ARBORICULTURAL IMPLICATIONS REPORT

for :

1 Meadowbank
London
NW3

Produced for:
Mr Jon Townsend

Prepared by:
Edward Buckton
BSc(Hons) Forestry M. Arbor A.

Date: 5th March 2013

Reference:
eb/aiams1/e/meadowbank2013

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Summary of Conclusions and Recommendations

This scheme represents a modified design to further accommodate two street trees located to the north of the site. Recent pruning by the Local Authority has provided the necessary clearance to build out the scheme.

Subject to the implementation of the proposed scheme in accordance with the recommendations set out in this report, the landscape and important trees will not be adversely affected either directly by or resulting from the construction of the proposed scheme.

As a consequence of the above, the scheme will have a low impact upon the visual character and appearance of the area.

Recommendations

1. **Undertake a pre-commencement site meeting**
2. **Agree the sequence of events**
3. **Adhere to the tree protection measures stipulated in this report**
4. **Monitor tree protection during construction period**

1.0 Introduction and Scope

1.1 This report has been commissioned by Mr Townsend to; i) assess the trees in accordance with BS 5837:2012 'Trees in relation to design, demolition and construction- Recommendations' (The BS); ii) detail the arboricultural consequences of the proposed project and assess its visual impact upon trees and amenity; iii) provide recommendations for effective tree protection, which are commensurate and appropriate for the scale and type of development; iv) develop a tree protection strategy for the duration of the construction including any land preparation or demolition works.

1.2 Reference to 'the proposed scheme' below will mean either the approved scheme for which planning consent has been granted or the scheme under consideration by the Local Planning Authority (LPA).

1.3 The trees were inspected, in accordance with BS 5837:2012 'Trees in relation to design demolition and construction- Recommendations' on the 26th September 2012 and a total of 3 tree records are provided.

1.4 This report sets out the protection measures that will be adopted to ensure effective tree preservation. The basic principles are that; the established fenced and ground protected areas are exclusion zones for the duration of the construction (or as duly agreed) and; excavations within the BS root protection areas (RPA) will be subject to professional assessment (see Note 1).

1.5 A full hazard assessment of the trees (including for example the assessment of decay or defects and its implications), has not been undertaken as this information is considered beyond the scope of this report. Naturally, any obvious hazards have been identified in the schedule and, I recommend that these are acted upon as soon as practicable.

1.6 Any operational practices recommended in this report are to be undertaken by the appropriate specialist company. Operatives are to carry out the relevant risk assessment and record such information, prior to commencement of tasks and work in accordance with current Health and Safety standards, practices and legislation. Unless formally agreed, no contractors are assessed, appointed or monitored by ACS Consulting. Responsibility and liability of all actions, non-actions, products and services associated directly with this report will be limited to the relevant client and contractor.

General Site Description

1.7 The site comprises an existing four storey residential building. Geological records suggest that the local soil is London clay and the site is predominantly flat with a gentle slope in a north to south orientation.

2.0 Tree Appraisal & Implications

2.1 The tree details are presented at **Appendix 1**. These details conform to those recommended by BS 5837:2005 'Trees in relation to construction-Recommendations'. The position of the trees is shown on the Tree Protection Plan (TPP) at **Appendix 2**.

2.2 **Specific Comments on Tree Stock in Relation to Scheme** (Impact of scheme on trees)

2.2.1 A previous application at the site was refused on the basis of impact on trees, particularly the need to prune canopies to accommodate the scheme. This has been taken into account with this revised application, which has reduced the size and elevation of the extension, to provide an improved separation to the mature Lime trees.

2.2.2 Both Lime trees are situated in the public highway and have been maintained by the Local Authority (LA) in a typical manner, by reducing the canopies and cutting back to the boundary of the site. The pruning requirements for the scheme do not demand any additional tree works, beyond the specification already employed by the LA. I consider that the works are appropriated and fitting for this urban situation. The pruning would also fall within the owner's common law right to cut back any overhanging branches to the boundary.

2.2.3 In November of 2012 the LA undertook crown reduction works to both trees and have them both back to the boundary. This has provided the necessary clearance for construction and no addition pruning is required at this stage.

Tree 1 – Extent of canopy spread

Recently (Nov 2012) pruned back to previous reduction points, providing sufficient clearance for the new build-line

2.2.4 Future pruning requirements for T1 will be limited to cutting back the canopy to these established reduction points. This will result in the removal of only small diameter branches. Pruning will largely be minimal, in many cases keeping branch reduction to below 1 meter. I do not consider that this will adversely affect the amenity value of the tree and regardless of the development, would be subject to the same pruning regime as part of the LA's street tree pruning programme.

2.2.5. The condition of T2 has changed significantly since the tree was originally surveyed in 2011. Root disturbance was noted in September 2012 as a result of works to repair the kerb line and footpath. I suspect that root damage occurred at this time, as since then, the southern and western proportions of the canopy have died back severely. Owing to the limited life expectancy of the tree, I consider that the tree does not constitute the same constraints on the scheme as it may have to the original application.

Tree 2 – Canopy dieback

Tree2 – Root damage and disturbance following highway repairs

2.2.6 The LA has also pruned T2 and cut this back to the boundary. This too has provided the necessary clearance for construction and no future tree works are required at this stage.

Tree 2 – Extent of canopy spread

2.2.7 The revised scheme has been reduced in height and mass, particularly in the footprint of the fourth floor, and in doing so increases the clearance from the canopies. The scheme building does not have windows on the elevations directly facing the trees and do not predict and conflict resulting from light loss. On this basis, there seems no reason to expect undue or irresistible pressure to be placed upon retained trees.

