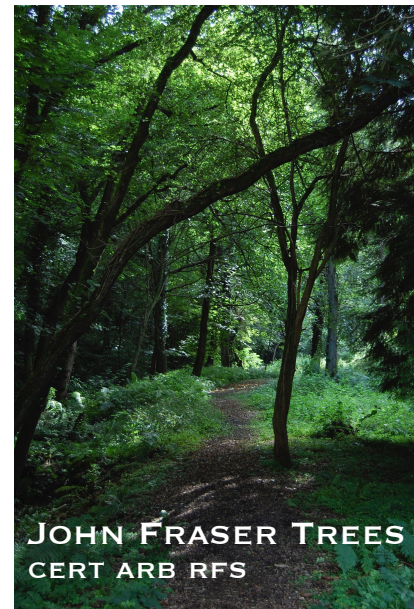


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ARBORICULTURAL IMPACT ASSESSMENT

Fourteen Acres, Old Hall Farm, Erbistock, Wrexham LL13 0DD

Prepared for
Tiodoro De Rosa

Prepared by
John Fraser Cert Arb RFS

Date 29 March 2017

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Summary

This development proposal is to build a livestock shed on agricultural land at Fourteen Acres, Old Hall Farm, Erbistock, Wrexham LL13 0DD. I have inspected all the trees that could be affected and list their details in Appendix 1.

There are 18 trees on the site growing along the line of a ditch on the Eastern boundary of the field. They are of moderate quality and condition. All the trees have been recently crown lifted. There are large pruning wounds on the trees which is why I have categorised the majority of them as of moderate rather than good quality. They grow on agricultural land where there are few other trees in close proximity. They provide screening from the Eastern approach of the private road. Provided the proposed building falls outside the Root Protection Area (RPA) the proposed changes will not adversely affect these trees if appropriate protective measures are taken. The development proposal should have no adverse impact on the contribution of the trees to local amenity or character of the area.

John Fraser Cert Arb RFS

1 INTRODUCTION

1.1 Instruction: I am instructed by Tiodoro De Rosa to inspect the significant trees that could be affected by the development proposal at Fourteen Acres, Old Hall Farm, Erbistock, Wrexham LL13 0DD and to prepare the following information to accompany their planning submission:

- ~ a schedule of the relevant trees to include basic data and a condition assessment
- ~ an appraisal of the impact of the proposal on trees and any resulting impact that has on local character and amenity
- ~ a preliminary arboricultural method statement setting out appropriate protective measures and management for trees to be retained

1.2 Purpose of this report: This report provides an analysis of the impact of the development proposal on trees and local amenity with additional guidance on appropriate management and protective measures. Its primary purpose is for the council to review the tree information in support of the planning submission and use as the basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process, it will be available for inspection by people other than tree experts so the information is presented to be helpful to those without a detailed knowledge of the subject.

1.3 Further explanations: To make this report easier to use, its emphasis is on keeping the main text concise with minimal background explanations. Where appropriate, further explanations and information are included as appendices.

1.4 Documents provided: Drawing Block Plan & Drawing Plan Site Layout provided by Tiodoro De Rosa on 22 March 2017.

1.5 Ecological constraints: The Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000, provides statutory protection to birds, bats and other species that inhabit trees. These could impose significant constraints on the use and timing of access to the site in addition to any of the tree matters considered in this report. These issues are beyond my area of expertise and you must seek advice from an ecologist to check if any such constraints apply to this site.



View of affected trees on East side of site



View of affected trees with ditch to the East

2 TERMS OF REFERENCE

- . 2.1 The aim of this report is to assess the quality and value of all the trees that may be affected by the construction at this site.

The trees have been categorised using Cascade Chart for Tree Quality Assessment from BS5837:2012. (Appendix 2) The report seeks to assess their importance in the landscape and likely future growth and provide information for protecting the trees during construction.

