ground either side of it.
- Compact the sub-base to ensure binding with the geogrid and to minimise future rutting.
- Place the final surface. In the main it is likely that this will consist of gravel or tarmacadam, although paving slabs and brick paviours may be acceptable provided they are dry bedded on the sub-base and the joints are not sealed with grout, to allow for infiltration of water and gaseous diffusion*.

Final Remarks

Adoption of this no-dig method for creating access and parking for light vehicles near to trees which avoids root severance should help to overcome concerns about possible adverse effects on trees. Nevertheless, successful retention of a tree will depend upon strict adherence to the above principles, and upon the tree's condition - indicative of its ability to withstand changes in its rooting environment. This should be assessed by a qualified arboriculturist.

References and Further Reading

Biddle, P.G. (1992). Tree Roots and Foundations. *Arboriculture Research Note 108/92/EXT.* Arboricultural Advisory and Information Service, Farnham, UK.

British Standards Institution (1991). *BS5837 Guide for Trees in Relation to Construction.* BSI, London, UK.

Department of Transport (1991) reprinted 1993 with amendments. *Manual of Contract Documents for Highway Works Volume 1. Specification for Highway Works.* HMSO, London.

Dobson, M.C. (1995). Tree Root Systems. *Arboriculture Research and Information Note 130/95/ARB.* Arboricultural Advisory and Information Service, Farnham, UK.

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

* For drives less than 3m width the finished surface may be constructed of a less permeable material such as asphalt/or reinforced mass concrete.

ISSN 1358-8249

Our ref: 770/0014

APPENDIX 3
NJUG Guidelines For Installing and Maintaining Utility Services Close to Trees

Damage to Trees

(1) Tree roots keep a tree healthy and upright. Most roots are found in the top 600 mm of soil. They often grow out further than the tree's height. The majority of these roots are very fine; even close to a tree few will be thicker than a pencil. Most street tree roots grow under the pavement and into front gardens, but they can also grow under the carriageway.

If roots are damaged, for example by trenching, the tree may fall or lose its vigour and decline.

(2) Tree trunks can be easily damaged, so be careful when working near them. For example, don't lean paving slabs against trees, don't chain machinery to them or nail site notices to their trunks.

Protecting Roots

(1) Establish a protection zone around each tree; the Precautionary Area. See FIG 1.

To determine the Precautionary Area measure the girth of the tree at chest height. Multiply this by 4 and draw a circle of this radius from the centre of the tree.

In the Precautionary Area:

(2) Don't excavate with machinery. Use trenchless techniques where possible. Otherwise dig only by hand.

When hand digging, carefully work around roots, retaining as many as possible.

Don't cut roots over 25 mm in diameter, unless the council's Tree Officer agrees beforehand.

Prune roots which have to be removed using sharp tool (e.g. secateurs or handsaw), Make a clean cut and leave a small a wound as possible.

Backfill the trench with an inert granular material and top soil mix. Compact the backfill with care around the retained roots. On non highway sites backfill only with excavated soil.

Don't repeatedly move/use heavy mechanical plant except on hard standing.

Don't store spoil or building material, including chemicals and fuels.

(3) Frost can damage exposed roots. If trenches are to be left open overnight, cover the roots with dry sacking. Remember to remove the sacking before backfilling.

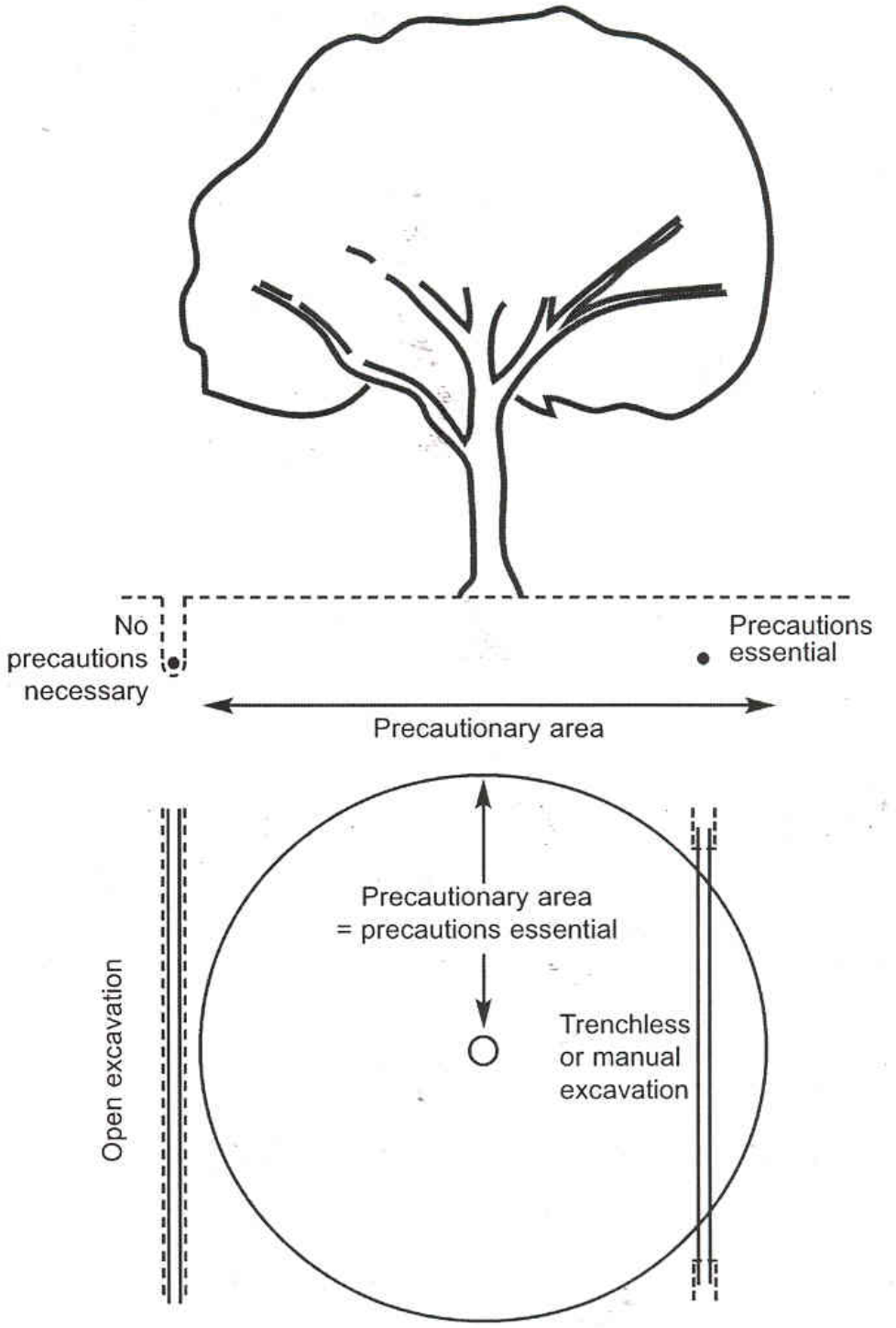


Fig. 1 To determine the Precautionary Area measure the girth of the tree at chest height. Multiply this by 4 and draw a circle of this radius from the centre of the tree.