2.2.8 The scheme is to be constructed using a low invasive, piled foundation design, which respects the existing ground levels and does not require excavation into the RPA's of either tree. The foundations for the existing garage shall be removed using a handing only methodology and replaced with small bore piles. As a consequence of the foundation design, there are no alterations to the growing conditions of the trees and I consider that it is acceptable. Further details are included at section 4.2 of this report.

3.0 Tree Protection Measures

General

3.1 A tree's BS root protection area (RPA) is based upon a radius measurement taken from the trunk centre and is included with reference to Table 2 of the BS (See **Appendix 1**). Professional arboricultural judgement may identify modifications to the morphology of an RPA. Any work within a tree's RPA will be subject to professional advice and the guidance set out in this report, particularly where construction is required within this area but beyond the position of fixed tree protection fencing.

3.2 Effective tree protection will be afforded subject to following a logical sequence of events, which **will follow a pre-commencement site meeting** (see para. 6.0). Invitees will include LPA representatives and the site agents and any specialist supervisors:

('S' refers to the stage in order)

S1 Undertake any agreed and or necessary tree works.

S2 Erect protective fencing and install ground protection

S3 Carry out demolition works and construct site access and parking areas

S4 Carry out ground works including excavations for foundations and services

S5 Erect scaffolding and complete construction works

S6 Remove protective fencing and complete landscaping works

3.3 The protection fencing will be erected in the position indicated on the Tree Protection Plan (TPP) at **Appendix 2**.

3.4 The type of fencing and its recommended specification is attached at **Appendix 2** also. In this case both, hoarding or fixed Heras fencing will be effective.

3.5 The protection fencing will remain in position for the duration of the construction phases for the house, including the removal of the existing structures and land preparation. Clear signs will be attached to the fencing once erected – suggested wording will be **'Protected Trees – No Access and Do Not Move this Fence'**.

Fig.1 Example of site signage (Tree protection)

3.6 Where, for construction purposes, it is necessary to position tree protection fencing within the RPA of tree No. 1, 2 and 3, suitable ground protection will be installed to prevent undue soil/root compaction from pedestrian and/or vehicular traffic. At **Appendix 3** are recommended examples of effective ground protection suited for this location. Included in the Appendix also is a diagrammatic indication of how ground protection or hard surfacing offers effective root/soil protection. The type of ground protection will be suitable for the type of proposed traffic e.g. scaffold boards over compressible material will be suitable for pedestrian and light machinery such as wheel barrows but polyethylene or steel ground plates will be used for heavier machinery and temporary re-enforced concrete may be suitable by agreement.

3.8 Hand excavations are required as part of the demolition process to remove the garage and it foundations. and may encounter roots. Although soil excavation near trees and root pruning is outlined in **Appendix 5**, specifically in this case however the treatment of roots will be undertaken in the following ways:

i) Clearly mark out the area for hand dig (using biodegradable marker paint) (see TPP)

ii) Use hand tools (forks and spades) to remove the spoil and deposit beyond RPA.

iii) Identify roots to be retained by brushing or the use of compressed air

iv) Unless after professional assessment permits pruning, roots in excess of 25mm Ø are to be retained in-situ by manually clearing around (with compressed air for example), wrapping with woven geotextile (e.g.Terram), covering with a void former e.g. split, rigid polythene piping, and filling with an compressible material (e.g. polyurethane foam).

v) Roots <25mm Ø will be pruned using sharp pruning tools. Roots will be pruned back to a side shoot or suitable position, ensuring the exposed face is kept to a minimum.

4.0 Underground Services & Foundations

4.1 The proposed scheme can make use of some existing services (e.g. main drainage and electricity). There is no requirement for new excavations in the vicinity of retained trees at this stage.

4.2 The foundations of the structures located within the BS RPA of trees 1 and 2 will be constructed by adopting the following methods (subject to confirmation by the consulting engineers):

Pile and beam foundation with 200mm piles at 2.5m centres

4.3 Prior to installing foundations, any overhanging branches will be pruned back to permit the safe of the use of piling rig. The power unit of the piling rig will be located away from the tree and its protection. A granular fill material will be used, over a geotextile fabric to temporarily dissipate load exerted by the piling rig.

Fig 2. Mini piling rig suited to this site

5.0 Soil Grade Level Changes

5.1 There are no significant changes proposed to soil levels (existing grade level), within the RPA of any retained tree. As such, no specific instructions are required to address grade changes and tree preservation.

6.0 Site Supervision - Arboricultural Specialist

6.1 It is important to recognize that the Local Planning Authority Officers (Enforcement Departments) have stringent powers to serve a **Temporary Stop Notice** through recent changes in the legislation governing planning and development. Circular 02/2005 (see Note 2). It is therefore important that works, which may impact upon trees and amenity, are suitably controlled by competent personnel. Identified below are details of a site monitoring process designed to minimize potential risks to retained trees on or off site.

6.2 A **pre-commencement** site meeting, involving invited representatives from the developer, contractors and engineers (as appropriate) will be undertaken to establish the principal timings and actions.

6.3 So as to ensure that the tree protection measures are implemented, an arboricultural specialist will be appointed to record the condition of the trees to be retained and the position and type of tree protection erected and or installed. The specialist will make a record of visits and which will be retained by the contractor/developer and or left on site for inspection (see **Appendix 4**).