A drawing of the site has been provided. I have not been provided with any details of services. No other details have been provided.

- . 2.2 Site visit and collection of data
 - . 2.2.1 Site visit: I visited the site on 23 March 2017. All my observations were from ground level without detailed investigations and I estimated all dimensions unless otherwise indicated. I did not have access to trees outside the boundaries and have confined observations of them to what was visible from the site. The weather at the time of inspection was clear, still and dry with good visibility.
 - . 2.2.2 Brief site description: The Site is located on the West side of the A528 approximately 400m down a private farm track. The site consists of a field with no visible crops. A ditch runs along the Eastern boundary of the field. Hawthorn and Blackthorn scrub is growing within the ditch. Parallel to the ditch are the trees which will be affected by the proposed building. Entry to the site is in the South East corner. There is an area of hard standing inside the entrance.
 - . 2.2.3 Collection of basic data: I inspected each tree and have used T1, T2, T3 etc to identify them on the site drawing. (Appendix 3) For each tree, I collected information on species, height, diameter, maturity and potential for contribution to amenity in a development context. Each tree was then allocated to one of four categories (U, A, B or C), which reflected its suitability as a material constraint on development. When collecting this information, I specifically considered any low branches that may influence future use, age class, physiological condition, structural condition and remaining contribution. This data with explanatory notes is set out in the tree schedule included as Appendix 1 and the supporting plan information. I

stress that my inspection was of a preliminary nature and did not involve any climbing or detailed investigation beyond what was visible from accessible points at ground level. This data collection is fully compliant with the BS 5837 recommendations set out in subsection 4.4.2.6 of that document.

- . 2.2.4 Advanced interpretation of data: Section 5 of BS 5837:2012 recommends that the trunk diameter measurement for each tree is used to calculate the root protection area (RPA), which can then be interpreted to identify the design constraints and, once a layout has been consented, the exclusion zone to be protected by barriers. An explanatory diagram for RPA assessment can be found in Appendix 4.

2.3 The use of the tree information on the proposed plan: Following my inspection of the trees, the information listed in Appendix 1 was used to provide constraints guidance. One zone of constraint was identified based on the following considerations:

- Zone 1 (where ground disturbance must be carefully controlled): This is called the RPA (Root Protection Area) and was established according to the recommendations set out in Table 2 and section 5 of BS 5837:2012. These recommendations quantify the RPA based on trunk diameter but there is no simplistic recipe for identifying a minimum distance for protective barriers. Instead, this has to be assessed by an arboriculturist taking into account a series of influencing factors set out in clause 5.2.4 of BS 5837:2012. The RPA considerations for the trees on this site are set out in Appendix 4 In principle, no significant disturbance should occur within the RPA and a high level of care is needed during any activities that are authorised within it if important trees are to be successfully retained.

3 ARBORICULTURAL IMPACT APPRAISAL

- 3.1 Summary of the impact on trees: I have assessed the impact of the proposal on the trees by the extent of the disturbance in RPAs. All the trees that may be affected by the development proposal are listed in table 1.

Impact	Reason	Category A Trees	Category B Trees	Category C Trees	Category U Trees
Trees to be removed	Building construction				
Retained trees that may be affected through root disturbance	Removal of existing surfacing/ structures/ landscaping and/ or installation of new surfacing/ structures/ landscaping	T13 (A3)	T1 (B1), T3 (B1), T5 (B1), T7 (B1), T8 (B2), T9 (B2), T10 (B1), T14 (B1), T15 (B1), T16 (B1), T17 (B1), T18 (B3)	T2 (C3), T4 (C3), T6 (C3), T11 (C2),	T12

3.2 Detailed impact appraisal

3.2.1 Category A, B & C trees that could potentially be adversely affected through RPA disturbance

Using the information from the tree survey I have calculated that the roots of T1 -T13 protrude into the construction area. The roots of T14 - T18 protrude into the construction site and are at risk from construction activity. The trees will act to lessen the visual impact of the new buildings from the approach road.

