40 Queens Grove
London

Tree Protection Document
July 2010

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On behalf of:
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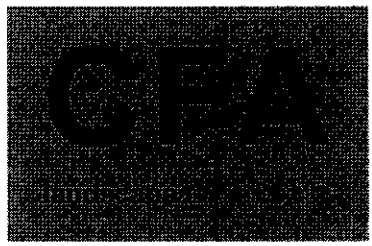

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1.0 Introduction

1.0 The purpose of this Tree Protection Document is to detail what actions must be taken to specifically protect Tree numbers 1 to 4 from the proposed demolition and construction works.

The trees numbered 1 to 4 *are* within a designated *Conservation Area* and as such are subject to the planning laws and Local Planning Authority approval and notification related to trees within Conservation Areas.

1.1 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: 2005 'Guide for trees in relation to construction'
- BS3998: 1989 'Tree Work'.

1.2 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 is a helpful tool in this regard.

2.0 Development Description

2.1 The site is situated at 40 Queen's Grove, NW8.

2.2 The site comprises a 4 storey building, which is to be demolished and replaced with a 4 storey residential dwelling including a basement.

2.3 The site lies within the London Borough of Camden.

3.0 Purpose

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 construction.

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)

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 and communicated between the Project Co-ordinator, their chosen Arborist Consultants and the Local Authority.

4.1 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.

4.2 1). At the pre-contract meeting for the start of the construction phases. The Main 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

4.3 The Main 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 Construction of the basement, superstructure, fabric of the building.
4). During the installation of utility services and/or underground services.
5). During the dismantling of protective fencing

4.4 In the event of accident or spillage in or adjacent to protected trees, the Main Contractor is to be informed immediately. In the event of spillage the Main 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 Main Contractor.

4.5 The Client Arboriculturalist is to be informed by the Main Contractor 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.

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, LB Camden 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 Client, 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 Fencing

5.1 Fencing must comprise a minimum 2.4m high exterior grade 20mm ply affixed to scaffolding poles driven securely into the ground at 1.5m centres. Supporting struts will be fixed to the inside of the fence to ensure maximum rigidity. Supporting struts will be measure no less than 100mm x 50mm. See Appendix 1.

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

'PROTECTED AREA –
NO ACCESS AND NO STORAGE OR WORKING WITHIN THIS AREA'.
'THIS IS/THESE ARE PROTECTED TREES'.

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 main 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 Main Contractor and the Client Arboriculturalist. Adjustment of protective fencing must follow the approved sequence indicated on the drawings shown in Appendix 5.

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

6.4 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.

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

6.6 Tree root investigations to determine the extent of tree roots must be carried out by trial pits and must be hand dug. Excavations near trees will effect groundwater conditions.

6.7 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.

6.8 Excavation machines shall not be used under any circumstances within the tree root zones or within the precautionary areas.

6.9 Where prolonged works take place within tree protection zones, aluminium tracking shall be installed over the ground to prevent compaction of the soil surface. Suitable framework for tracking shall also be installed. Following removal of temporary tracking, the ground must be aerated by hand forking taking care to avoid root damage.

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

6.11 Mobile and tower cranes and machinery must be located clear from trees. Jib swings are to be limited to prevent oversailing of trees. Dismantling of tower cranes at the end of the construction period must be carried out in such a way as to prevent any damage to the remaining trees. The sequence of installation and dismantling cranes is shown in clause 13.0 – Programming.

6.12 Delivery vehicles must have roadside 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.

6.13 The Main Contractor is to confirm that there will be no storage of chemicals, diesel or materials around within the protected root zone of the protected trees. All Chemicals, diesel etc. will be stored on the opposite side of the site from the protected trees. Due to reasons of topography and the selected locations for the storage areas, there will be no surface water run off affecting the protected trees.

6.14 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.

6.15 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.

6.16 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.