6.4 Key times for site supervision include:

1. Completion of agreed/necessary tree works
2. Erection of tree protection fencing
3. Installation of ground protection
4. Works within RPA's of retained trees
5. Landscaping

NOTE: THE APPOINTED ARBORICULTURAL SUPERVISOR IS TO BE CONSULTED BEFORE ANY WORK, EITHER SCHEDULED OR UNSCHEDULED, IS UNDERTAKEN WITHIN THE EXCLUSION ZONE OR ROOT PROTECTION AREAS OF ANY RETAINED TREE. FAILURE TO DO SO MAY LEAD TO ENFORCEMENT ACTION.

6.5 Site monitoring will be at regular intervals, (beyond that stated above) and at minimum three-week intervals (subject to development scale). Below is a recommended programme of arboricultural supervision. (This program may alter dependent upon site circumstances or by agreement.)

Table 3

Stage	***Action***	***Arboricultural Supervisor (AS) (Required – Y/N)***	***Notes***
1	*Pre-commencement meeting*	*Y*	*Site Agent(SA) and demolition contractor to attend*
2	*Tree works*	*Y*	*Following completion of tree works*
3	*Installation of Tree protective fencing and ground protection*	*Y*	*PRIOR to demolition works*
4	*Demolition and removal of garage foundations*	*Y*	*To advise on root treatment*

7.0 Precautions during Landscape Work

7.1 The following steps (both general and site specific), are advisable in relation to implementing any landscape works, which may have the potential to affect retained and or protected trees:

1. Advise arboricultural supervisor of intended time frame of landscape work in advance of commencement.
2. Re-locate existing tree protection fencing/ground protection to enable landscape work to proceed.
3. With bio-degradable spray paint or site pins with plastic tape, mark out the position of the relevant tree root protection areas (RPA) as per the tree protection plan.
4. Within the RPAs, avoid using any mechanical tools or vehicles (e.g. tracked or wheeled machinery).
5. Spread any mulch or top soil manually, with the use of wheel barrows and hand tools. It will be acceptable to use of the back actor of a tracked excavator to spread piled top soil or mulch into the RPAs of protected trees provided the bucket does not come in contact with the ground and that the power unit is positioned outside of the RPAs at all times.
6. Any planting pits are to be excavated manually within the RPAs of any retained trees.
7. Multiple passes within the RPAs along one route, pedestrian and with wheel barrows will require some ground protection to be installed prior to working. Ground protection can be scaffold boards over wood chip for example.
8. A record of the landscape working method is to be made and provided to the Council for their file.
9. Hard landscaping features will be constructed under supervision within the RPA of retained trees and will avoid, where possible, the re-grading of soil.

8.0 General Site Care

8.1 No fires will be lit on site.

8.2 No access will be permitted to within the fenced or otherwise protected areas (unless for site accommodation or Authorised agreement) at any stage during construction.

8.3 No materials, equipment or debris will be stored within the fenced areas unless agreed with the arboricultural supervisor.

8.4 Areas for mixing are to be located beyond RPAs of trees and contained to prevent leaching into the soil.

8.5 A copy of this report and the Tree Protection Plan is to remain on site at all times.

Note 1. RPA to be assessed by an arboriculturalist. BS 5837:2012 'Trees in Relation to Construction - Recommendations' paras. 5.2.4 and 11.1.1.

Re-building of existing structures located within the protection distances, such as retaining walls, may require soil excavation and root treatment.

Note 2. The Circular 02/2005 gives guidance on the temporary stop notice provisions in Part 4 of the Planning and Compulsory Purchase Act 2004 which inserted sections 171E to 171H to the Town and Country Planning Act 1990.

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APPENDIX 1

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Tree Survey Schedule

Site: 1 Meadowbank NW3

Surveyor:E.B

Date: 26th Sept 2012

Ref:meadowbank2012

Tree No.	English Name	Height	Crown Spread	Ground Clearance	Age Class	Stem Diameter	Protection Multiplier	Protection Radius	Growth Vitality	Structural Condition	Landscape Contribution	B.S. Cat	Sub Cat	Useful Life	Observations
T1	Lime, Common	19	8 6 8 5	4/6n	Mature	700	12	8.4	Normal	Good	Medium	B	1,2	>40	new paving and disturbed kerb-line - potential root damage Reduced in past, one sided form Street tree
T2	Lime, Common	18	6 5 6 5	5/4e	Mature	660	12	7.9	Poor	Good	High	C	1	10-20	Die-back to southern and western sections of canopy, small leaf size Reduced in past Street tree, new paving and disturbed kerb-line visible root damage
T3	Robinia(False Acacia)	12	3 3 3 3	6/4n	Mature	300	12	3.6	Moderate	Good	Medium	C	1,2	20-40	Drawn habit Ivy smothered overhang by 2-3m

Notes:

1. Height describes the approximate height of the tree in meters from ground level.
2. The Crown Spread refers to the crown radius in meters from the stem centre and is shown above on each of the four compass points (i.e. N, E, S, W) clockwise.
3. Ground Clearance is the height in meters of crown clearance above adjacent ground level.
4. Stem Diameter is the diameter of the stem measured in millimetres at 1.5m from ground level or just above ground level for multi stemmed trees. The diameter may be estimated (e), where access is restricted. An average (a) may be taken for tree groups. A full inspection is always recommended.
5. Protection Multiplier is 12 for single stemmed .
6. Protection Radius is a radial distance measured from the trunk centre and is used to calculate the BS RPA.
7. Growth Vitality - Normal growth, Moderate (below normal), Poor (sparse/weak), Dead (dead or dying tree).
8. Structural Condition - Good (no or only minor defects), Fair (remediable defects), Poor - Major defects present or suspected.
9. Landscape Contribution - High (prominent landscape feature), Medium (visible in landscape), Low (secluded/among other trees).
10. B.S. Cat. refers to British Standard 5837:2012 'A' - High, 'B' - Moderate, 'C' - Low, 'U' - Remove or very poor quality.
11. Sub Cat refers to the retention criteria values where 1 is Arboricultural, 2 is Landscape and 3 is Cultural including Conservation/ecological, historic and commemorative.
12. Useful Life is the tree's estimated remaining effective contribution in years.