3.2.2 Category U trees

T12 is dead and being propped up by a branch from an adjacent tree. It offers no risk to the proposed development.

4 ARBORICULTURAL METHOD STATEMENT

- 4.1 Introduction: This section is an arboricultural method statement specifying the methodology to be used for the protection of trees and works close to trees that has the potential to result in the loss of or damage to a tree. It includes details of site management and supervision required for successful tree retention.
- 4.2 Tree protection plan: The plan found at Appendix 3 is illustrative and based entirely on provided information. This plan can only be used for dealing with the tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre-commencement meeting before any demolition or construction activity starts. Its base is Drawing Block Plan as provided by Tiodoro De Rosa. It shows the existing trees numbered, with category A trees highlighted in light green, B trees highlighted in mid blue, category C trees highlighted in grey and category U trees highlighted in dark red. It also shows the locations of the proposed protective measures.
- 4.3 Tree protection barriers: Illustrative guidance for barrier design based on BS 5837 recommendations is included as Appendix 5. The precise location of the barriers must be agreed at the pre-commencement meeting before any development activity starts.
- 4.4 Ground protection: Any RPAs outside the protective barriers must be covered in ground protection based on the BS 5837 recommendations, until there is no risk of damage from the demolition and construction activity. Examples of temporary ground protection can be found at Appendix 5. The precise location must be agreed at the pre-commencement meeting before any development activity starts.
- 4.5 Precautions when working in RPAs: Only work agreed with the local planning authority can be carried out within RPAs. Any work in RPAs must be done with care as set out in Appendix 6.
 - 4.5.1 Removal of existing surfacing: Little of the site is covered in hard surfacing however any impact should be minimised by following the general guidance set out in Appendix 6
 - 4.5.2 Demolition of buildings within RPAs: There are no buildings on the site

- 4.5.3 Installation of new surfacing: Any new surfacing proposed within the RPAs of trees will be designed to be of a no-dig construction to minimise the impact on tree roots and soil structure. In addition, substrates and finished surfaces must be of a porous design to allow water and air passage in and out.
- 4.5.4 Foundation type and design: The proposed footprint of the new buildings falls within part of the RPA.
- 4.5.5 Installation of new services: The exact location of services is often difficult to establish until construction is in progress. During the design stage every effort must be made to keep all new services outside RPAs. When existing services within RPAs require upgrading or new services have to be installed in RPAs conventional excavation techniques are unacceptable and great care must be taken to minimise any disturbance. Trenches installation should be the preferred option but if that is not feasible any excavation must be carried out by hand or using a compressed air lance according to the guidelines in Appendix 6
- 4.5.6 Site hoarding and signs: Where site hoarding runs through RPAs it must be erected to avoid damage to retained trees. It shall be positioned or shaped to avoid contact with the trunk, branches or crown of the tree and make allowance for movement during windy conditions. The posts shall be installed following the guidance set out in Appendix 6
- 4.5.7 New soft landscaping: All retained trees may be affected by landscape activities which have the potential to cause severe damage. In addition the removal of protective fencing to carry out landscape operations may allow other contractors in previously protected areas. To minimise impact the guidance in Appendix 6 must be followed.
- 4.6 Other site works with the ability to affect trees
- 4.6.1 Tree work recommendations: No tree works are recommended within the RPA. however, should the need arise to remove stumps and other vegetation they must be removed by hand or using specialised stump grinding machinery to minimise root damage to the retained trees. Where poisoning of stumps is specified this must be carried out by trained and qualified operatives. Only chemicals approved for this purpose and used in accordance with the manufacturer's instructions will be used.
- 4.6.2 Site and fuel storage, cement mixing and washing points: All site storage areas, cement mixing and washing points for equipment and vehicles and fuel storage areas should be outside RPAs unless otherwise agreed with the

LPA. No discharge of potential contaminants should occur within 10m of a retained tree stem or where there is a risk of run off into RPAs.