APPENDIX 4 Arboricultural Site Supervision

SITE:	UCLH Proton Beam Rosenheim Building	PERSONNEL INFORMATION ON SITE:
CLIENT:		
SITE AGENT:		
DATE:		
INSPECTED BY:		

Tree Protective Fencing is Described As: Comments / Actions:

- In place ☐
- In wrong location ☐
- Partially in wrong location ☐
- Not in place ☐
- In need of re-erection ☐

Within the Agreed Exclusion Area: Comments / Actions

- All is clear ☐
- Minor debris exists ☐
- Excessive debris exists ☐
- Materials/ Equipment stored ☐
- Works are being undertaken ☐
- Works have been undertaken ☐

Details of Proposed Works:

Amendments to: Details / Actions

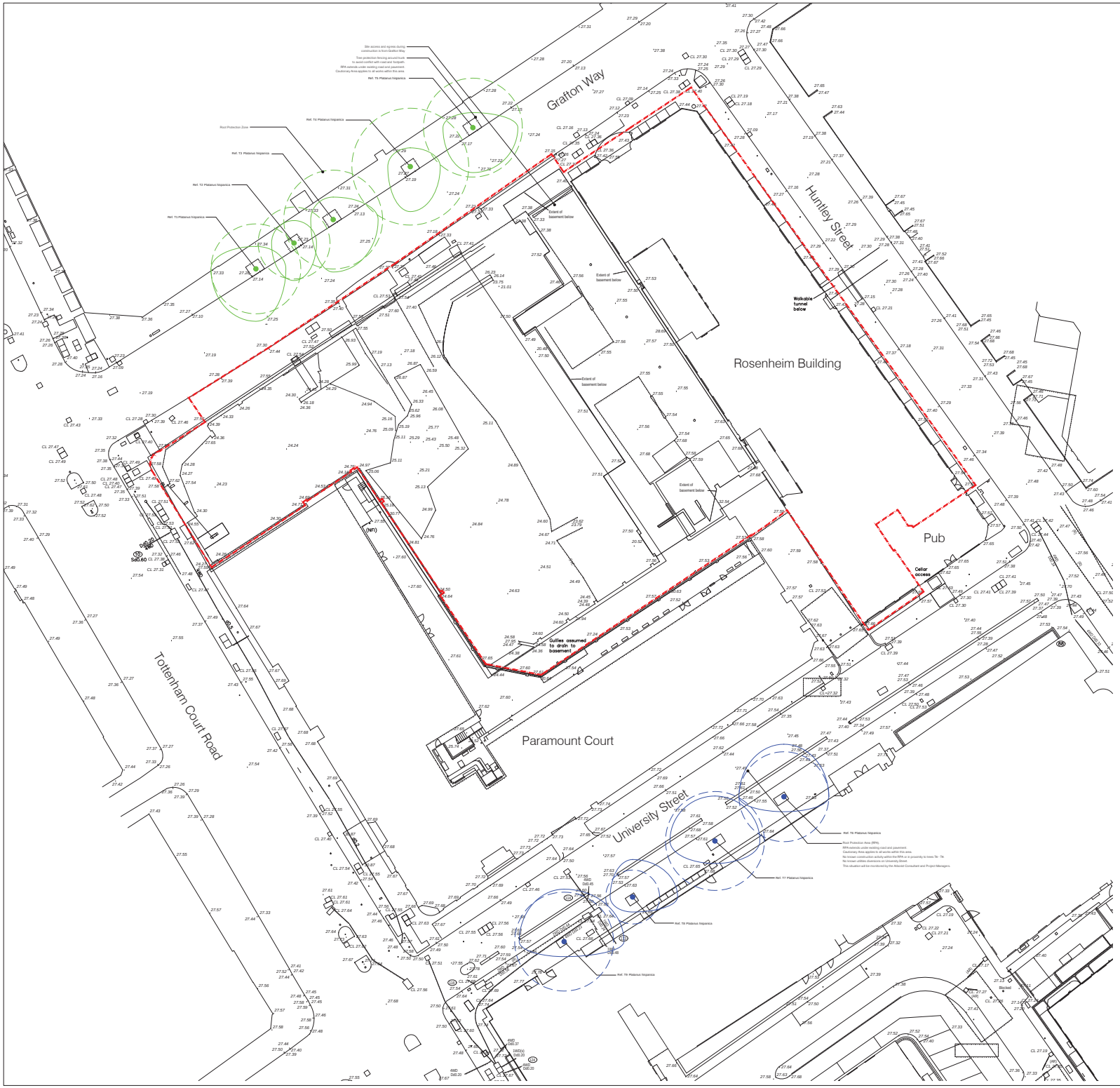
- Development Proposal ☐
- Logistical Implementation ☐
- Method Statement ☐
- Fencing Layout ☐

General Comments:

SIGNED: SIGNED:

Revision: Reference: Date:

APPENDIX 5 Minimum Root Protecting Area (RPA) & Tree Protection Fencing
(See full scale drawing as submitted with this application).



Root Protection Area (RPA)

Reference	RPA Radius	RPA Area
Ref. T1	6m	113.1m²
Ref. T2	4.8m	72.38m²
Ref. T3	6.6m	136.85m²
Ref. T4	7.8m	191.13m²
Ref. T5	6.6m	136.85m²
Ref. T6	6m	113.1m²
Ref. T7	6.6m	136.85m²
Ref. T8	3.6m	40.72m²
Ref. T9	6.6m	136.85m²

Dimensions to be verified on site.
Figured dimensions to take preference to those scaled.