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see **4.5.7**.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	See Table 2
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	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	See Table 2

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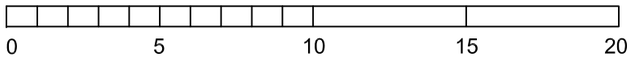
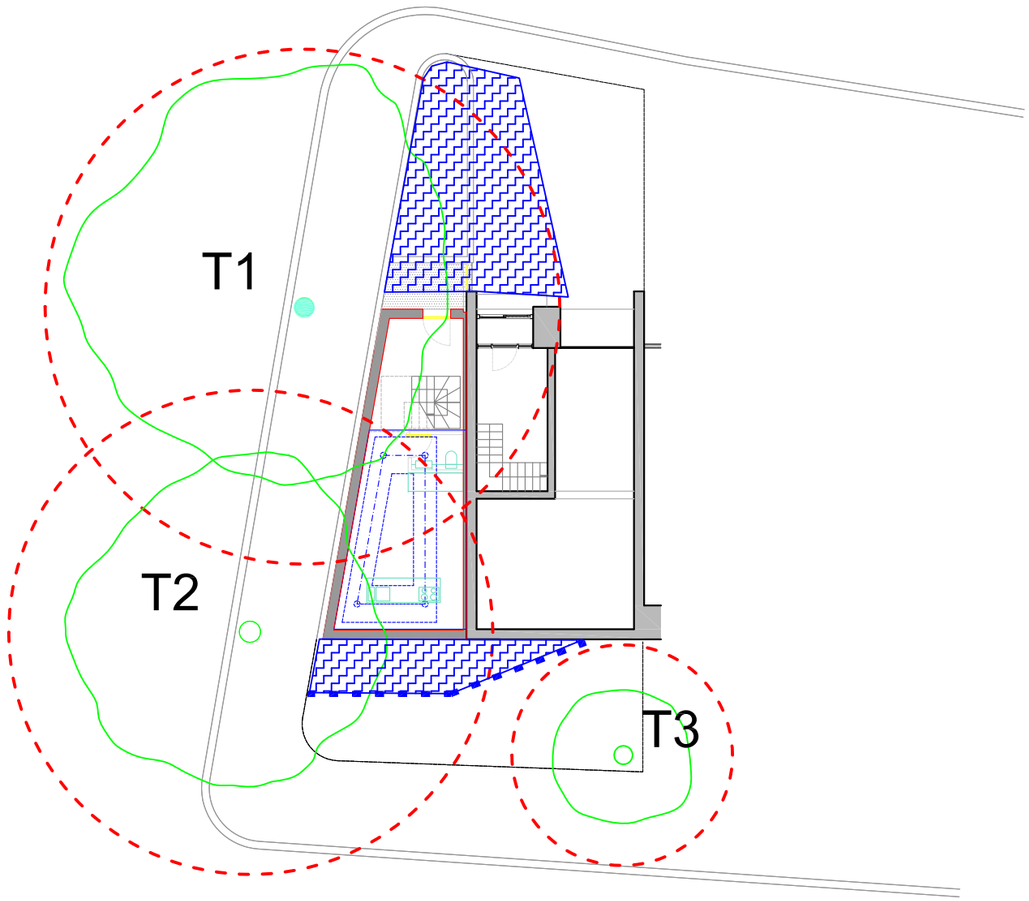
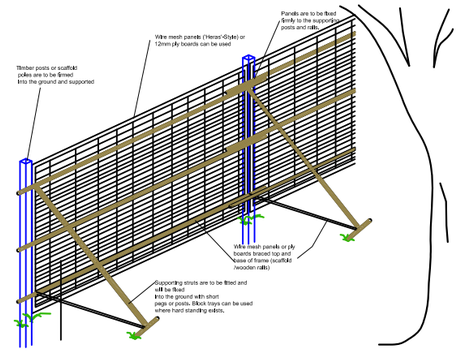
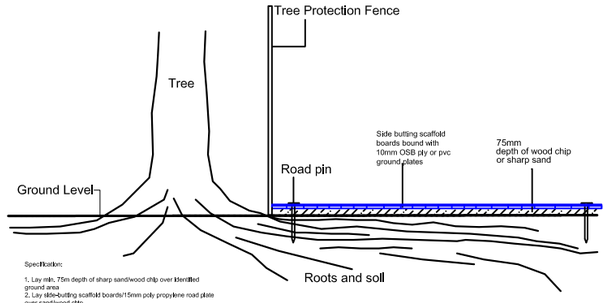




BS-grade Tree Protection Fencing





Indicative

Notes:

BS Root Protection Area, (RPA) shown uniform here but site features such as roadways, kerb and foundations, may modify root patterns and therefore the RPA shape

The BS rooting areas are to remain free from construction works which has the potential to damage or remove roots to an extent which may affect the condition of the tree.