- 4.6.3 Temporary buildings: Site cabins, marketing trailers and other temporary buildings can sometimes be used within RPAs with the prior consent of the local authority. Careful installation and ground protection must be used as detailed in Appendix 6
- 4.6.4 Protection of tree canopies: Piling rigs and cranes are often used close to trees. Where protective fencing does not entirely protect the canopies of trees from potential damage from high vehicles and plant care must be taken to ensure no damage is caused. Work must be carefully planned and a bandsman used to guide the operator. Arboricultural supervision may be required.
- 5 Site management and supervision
 - 5.1 Pre-commencement site meeting: Before any site works including site clearance begin a site meeting between the site manager and arboricultural consultant should be held and to which the LPA tree officer will be invited. The purpose of the meeting will be to discuss the tree protection measures detailed in this document and to agree the sequence of events where they can impact on trees. At this meeting a programme of tree protection will be agreed by all parties to form a basis of any monitoring and/or supervision arrangements between the arboricultural consultant and developer.
 - 5.2 Site management: It is the developer's responsibility to ensure that the details of this arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents must be kept on site at all times and the site manager must brief all personnel who could have an impact on trees on the specific tree protection requirements. This must be a part of the site induction procedures and written into appropriate site management documents.
 - 5.3 Site monitoring and supervision: Once work begins on site the project arboricultural consultant should visit the site at an interval agreed at the pre-commencement site meeting. The interval should be sufficiently flexible to allow the supervision of key works as they occur. The arboricultural consultant's role is to monitor compliance with arboricultural conditions and advising on any tree problems that arise or modifications that become necessary.

Appendix 1 Tree survey sheets

Client Tiodoro De Rosa Site Fourteen Acres, Old Hall Farm, Erbistock, Wrexham LL13 0DD Date 23 March 2017

Tree No.	Species	Age	DBH (cm)	Top Height (m)	Height of clear stem (m)	Crown spread (m)	Condition code	Action	Retention value	Comments
T1	Oak	SSM	42.5	13	N/A	3	FG		B1	Tight fork at 4.5m. Included bark. Historic pruning cuts poor
T2	Oak	SSM	49.3	6.5	N/A	3	P		C3	Heavily pruned. Historic wounding at base with decay
T3	Oak	SSM	62.3	14.7	6.7	14	G		B1	Typical of its species
T4	Oak	SSM	63.3	14.7	9	12	FG		C3	Hazard beam on East side of crown. No target exists
T5	Oak	SSM	46	11.5	N/A	8	FG		B1	Grown around barbed wire fencing
T6	Oak	SSM	44.4	9	N/A	N/A	P		C3	Poor historic pruning cuts at base of tree. Recently heavily pruned.
T7	Oak	SSM	50	11.5	N/A	8	FG		B1	Grown around barbed wire fencing. Surface roots visible on West side of tree
T8	Oak	SSM	49.3	10.5	4.9	3	FG		B2	Large recent pruning wounds
T9	Oak	SSM	45	10	N/A	3	L		B2	Grown around barbed wire fencing. Decay in base

Tree No.	Species	Age	DBH (cm)	Top Height (m)	Height of clear stem (m)	Crown spread (m)	Condition code	Action	Retention value	Comments
T10	Oak	SSM	75.5	16	N/A	12	G		B1	Large recent pruning wounds. Main stem forks at 2m from ground
T11	Oak	SSM	55	16	N/A	4	FG		C2	Grown around barbed wire fencing.
T12	Oak	SSM	27	6.1	N/A	N/A	Dead		U	Propped up by branch on adjacent tree
T13	Oak	SM	61.6	18.4	8.4	7.5	G		A3	Typical of species
T14	Oak	SSM	35	16	N/A	4	FG		B1	Typical of species
T15	Oak	SM	62	17	2	6.5	FG		B1	Grown around barbed wire fencing
T16	Oak	SSM	58.2	16	6	8	G		B1	Large recent pruning wounds 3m from ground
T17	Oak	SSM	42	14.3	4	7	FG		B1	Grown around barbed wire fencing
T18	Oak	UM	35.4	7.7	3	7	FG		B3	Suppressed growth on South side of tree