1st Floor 79-81 High Street Godalming Surrey GU7 1AW
Telephone: (01483) 426 890. Fax: (01483) 869 920.
e-mail mail@charlesfunke.com web: www.charlesfunke.com

Key:

- Tree Canopy
- Tree RPA
- Tree Protection Fencing
  Fencing to comply with BS5837:2012 recommendations.
  Refer to section 6.2 barriers and ground protection.
- Site Boundary

NOTE:

Refer to Charles Funke Associates documents;

770-0013 Tree Survey Document

770-0014 Tree Protection Document

770_PH4_LAN_PLN_002 Tree Survey Plan

REVISION		DATE

CHARLES FUNKE ASSOCIATES
CHARTERED LANDSCAPE ARCHITECTS

Telephone: (01483) 426890 Fax: (01483) 869920 e-mail: mail@charlesfunke.com
1st Floor 79-81 High Street Godalming Surrey GU7 1AW

CLIENT: UCLH

PROJECT: Proton Beam Therapy (The Rosenheim Building)

DRAWING TITLE: Tree Protection Plan

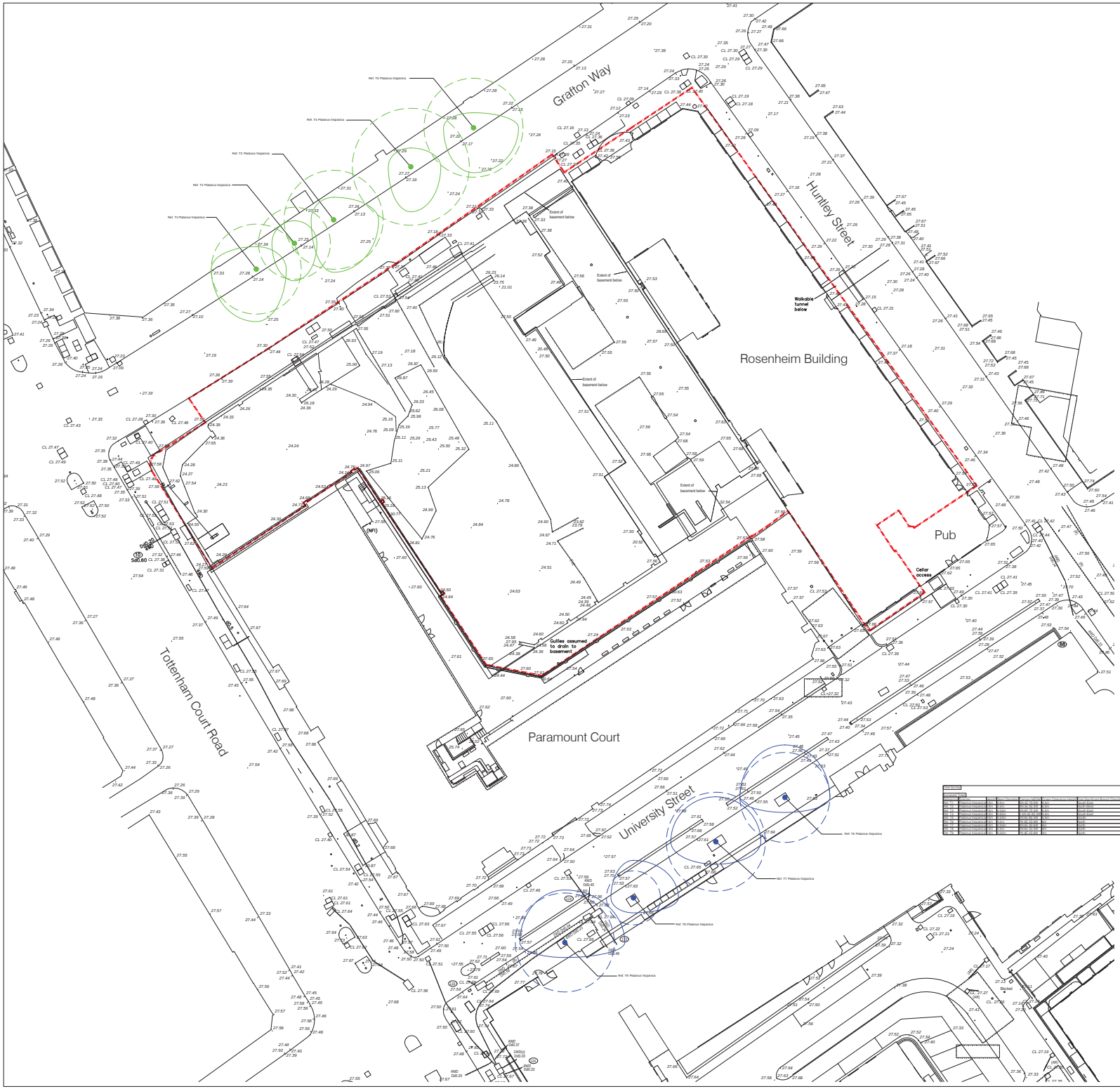
DRAWING STATUS: FOR PLANNING

COMP. FILE NAME: 770_PH4_LAN_PLN_003

DRAWN BY	CHECKED BY
BS/MY	DR

SCALE	DATE
1:250 @ A1	JULY 2014

DRAWING NO.	REVISION
770_PH4_LAN_PLN_003	0



Dimensions to be verified on site.
Figured dimensions to take preference to those scaled.

1st Floor 79-81 High Street Godalming Surrey GU7 1AW
Telephone: (01483) 426 890. Fax: (01483) 869 920.
e-mail mail@charlesfunke.com web: www.charlesfunke.com

Key:

- Tree Canopy
- Tree RPA
- Site Boundary

NOTE:

There are no trees within the site boundary. Those trees surveyed are in proximity to the site and are established street trees.

Refer to Charles Funke Associates documents;

770-0013 Tree Survey Document

770-0014 Tree Protection Document

770_PH4_LAN_PLN_003 Tree Protection Plan

REVISION		DATE

CHARLES FUNKE ASSOCIATES
CHARTERED LANDSCAPE ARCHITECTS
Telephone: (01483) 426890 Fax: (01483) 869920 e-mail: mail@charlesfunke.com
1st Floor 79-81 High Street Godalming Surrey GU7 1AW

CLIENT
UCLH

PROJECT
Proton Beam Therapy
(The Rosenheim Building)