A grade trees

C grade trees (clear)

B grade trees

U grade trees

Recommended position of fixed 'Heras' style tree protection fencing.

Recommended area for effective ground protection

PROJECT
1 Meadow Bank, NW3

DRWG. TITLE:
Tree Protection Plan

SCALE: 1:100@A.1
DATE:5th March 2013
DRAWN BY: EB

DRAWING NO: TPPeb_MB
REV:1

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Tree Protection Fencing

Specifications (specifically identified by outline box)

2.4m Hoarding

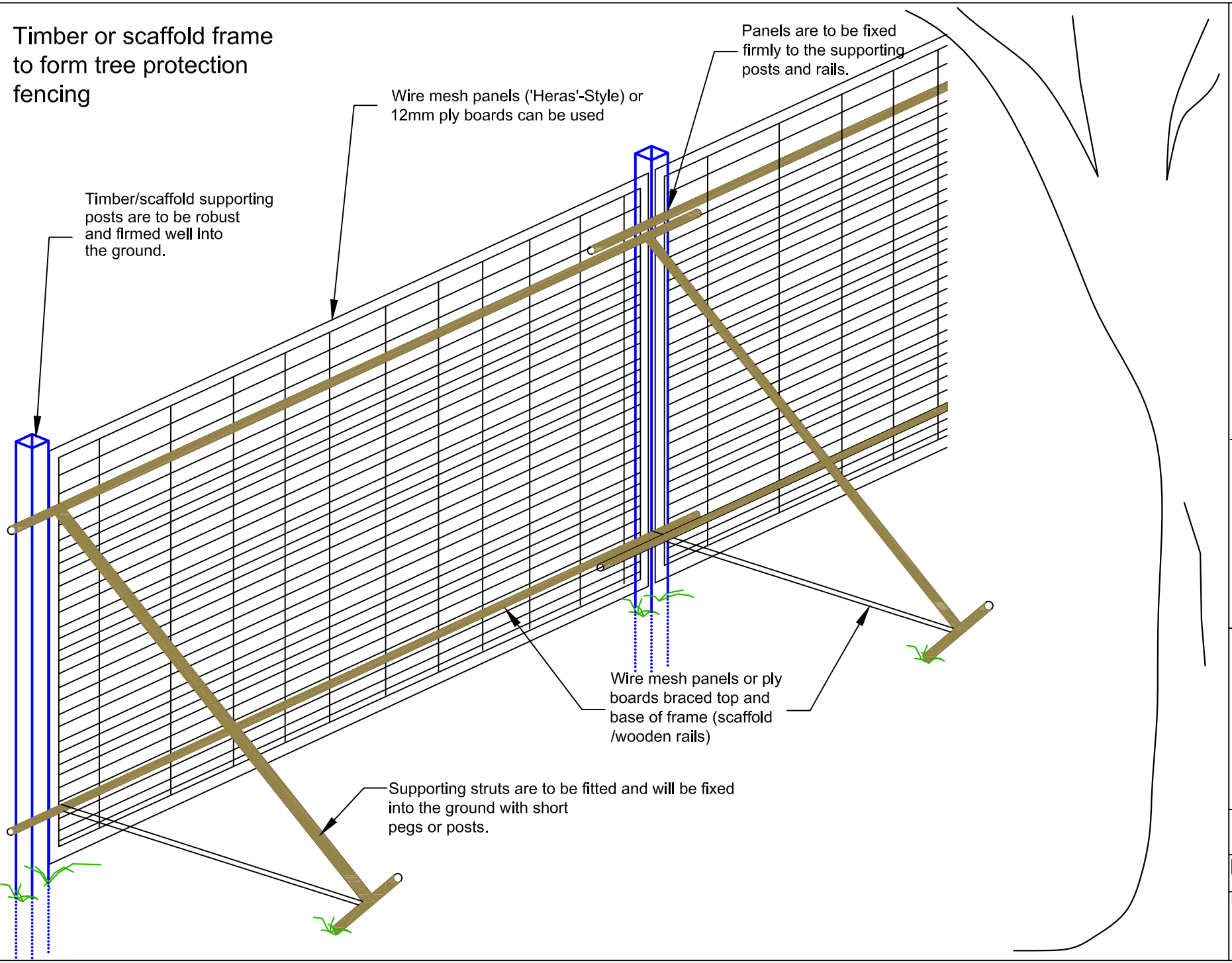
3.0m 100 X 100mm square wooden posts
3 X 38 X 87mm wooden rails affixed to posts
2.4m X 1200 outside grade ply panels (12mm) affixed to rails.
50 X 100mm angled supporting struts affixed internally (quantity as required).

(Supporting posts fixed into position using concrete. All post holes to be hand excavated. Post holes to be no larger than 300 X 300mm.)

Heras Fencing

Heras fencing describes the 2.4m galvanised steel mesh panelled fencing normally supplied with pre-cast concrete bases. **Bases are to be replaced with a fixed frame to which panels are clamped/ firmly fixed.** For extra stability, scaffold poles/4x4 wooden posts are to be firmed into the ground as supporting posts and supporting struts are to be attached at a 45 degree angle on the 'tree-side' of the fencing and fixed into the ground. Supporting posts will be braced at the top and base for added support.

Timber or scaffold frame to form tree protection fencing



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Title:

Example of Tree Protection Fencing

Note:

Steel scaffold or timber can be used to support boards or wire mesh panels

Date: Jan. 07

Ref:

Note: Sketch Plan Only - Not to Scale

Tree Protection Fencing

Scaffold Framework supporting ‘Heras’ type panels with signs attached.