Age UM - Under Mature SSM - Small Semi Mature SM - Semi Mature M - Mature OM - Over Mature
 Condition P - Poor FP - Fairly Poor F - Fair FG - Fairly Good G - Good
 Retention Value U - Dead or declining A - High Quality B - Moderate Quality C - Low Quality

Appendix 2 Cascade chart for tree quality assessment

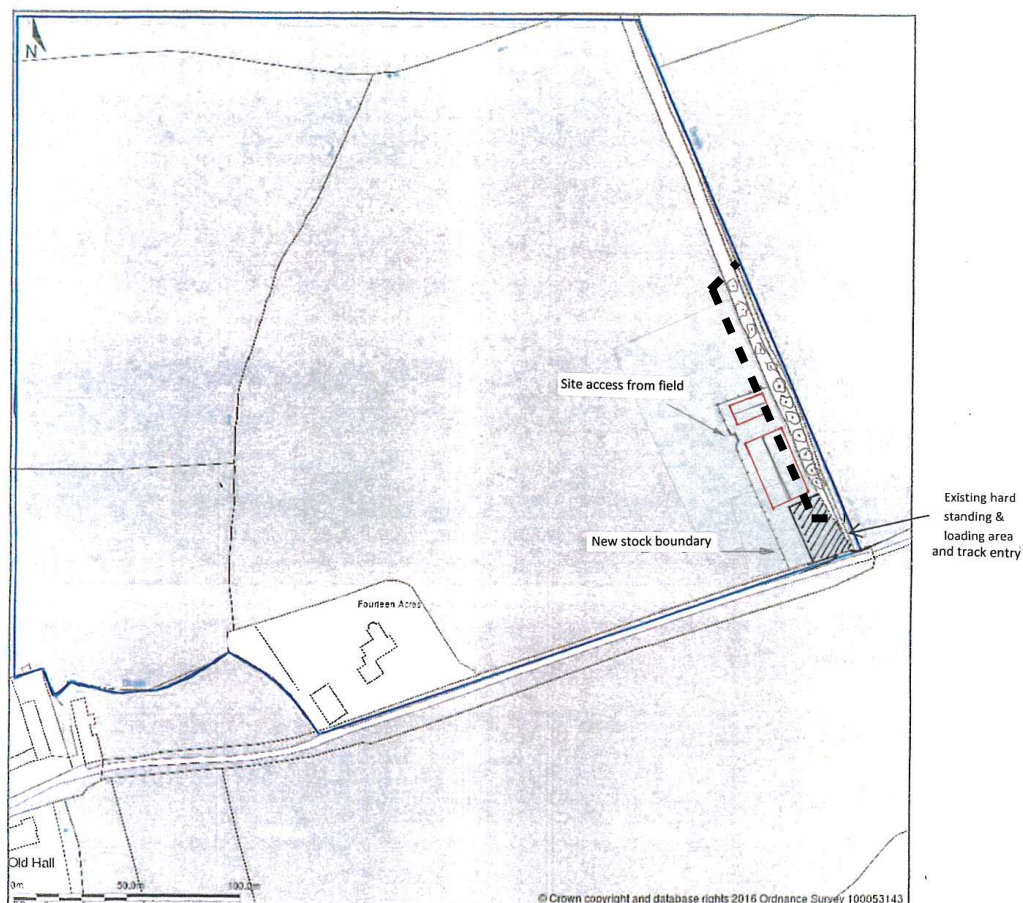
Table 1 Cascade chart for tree quality assessment