DRAWING TITLE
Existing Tree Survey

DRAWING STATUS
FOR PLANNING

COMP. FILE NAME
770_PH4_LAN_PLN_002

DRAWN BY	CHECKED BY
BS/MY	DR

SCALE	DATE
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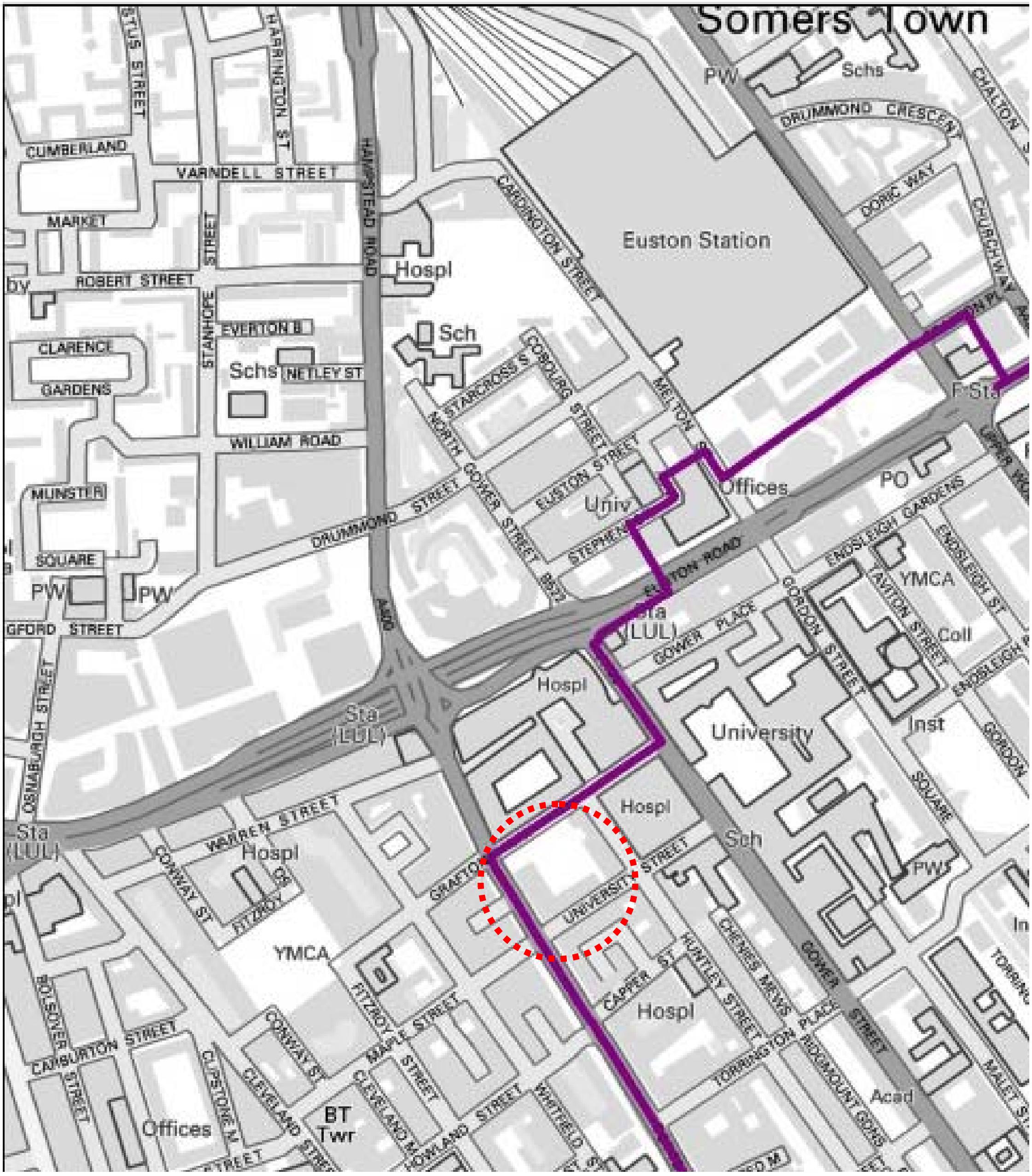
DRAWING NO.	REVISION
770_PH4_LAN_PLN_002	0

BS5837:2012 Cascade chart for tree quality assessment

Category & Definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention				
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				Red on plan BGA 127.0.0
Trees to be considered for retention				
	1. Mainly arboricultural qualities	2. Mainly landscape qualities	3. Mainly cultural values, including conservation	
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years				Light Green BGA 0.255.0
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years				Mid Green BGA 0.0.255
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 150 mm				Grey BGA 255.255.255

Appendix 6
Site Photographs for Reference

North



Trees T1 – T5 Platanus x hispanica Grafton Way, looking North-East.

Trees T1 – T5 Platanus x hispanica Grafton Way junction with Huntley Street, looking south-west.

Trees T6 – T9 Platanus x hispanica

University Street junction with Huntley Street, looking south-west.