Wooden Framework with ‘Heras’ type panels attached.

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Example of ground protection, which is best laid over 50mm of a compressible material such as woodchips or sharp sand for optimum tree root protection.

WALK TOP - Ideal for car parks and walk ways.

Ground plates can be useful for dissipating loads, at sensitive construction locations.

DOUBLE LINK JOINERS - lock Ground-Guards into one large working platform.

OSB boarding fixing scaffold Boards below can be very effective ground protection for lighter traffic such as pedestrians, wheel-barrow and occasional passes with light dumper vehicles for example.

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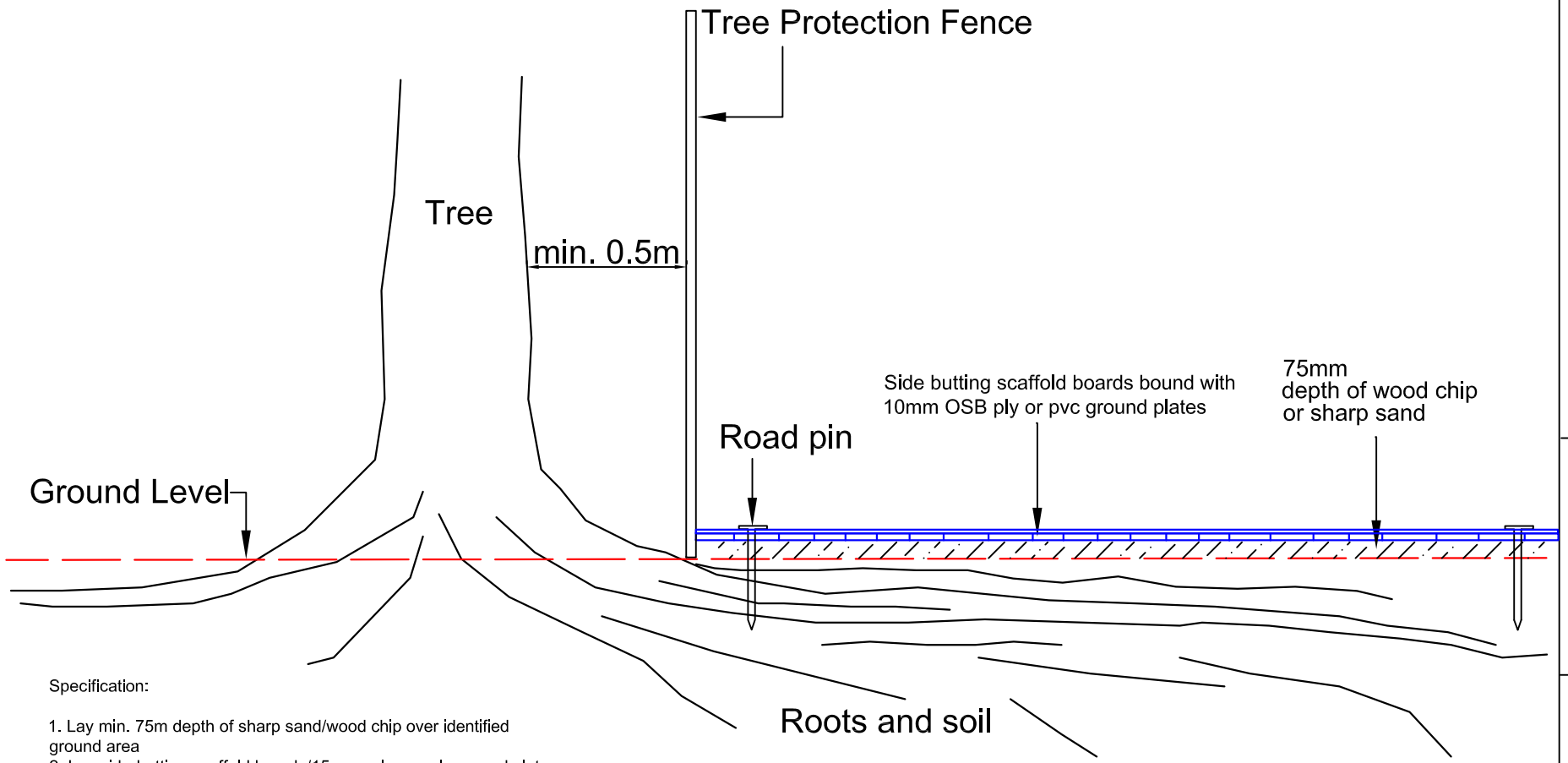

Specification:

1. Lay min. 75m depth of sharp sand/wood chip over identified ground area
2. Lay side-butting scaffold boards/15mm poly propylene road plate over sand/wood chip
3. Fix ground protection cover into place with pins/pegs
4. Erect protection fence (where feasible).
5. Erected scaffolding can act as protection fencing.
6. Remove ground protection upon completion/landscaping only.

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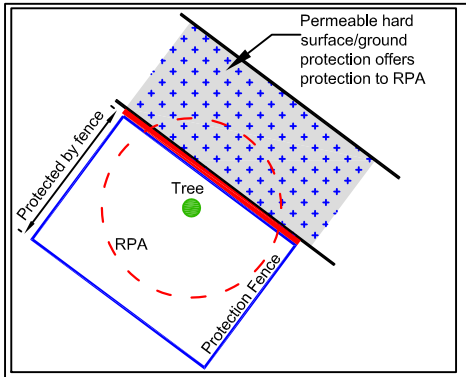
Ground Protection Example

Date:

Ref:

Note: Sketch Plan Only - Not to Scale
Not all site features shown



Protected tree

The red line denotes the position of lateral and vertical protection offered by robust fencing and properly installed low-invasive, permeable hard surfacing or ground protection, respectively.