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 <i>NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.</i>	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

Appendix 3 Plan illustrating tree protection and management proposals



Fourteen Acres, A528 Between A539 And B5426, Wrexham, LL13 0DD



Site Plan shows area bounded by: 334852.27, 343684.87 335252.27, 344084.87 (at a scale of 1:2500) The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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Map Not To Scale

Key - - - - - RPA 8.04m from base of trees

Appendix 3 Plan showing position of trees

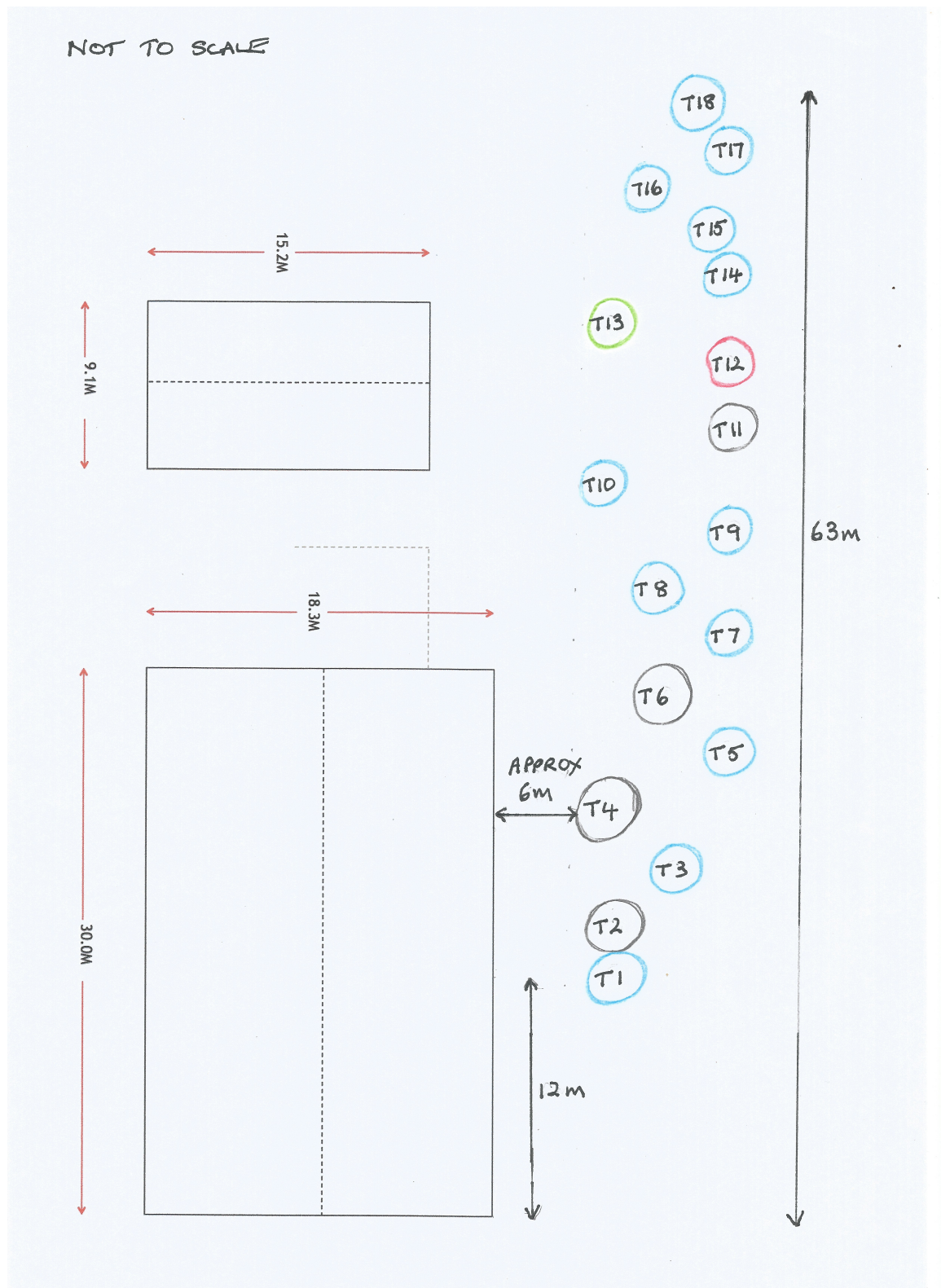
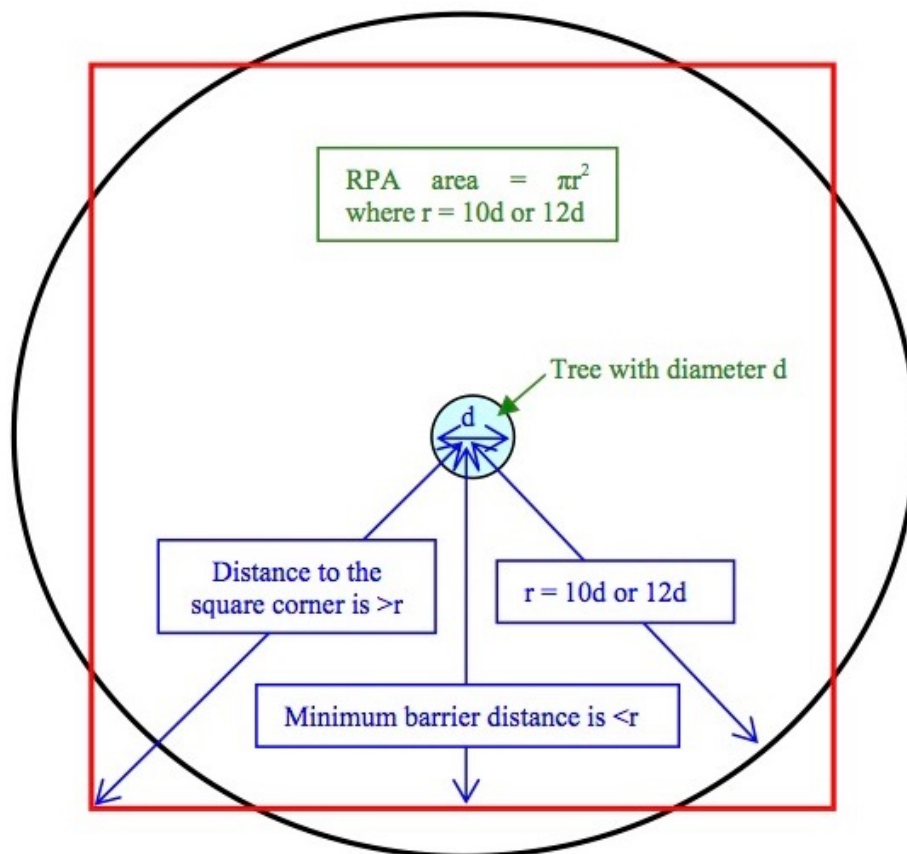