Rosenheim Building/Site

University Street

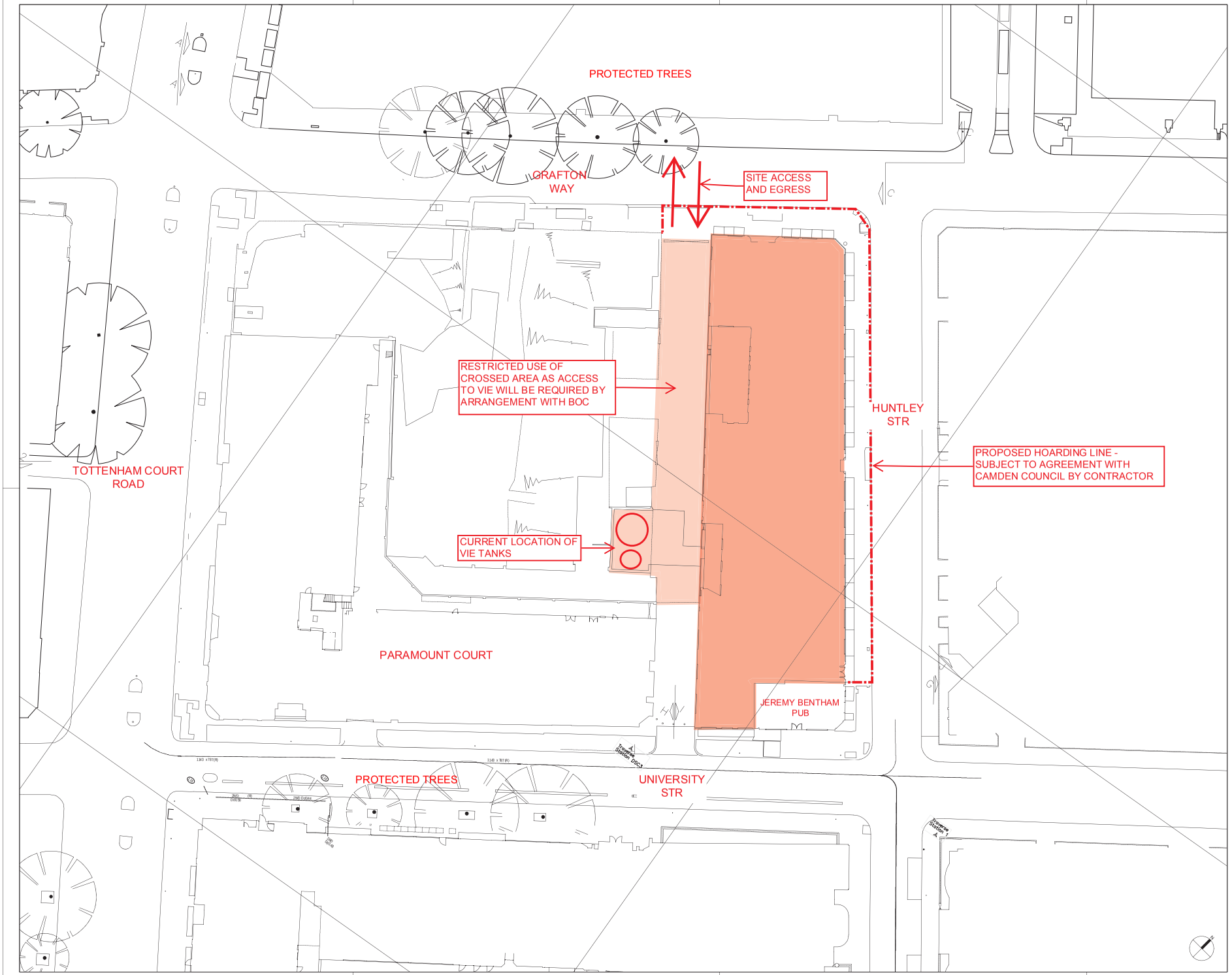
Trees T6 – T9 Platanus x hispanica

University Street junction with Tottenham Court Road, looking north-east.

Paramount Court

University Street

Appendix 7
Site Constraints Drawing and Utility Diversion Drawings



Building Information Modelling (BIM)
This drawing is an extract from a BIM model. The Model Status indicates the purpose for which this drawing has been created:

WORK IN PROGRESS: The contents of this drawing have not yet been checked or verified for use outside of the authoring team.
SHARED: The contents of this drawing are checked and validated for the purpose of design coordination only.
PUBLISHED: The contents of this drawing are formally revised, checked, validated and approved in accordance with quality assurance procedures.
ARCHIVED: The contents of this drawing have been archived and is fit for record purposes only.

Levels and contours are relative to an Ordnance Survey

DO NOT SCALE FROM THIS DRAWING. WORK ONLY FROM FIGURED DIMENSIONS. THIS DRAWING TO BE READ IN CONJUNCTION WITH RELEVANT CONSULTANT'S DRAWINGS.

NOTES:

Revision Schedule

No.	Date	Description
A	02.05.14	ISSUED FOR INFORMATION

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CLIENT
University College London Hospitals

PROJECT
Proton Beam Therapy - Phase 4

DRAWING
Rosenheim Demolition
Site Constraints
Ground Level

MODEL REFERENCE

SCALE @ A1	MODEL STATUS	MODIFIED TIME:
	WORK IN PROGRESS	02/05/2014 12:35:28

DRAWN BY:	CHECKED BY:
RG	FS

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12046	Tender	Eoin O'Morain

DRAWING NO.	REVISION
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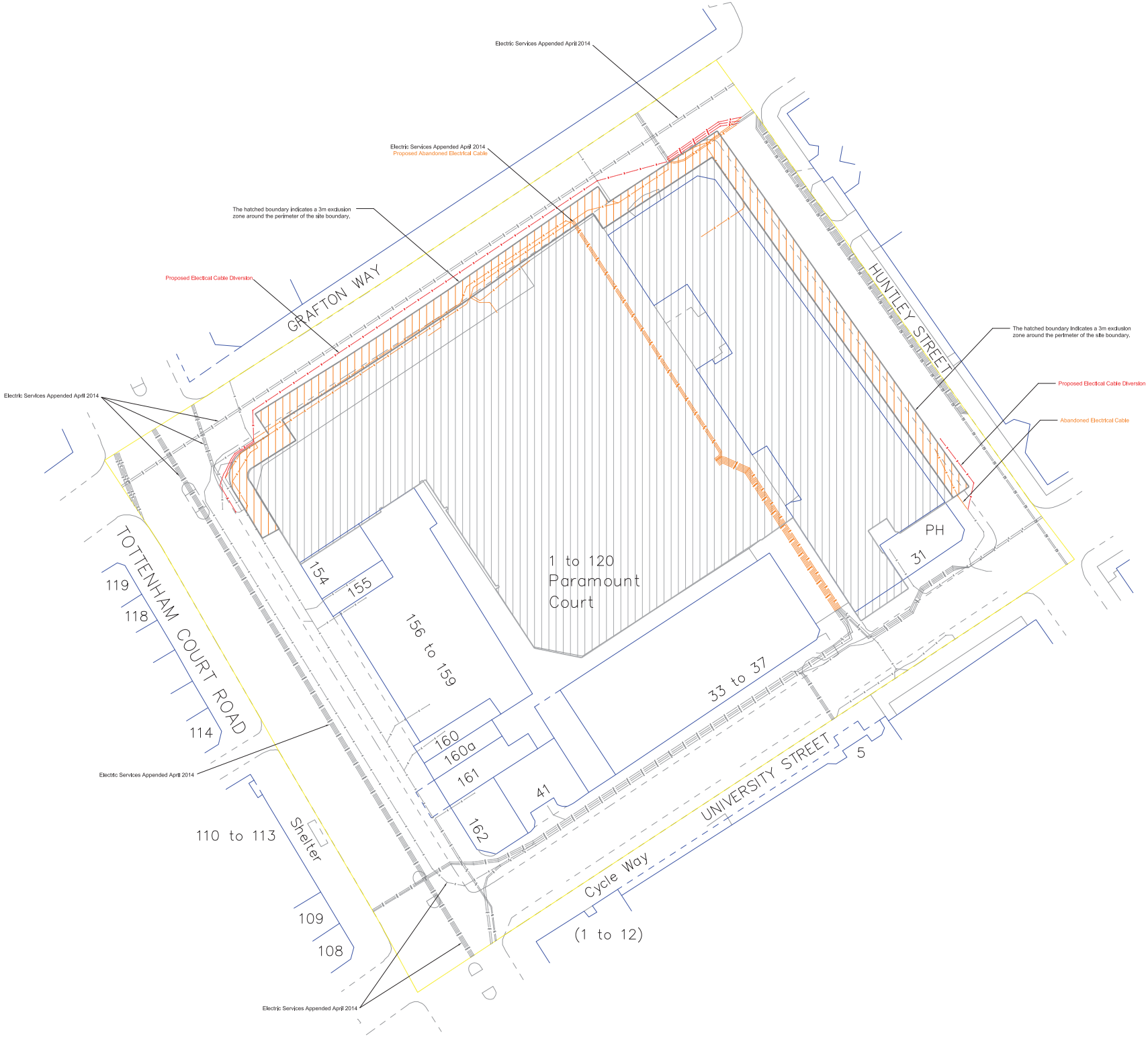