Protection Fence

Tree tunk centre

Lateral or horizontal protection is offered to the tree by the erection of robust fencing.

The tree's rooting area beneath a low-invavise and porous hard-standing surface (or ground protection), is offered verticle protection by the surface itself.

y mtrs

x mtrs

Ground level

Rooting zone in need of protection

Area protected by fence

Area protected by surface

Note:

In this example, the BS RPA radius of the tree is calculated at x mtrs. A proportion (y mtrs), of the RPA, is covered by new permeable hard surface (or ground protection). Provided that hard standing is constructed in accordace with the principles of BS 5837:2005 para 11.8.1 and having been designed with specialist advice from an engineer and arboriculturalist, **the RPA of the tree is not reduced**.

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Title:

Tree/Root Protected Area

Date: Oct. 2010

Ref:

Note: Sketch Plan Only - Not to Scale
Not all site features shown

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Arboricultural Site Supervision

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Site: 1 Hyde Park, London
Inspected By: H .Applevard
Client: RPC
Site Agent: Shaun Clark

Date of Inspection: 15/02/2007
Time of Inspection: 3:30pm

Tree Protective Fencing

Tree protection in correct location

Comments/Action
No action at this time

Effective fencing in position

Agreed Construction Exclusion Zone

No debris within construction exclusion zone

Comments/Action
No action at this time

Amendments to Documentation Required

No amendments required

Comments/Action
Building works outside scope of Method Statement

Fencing with signs

Remedial Works

General Comments

Tree protection and on-site supervsion effective and understood.

APPENDIX 5

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Hand Digging In the Vicinity of Trees
Method Statement

1.0 Introduction

1.1 Within and adjacent to areas of construction, trees valued as important landscape assets may exist. It is possible such trees are protected by legislation in the form of a Tree Preservation Order, conservation area or by planning conditions. In either case, disregard of the tree's well being by causing damage to the roots, trunk or branches may be an offence. Consent from the Local Planning Authority may be required to undertake works that may have an impact on the tree prior to commencement.

1.2 Whilst the trunk and branches of a tree can be seen and therefore more easily avoided, tree roots are concealed beneath the ground. Their hidden nature can lead to inadvertent damage from construction processes. Dependant upon the extent of any root damage, the whole tree can be adversely affected. It is for this reason that it is necessary to ensure adequate precautions are adopted when considering construction in the vicinity of trees.

1.3 Hand digging rather than excavation by mechanical means has proved to be an effective way of limiting the effects of construction on nearby trees. It is often considered impractical, time consuming and costly to excavate by hand when machinery exists specifically for the purpose of digging. However, avoidance of unsustainable damage being caused to important trees through hand digging may far out weigh subsequent costs associated with legal penalties and loss of amenity.

1.4 Below are detailed the basic principles to acknowledge in respect of tree roots and the practical steps that can be taken to effectively avoid causing unsustainable damage to trees.

1.5 It is assumed that all operations are commenced only AFTER having undertaken and recorded appropriate risk assessments in line with current and relevant Health & Safety legislation, common industry practice and guidance.

2.0 Tree/Root Damage – How it can occur

2.1 The majority of tree roots exist in the upper **600mm to 1000mm** of soil. Excavations of the soil in the vicinity of trees, to this depth, can be harmful to tree roots and consequently the tree.

2.2.1 Tree root systems comprise two main root types, those that **anchor** the tree in the ground and those that **supply** the tree with water and elements. Roots that support the tree are woody and those that are involved with the **conduction** of water and nutrients are non-woody or fibrous. Both types of roots can be damaged directly by severing or crushing. Fibrous roots can die from asphyxiation by **soil compaction** and/or soil contamination. Trees differ in their tolerance of root loss or disturbance, according to their species and condition or both.

2.3 The larger the root damaged, the greater the impact on the tree.

3.0 Hand Digging in the Vicinity of Trees – The Process

3.1 First it is necessary to consider all available options to construct beyond the likely range of influence on the tree's condition – normally beyond 1m from the tree's trunk and within an area below the tree's canopy or by referring to an area calculated using the formulae at para 4.6.1 of BS 5837:2012 'Trees in relation to design, demolition and construction - Recommendations'. This area is called the Precautionary Zone or Root Protection Area. **When it is established that no options are available other than to construct within this zone, hand digging will be needed.** When considering hand digging, an appointed specialist supervisor/consultant will be able to advise during construction and must be on site at the commencement of works.

3.2 Before beginning to dig, mark out the tree's precautionary area with ground marker paint, clearly on the ground. This will identify the area within which hand digging must take place. **For safety and before beginning to dig, ensure there are no underground services or objects that may cause injury if damaged**. Any existing protection fencing is to be located to the nearest position of construction and fixed in place, between the tree and area of construction. It will be clearly visible to operators thereafter where hand digging will need to be undertaken. The use of mechanical digging equipment to remove the top surface layer (50-100mm) is to be avoided and hand tools are required for this exercise too.

3.3 When hand digging, using typical hand tools, carefully work around roots, retaining as many as possible. Using a brush or compressed air will expose roots cleanly before deciding whether it will be necessary to prune. Care must be taken not to damage roots including the roots' bark.