6.17 Furthermore, the demolition 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.

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

6.19 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 Client Arboriculturalist and the Tree Officer and have been actioned to their approval.

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

6.21 All the demolition work must be carried out by hand both within and adjacent to the protective fencing boundary of the trees.

6.22 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 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).

7.2 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.

8.0 Tree Protection and Storage of Materials

8.1 All materials for construction purposes must be carefully stored outside the enforced tree protection areas. The proposed area for materials to be stored is to be designated by the Main Contractor. The Main 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.

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.

10.0 Landscaping Works within Tree Protection Zones

10.1 A calculation of the Root Precautionary Areas within the application site boundary has been made in accordance with BS 5837: 2005 and this is shown on CFA drawing 662_LAN_PLN_ 002 Tree Protection Areas.

10.2 Hard Landscape Installation:

- Only tracked vehicles are to be used for the formation of new hard surfacing in order to reduce compaction and disturbance of the ground.
- Only limited excavation by hand will be allowed over the precautionary area as described in Fig 1. Appendix 3.

10.3 Soft Landscape Installation:

- All landscaping must avoid soil re-grading and disturbance within the tree protective areas. If cultivation of the soil and making up of levels is required within the protective distances cultivation should not exceed 50mm depth and must at all times be by hand. Soil re-profiling required to achieve the finished levels around trees will be carried out by hand.

Where ground cover planting is proposed around the trees and under the tree canopies.

- Planting pits shall not exceed 150mm depth and shall avoid any damage to the structural tree roots.

Where grass is proposed around the trees and under the tree canopy.

- Cultivation depth for grass turfing shall not exceed 50mm depth and shall be carried out by hand to avoid damage to structural tree roots.
- An investigation of the extent of the main root spread shall be carried out by hand before any cultivation works commence..

11.0 Dismantling Protective Fencing

11.1 In order to implement final surface treatments at the front and-rear of the site, it will be necessary to dismantle the protective fencing. Supervision of this exercise and control of the landscaping thereafter must be administered by the appointed Main Contractor.

11.2 A minimum of seven days notice will be given to the LB of Camden prior to the dismantling of the protective fencing.

12.0 Construction Traffic Access

12.1 Protective fencing will be installed in accordance with the dimensions shown from tree 1, 2 , 3 and 4 on drawing 662_LAN_PLN_002 in Appendix 5 of this document and with BS 5837, 2005 (*"Guide for Trees in Relation to Construction - Recommendations"*), and shall remain in place until the start of the hard landscape works. This fence shall be installed in accordance with Fig 5 Appendix 1 in this document.

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

12.3 Where existing hard surfaces break up during the works, protective 'Geo-grid' and aggregate sub base will be laid over tree precautionary areas to minimise ground compaction from site construction vehicles over the tree root zone. See Figs 4 and 5, Appendix 2.

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 Local Tree Officer for their approval.

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

Stage 1 Pre-Contract Meeting

Stage 2 Install protective fencing to Trees marked as 1, 2, 3 and 4

Stage 3 Demolish/dismantle existing house and foundations

Stage 4 Site Clearance

Stage 5 Install new services using existing trenches

Stage 6 Install new foundations

Stage 7 Construct new house

Stage 8 External works

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

13.4 The trees in question are shown on CFA drawing 662_LAN_PLN_ 002 in Appendix 5 of this document. A visual inspection of the trees was carried out on with the Arborist Consultant and the following table identifies the proposed arboricultural management to the retained trees:

Tree number	Tree Species	Common Name	Proposed Works
1	*Acer saccharinum*	*Silver Maple*	*None*
2	*Acer saccharinum*	*Silver Maple*	*None*
3	*Acer saccharinum*	*Silver Maple*	*None*
4	*Acer saccharinum*	*Silver Maple*	*None*

13.5 **Stage 1 Pre Contract Meeting**

13.6 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, Client's Landscape Consultant, Main Contractor, Client, Main 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.