LEGEND

- Mapped Area
- Electricity Cable
- Extra High Voltage Electricity
- High Voltage Electricity
- Low Voltage Electricity
- Abandoned Electricity Cables
- Diverted Electricity Cables

ABBREVIATIONS (where applicable)

CI	Cast Iron	SI	Spun Iron
CP	Concrete (Pre-Cast)	ST	Steel
DI	Ductile Iron	VC	Vitrified Clay
PE	Polyethylene		

NOTES

Geotec Desktop Mapping have overlaid the statutory data provided on to an Ordnance Survey plan, Statutory Information can only provide an indication as to services location and positional accuracy cannot be guaranteed,

Any inaccuracies in the Ordnance Survey base plan may have an effect on the positional accuracy of the statutory information,

Affected & Unaffected Services

Services	Updated Services Appended 04/14	Within Hatched Boundary and Exclusion Zone	Services Checked Unchanged 10/12
UK Power Networks			
National Grid Gas			
SSE			
Open Reach			
Interoute			
LUL			
Thames Water			
Foul			
Trunk Main			
Global Crossing			
Fibrenet			
Colt			
EU Networks			
Verizon			
BT			
Other Fibre Optic			
Other Ducts			

YES	
NO	

ELECTRIC SERVICES DRAWING

ReachActive

Reach Active Ltd
4 Centrus
Mead Lane, Hertford
Hertfordshire, SG13 7GX
Tel: +44 (0)1992 663080
Fax: +44 (0)1992 663081

Dwg No:	RA-UCLPR-SS-006 Electrical Service Diversions

Site:
University College London Hospital
UCLH Phase 4
London W1T
Grid Ref: 529394 182187

Date: April 2014

Sheet No:	1 of 1	Issue No:	001	Scale:	A0 1:200
Drawn by:	NR/LH	Checked by:	RW	Approved by:	CK

Revision	Description	Initial	Date
E&OE			

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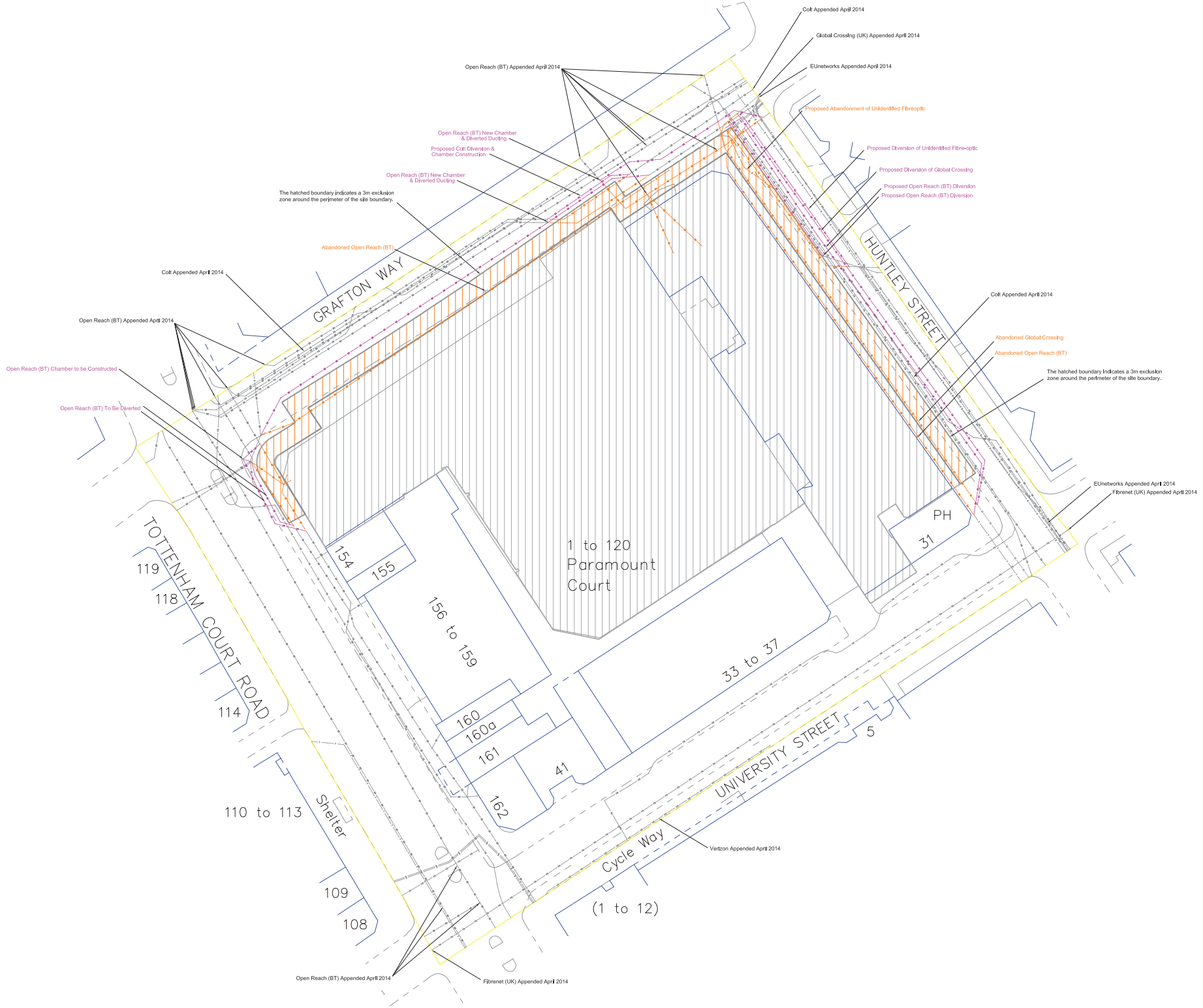