3.4 Retain all roots with a diameter greater than 25mm. Where such roots must be removed, after consulting a trained arboriculturalist (e.g. Local Authority Tree Officer or the

appointed Arboricultural Consultant), these roots must be pruned with sharp cutting tools such as a handsaw, secateurs or pruners. The cut must leave the smallest wound possible and the root must be left as long as practicably possible. Roots in excess of 50mm diameter are to be retained and protected by surrounding the root with uncompacted sharp sand, void-formers or other compressible materials.

3.5 Where roots do not exist, e.g. beyond the depth of the rooting area, mechanical excavation should not be considered without specialist supervision.

3.6 All spoil is to be deposited beyond the precautionary zone. Soil build-up can cause roots to die.

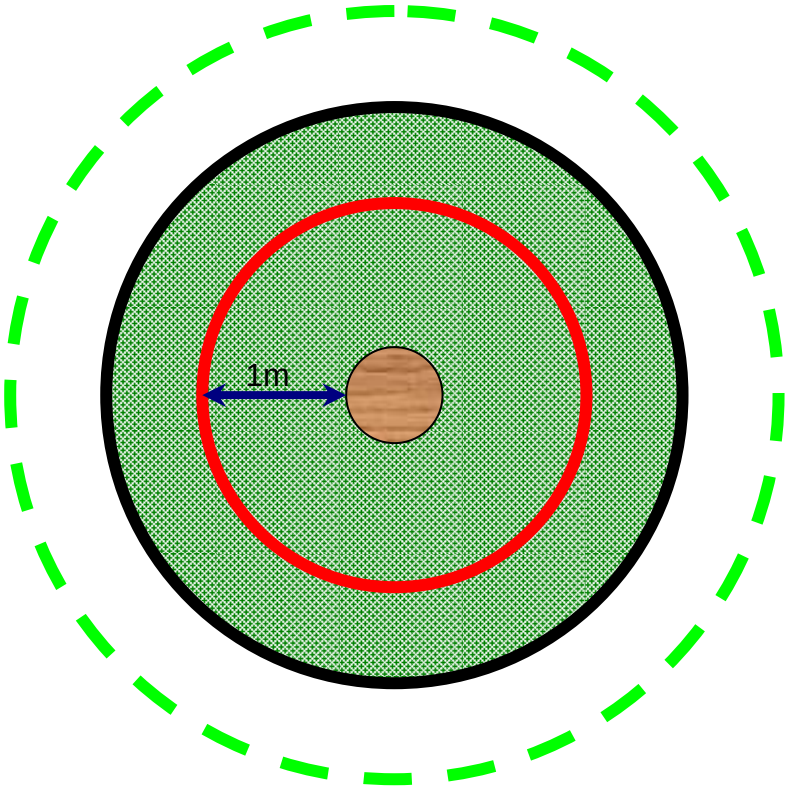
3.7 As soon as practicable, exposed roots are to be covered with loose backfill material such as soil/sand mix or a hessian-type material to offer immediate protection from drying winds and desiccation. When excavating for the introduction of posts, pads or piles, the sides of the pits should be lined with a geotextile material to prevent the potential for lime scorching of small diameter roots.

3.8 Where it is impossible to avoid completing the construction in one day for example, any exposed roots or their cut ends are to be covered with sacking material over night to prevent drying out and to add protection. This is particularly important in winter months, where frost can cause further damage to roots.

3.9 Upon completion of the hand digging, where appropriate protection fences are to be re-located and fixed in their original position.

Attached is an extract from the National Joint Utilities Group publication V4 2007, ‘Guidelines for the planning installation and maintenance of utility services in proximity to trees’.

Before considering hand digging and determining precautionary zones or root protection areas, specialist arboricultural advice should be sought.



TREE PROTECTION ZONE

Key to Diagram

Trunk of Tree

Spread of canopy or branches

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

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

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

DAMAGE TO TREES

Tree roots keep a tree healthy and upright. Most roots are found in the top 600mm of soil and 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 footway but may also extend under the carriageway. If roots are damaged the tree may suffer irreversible harm and eventually die.

PROTECTING ROOTS - DO'S and DON'TS

There are three designated zones around a tree each of which has its own criteria for working practices.

THE PROHIBITED ZONE

Don't excavate within this zone.

Don't use any form of mechanical plant within this zone

Don't store materials, plant or equipment within this zone.

Don't move plant or vehicles within this zone.

Don't lean materials against, or chain plant to, the trunk.

Do contact the local authority tree officer or owner of the tree if excavation within this zone is unavoidable.

Do protect any exposed roots uncovered within this zone with dry sacking.

Do backfill with a suitable inert granular and top soil material mix as soon as possible on completion of works.

Do notify the local authority tree officer or the tree's owner of any damage.

THE PRECAUTIONARY ZONE

Don't excavate with machinery. Where excavation is unavoidable within this zone excavate only by hand or use trenchless techniques.

Don't cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.

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

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

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

Do 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.

Do protect any exposed roots with dry sacking ensuring this is removed before backfilling.

Do notify the local authority tree officer or the tree's owner of any damage.

THE PERMITTED ZONE

Don't cut roots over 25mm in diameter, unless advice has been sought from the local authority tree officer.

Do use caution if it is absolutely necessary to operate mechanical plant within this zone.

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

Do protect any exposed roots with dry sacking ensuring this is removed before backfilling.

Do notify the local authority tree officer or the tree's owner of any damage.