13.7 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.

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

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

13.10 Copies of supplementary Method Statements, as required to proceed with the works, will be supplied by the Main Contractor 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 Main 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. Method Statements shall cover the following stages and shall address the following elements:

13.11 **Stage 2 Installation Adjustment of Tree Protective Fencing and Tree Surgery Works**
- Works to be carried out by approved/qualified tree surgeon
- Contractor's Access to be identified on drawing and ground protection provided over root precautionary areas in accordance with this document

13.12 **Stage 3 Demolish/dismantle existing house and foundations**
- Method statement to include how dust will be controlled from affecting trees

13.13 **Stage 4 Site Clearance**
- Method statement to confirm how protection to root precautionary areas will be maintained

13.14 **Stage 5 Install new services using existing trenches**
- Method statement to confirm that any new trenches will not clash with root precautionary areas

13.15 **Stage 6 Install new foundations**
- Method statement to confirm that protection to root precautionary areas will be maintained

13.16 **Stage 7 Construct new house**
- Method statement to confirm that any cranes or other machinery will clear tree canopies and confirm location for positioning crane

13.17 **Stage 8 External works**
- Method statement to confirm how new paving works will be installed over root precautionary areas

14.0 Appendices

Please see overleaf.

APPENDIX 1

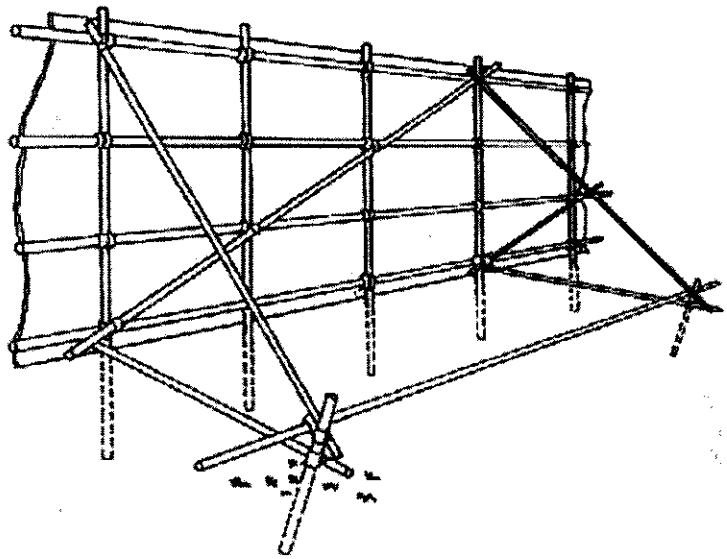
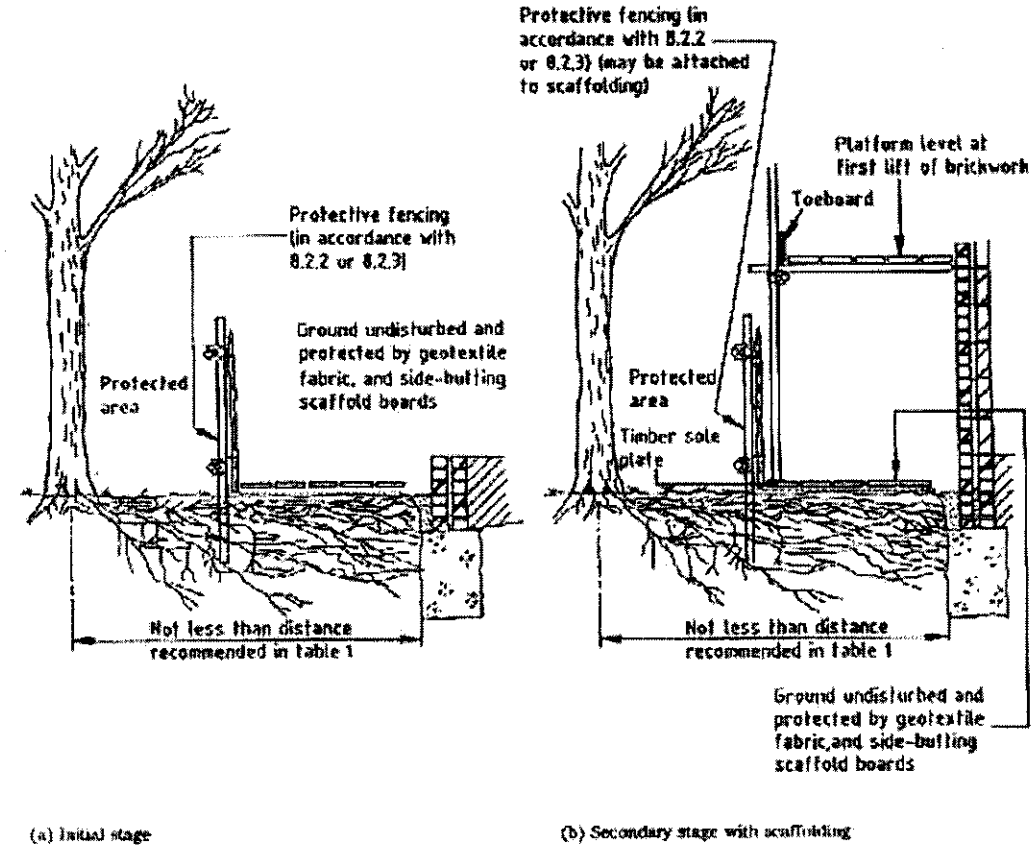