LEGEND

- Mapped Area
- Telecom
- Cable Television
- Duct
- Fibre Optics
- Colt
- EU Networks
- Fibre Net
- Global Crossing
- Open Reach (BT)
- Verizon
- Abandoned Infrastructure
- Diverted Infrastructure

ABBREVIATIONS (where applicable)

CI	Cast Iron	SI	Spun Iron
CP	Concrete (Pre-Cast)	ST	Steel
DI	Ductile Iron	VC	Vitrified Clay
PE	Polyethylene		

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Any inaccuracies in the Ordnance Survey base plan may have an effect on the positional accuracy of the statutory Information,

Affected & Unaffected Services

Services	Updated Services Appended 04/14	Within Hatched Boundary and Exclusion Zone	Services Checked Unchanged 10/12
UK Power Networks	■	■	
National Grid Gas		■	■
SSE			■
Open Reach	■	■	
Interoute			■
LUL			■
Thames Water		■	■
Foul	■		
Trunk Main	■		
Global Crossing	■	■	
Fibrenet	■		
Colt	■	■	
EU Networks	■		
Verizon	■		
BT		■	■
Other Fibre Optic		■	■
Other Ducts		■	■

YES	■
NO	

TELECOM, FIBRE OPTICS & DUCT SERVICES DRAWING

ReachActive

Reach Active Ltd
4 Centrus
Mead Lane, Hertford
Hertfordshire, SG13 7GX
Tel: +44 (0)1992 663080
Fax: +44 (0)1992 663081

Dwg No:	RA-UCLPB-SS-005 Telecom & Fibre Service Diversions

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UCLH Phase 4
London WC1
Grid Ref: 529394 182187

Date: April 2014

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Revision	Description	Initial	Date
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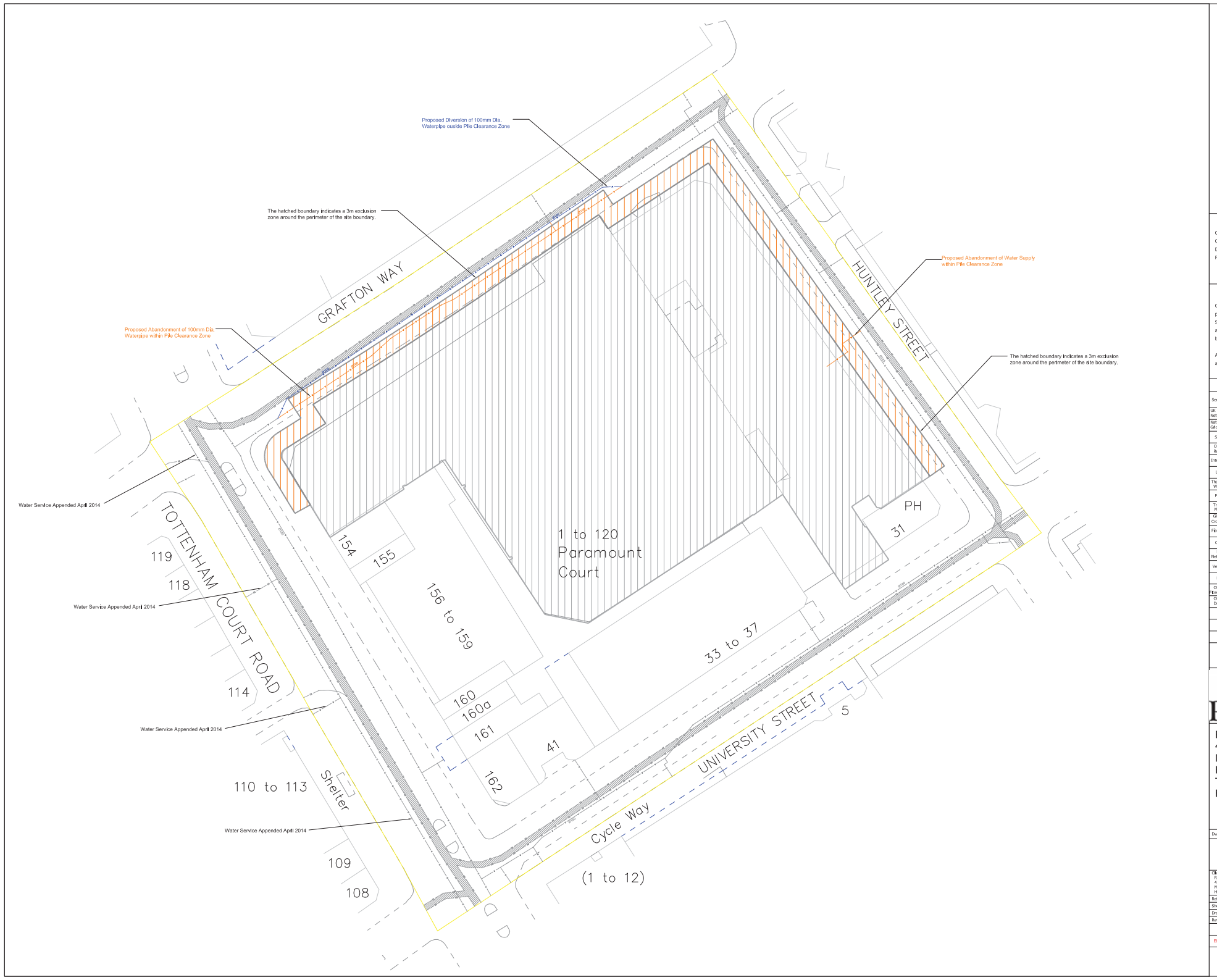

LEGEND

- Mapped Area
- Foul Water
- Surface Water
- Combined Sewer
- Existing Unaffected Water Main
- Abandoned Water
- Diverted Water

ABBREVIATIONS (where applicable)

CI	Cast Iron	SI	Spun Iron
CP	Concrete (Pre-Cast)	ST	Steel
DI	Ductile Iron	VC	Vitrified Clay
PE	Polyethylene		

NOTES

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Any inaccuracies in the Ordnance Survey base plan may have an effect on the positional accuracy of the statutory information,

Affected & Unaffected Services

Services	Updated Services Appended 04/14	Within Hatched Boundary and Exclusion Zone	Services Checked Unchanged 10/12
UK Power Networks			
National Grid Gas			
SSE			
Open Reach			
Interoute			
LUL			
Thames Water			
Foul			
Trunk Main			
Global Crossing			
Fibrenet			
Colt			
EU Networks			
Verizon			
BT			
Other Fibre Optic			
Other Ducts			