Figure 5. Protective fencing for special conditions



(a) Initial stage (b) Secondary stage with scaffolding

Figure 6. Scaffolding within a protected area (see 8.3.2)

APPENDIX 2

Trees in focus
Practical Care and Management

APN 1
Arboricultural Practice Notes

AAIS

Driveways Close to Trees

Derek Patch and Martin Dobson

Arboricultural Advisory and Information Service

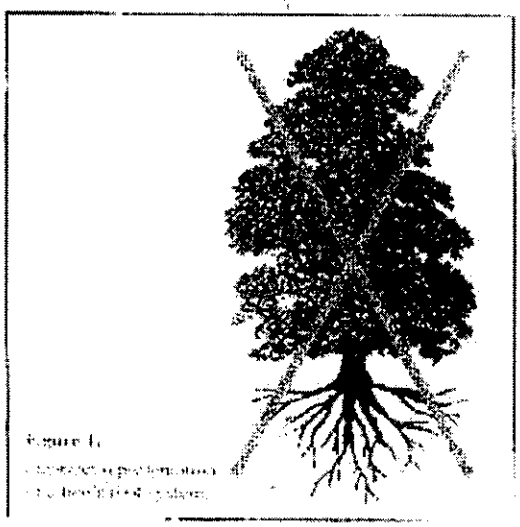
Summary

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.

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

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.

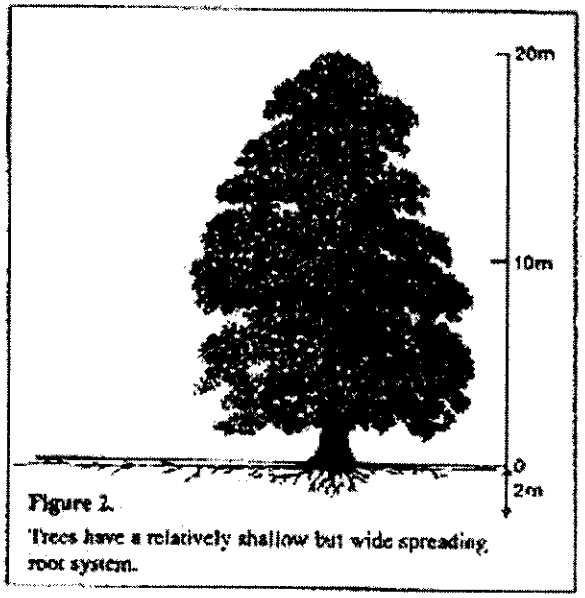


Figure 2.
Trees have a relatively shallow but wide spreading root system.

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

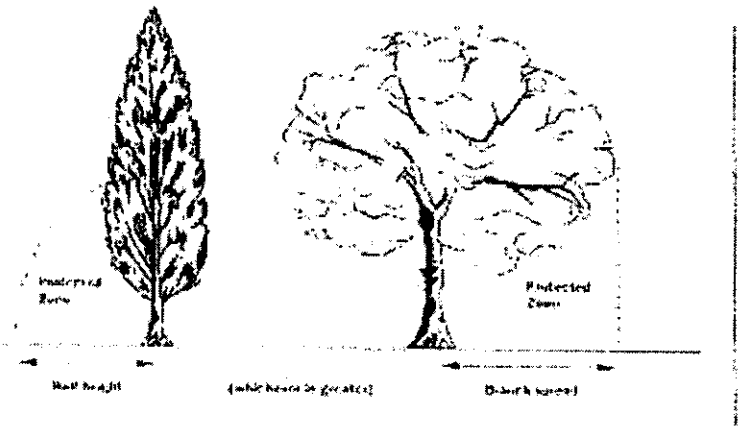


Figure 3.

Distance from a tree with a protected zone in which roots should be protected by no-digging.

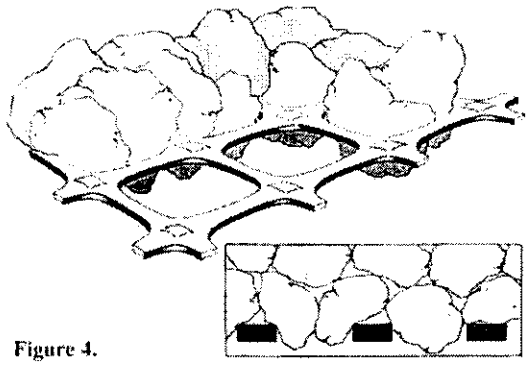


Figure 4.
The mechanism of interlock between aggregate and geogrid.

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.

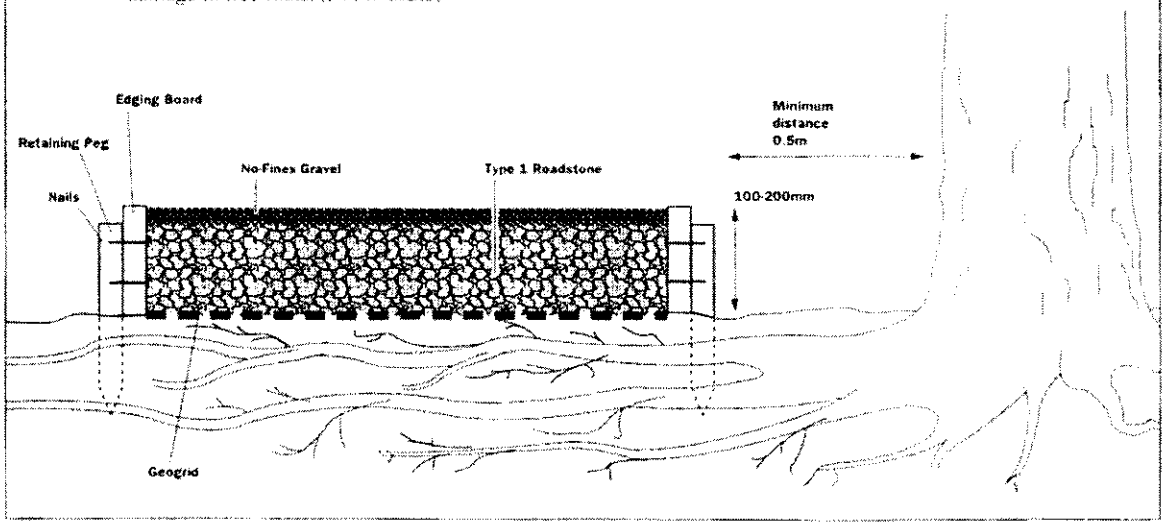
Granular sub-base material Type 1, as specified by the Department of Transport (Department of Transport, 1991: clause 803) is the recommended aggregate. This has a relatively low fines content which means that even when it is compacted it should be freely draining and will allow oxygen to diffuse into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