YES	
NO	

WATER SERVICES DRAWING

Reach Active Ltd
4 Centrus
Mead Lane, Hertford
Hertfordshire, SG13 7GX
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Fax: +44 (0)1992 663081

Dwg No:	RA-UCLPP-SS-004 Water Service Diversions
Client:	Reach Active Ltd 4 Centrus Mead Lane, Hertford Hertfordshire, SG13 7GX
Site:	University College London Hospital UCLH Phase 4 London WC1T Grid Ref: 529394 182187
Ref No:	140408Z2w
Date:	April 2014
Sheet No:	1 of 1
Issue No:	001
Scale:	A0 1:200
Drawn by:	NR/LH
Checked by:	RW
Approved by:	CK

Revision	Description	Initial	Date
E&OE			

SCALE BAR

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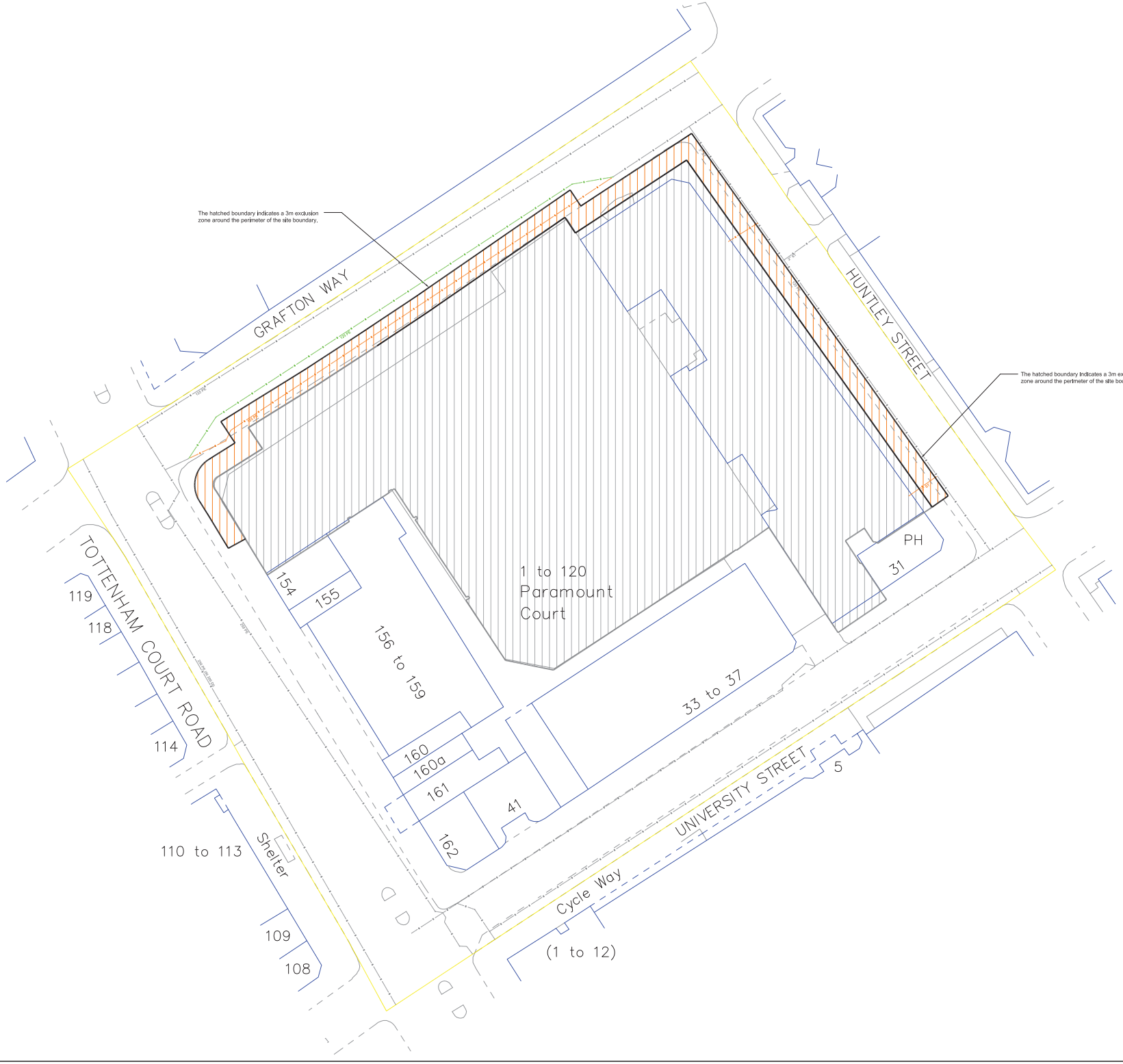

LEGEND

- Mapped Area
- Existing Gas Main
- Abandoned Gasmain
- Diverted Gasmain

ABBREVIATIONS (where applicable)

CI	Cast Iron	SI	Spun Iron
CP	Concrete (Pre-Cast)	ST	Steel
DI	Ductile Iron	VC	Vitrified Clay
PE	Polyethylene		

NOTES

Geotec Desktop Mapping have overlaid the statutory data provided on to an Ordnance Survey plan,
Statutory Information can only provide an indication as to services location and positional accuracy cannot be guaranteed,

Any inaccuracies in the Ordnance Survey base plan may have an effect on the positional accuracy of the statutory information,

Affected & Unaffected Services

Services	Updated Services Appended 04/14	Within Hatched Boundary and Exclusion Zone	Services Checked Unchanged 10/12
UK Power Networks	■	■	
National Grid Gas		■	■
SSE			■
Open Reach	■	■	
Interoute			■
LUL			■
Thames Water		■	■
Foul	■		
Trunk Main	■		
Global Crossing	■	■	
Fibrenet	■		
Colt	■	■	
EU Networks	■		
Verizon	■		
BT		■	■
Other Fibre Optic		■	■
Other Ducts		■	■

YES	■
NO	

GAS SERVICES DRAWING

ReachActive

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Dwg No:	RA-UCLPB-SS-003 Gas Service Diversions

Site:
University College London Hospital
UCLH Phase 4
London W1T
Grid Ref: 529394 182187

Ref No:				Date:	April 2014
Sheet No:	1 of 1	Issue No:	001	Scale:	A0 1:200
Drawn by:	NR/LH	Checked by:	RW	Approved by:	CK

Revision	Description	Initial	Date
E&OE			

SCALE BAR

0.0m 2.0m 4.0m 6.0m 8.0m 10.0m 12.0m 14.0m 16.0m 18.0m 20.0m