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.

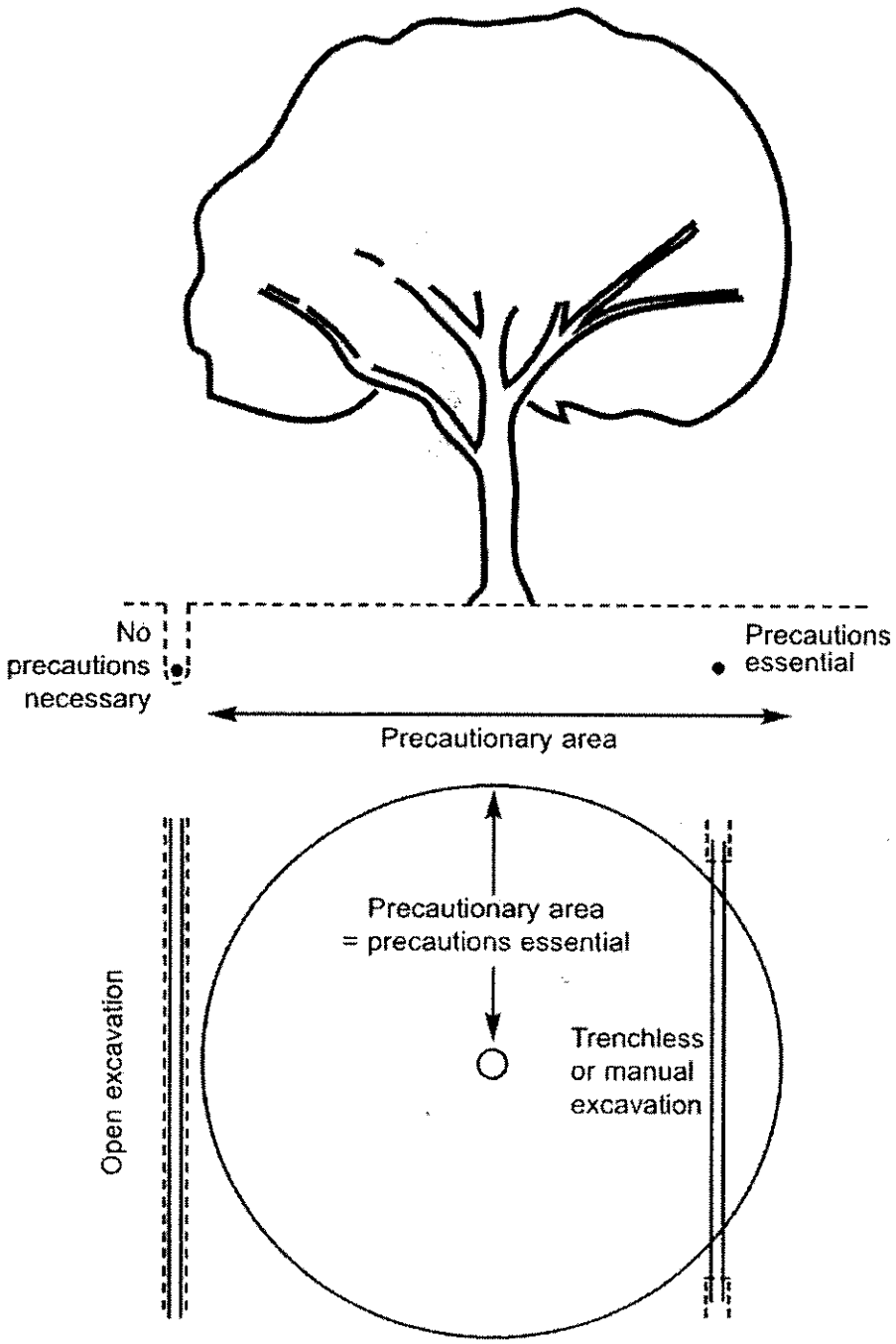


Fig. 1 To determine the Precautionary Area measure the girth of the tree at chest height. Multiply this by 4 and draw a circle of this radius from the centre of the tree.

APPENDIX 4 **Arboricultural Site Supervision**

SITE:		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 ☐

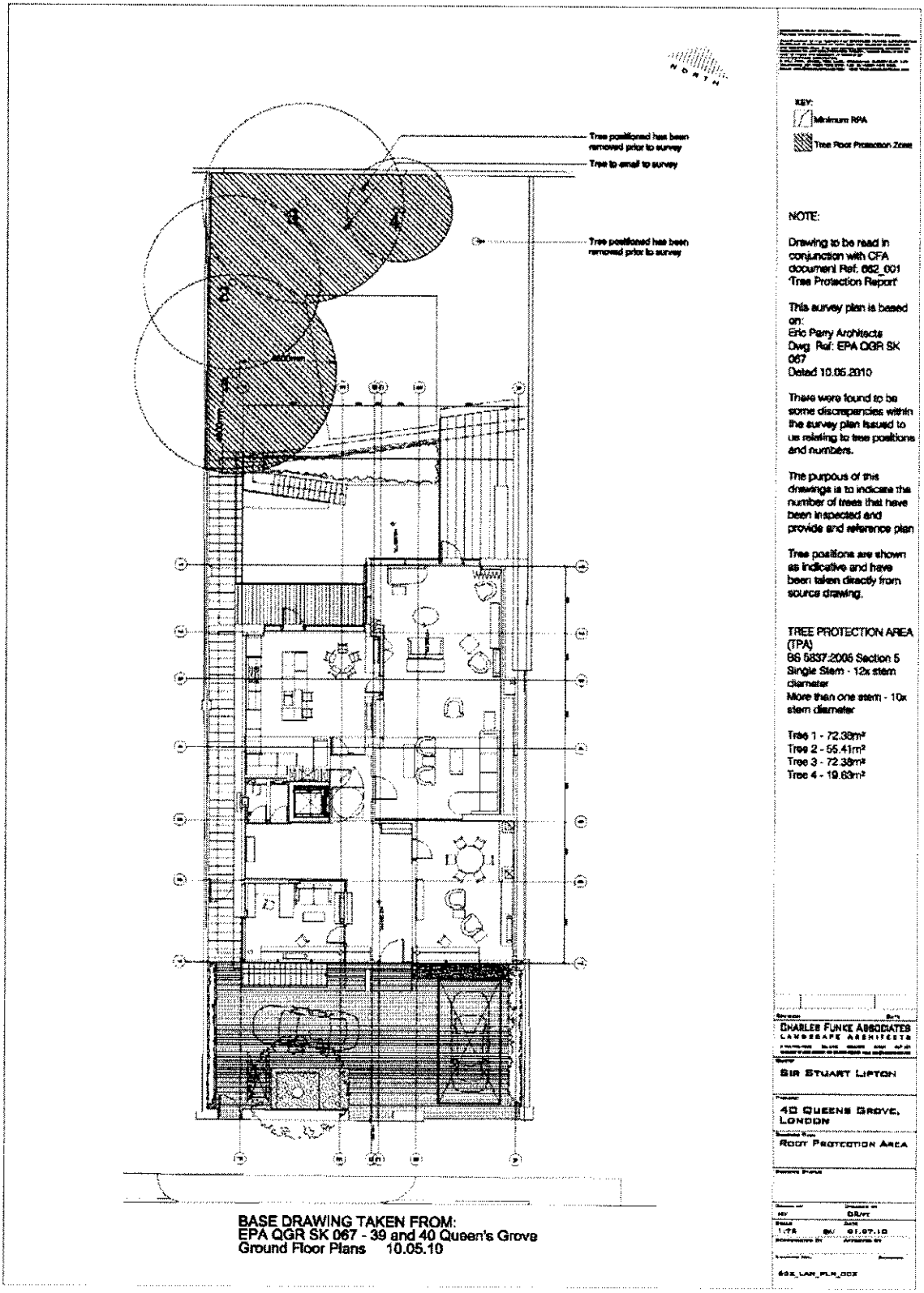
General Comments:

SIGNED: SIGNED:

Revision: Reference: Date:

APPENDIX 5

Tree Protection Layout Plan



APPENDIX 6

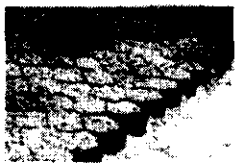
Geoweb Root Protection

THE SOLUTION

Where access driveways or vehicle hard standing areas are planned in areas adjacent to trees, Arboricultural Officers will normally specify a 'no dig' construction to eliminate the damage associated with normal construction methods. With this method no removal of surface soils is allowed. Instead, a permeable structural sub-base is laid directly onto the existing ground level with a permeable wearing course, such as grass reinforcement, low tack resin coated gravels or block paving, laid on top.

'No dig' construction may be accommodated with the use of perforated Geoweb in the sub-base layer. Geoweb reduces the overall depth of construction by introducing a cellular structure which dissipates downward loads by a horizontal transfer through the cell structure. This process in conjunction with the perforated cell wall also imports structural integrity to free draining aggregates which would otherwise be unacceptable in road construction. Therefore, a robust, shallow and free-draining sub-base is achieved, which allows vehicular access whilst allowing water and oxygen to permeate down to the tree roots.

Expanding and staking Geoweb panels



Infilling the Geoweb

In accordance with British Standard BS5837: 1991 - Guide for Trees in Relation to Construction and APN 1:1996 – Driveways Close to Trees, Geoweb acts to protect tree roots in three main ways;

1. **Used with the correct infill, Geoweb allows the construction of a permeable sub-base.**
2. **Geoweb enables 'no dig' construction to be used, avoiding any severance of tree roots.**
3. **Geoweb prevents the compaction of soil surrounding roots.**

The permeable wearing course to complete the system can be accommodated through Ecoblock, a grass protection or gravel retention system. The cellular construction of Ecoblock provides a fully permeable, attractive wearing course which is capable of accommodating heavy vehicle loads, whilst allowing the exchange of oxygen and free drainage of water to the sub-base.

The Geoweb system has been used in tree root protection applications with great success for the following clients:

- **Node House - North Dorset District Council**
  A number of mature beech trees have been protected during the construction of a large residential property. This site has been closely monitored for the past 30 months by local tree officers. There have been no noticeable problems.
- **Woodfield School - Wigan Metropolitan Borough Council**
  Geoweb was used to protect the roots of trees lining an access road and in an extended car parking area.

KEY BENEFITS OF THE GEOWEB SYSTEM:

- *'No-dig' solution*
- *Cost effective*
- *Fast and simple to install*
- *Design flexibility*
- *Environmentally-friendly*
- *Tried and tested product*

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We can provide comprehensive technical support for our range of ground engineering products. If you have a particular application which you would like to discuss in more detail, please contact our Specification Sales Team on 01204 862222, who will be pleased to arrange for one of our representatives to contact you.