Figure 1: Explanatory diagram for RPA assessment



Appendix 5 Illustrative specification for tree protection barriers

Figure 2 Default specification for protective barrier

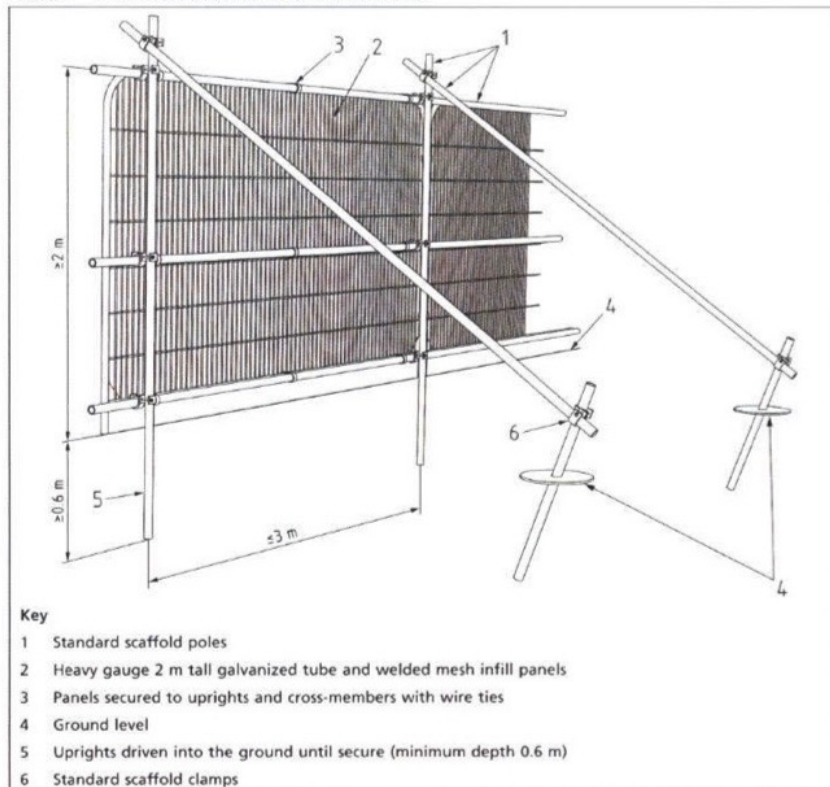
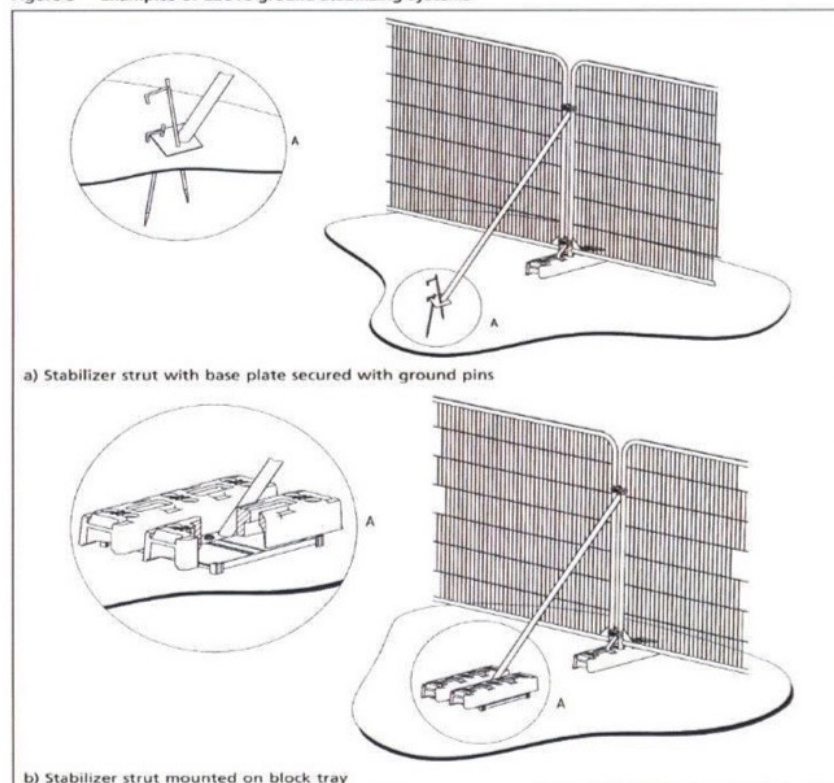


Figure 3 Examples of above-ground stabilizing systems



Figures above are reproduced with the permission of the British Standards Institute



Green Tek Ground Guards showing geotextile membrane, 100 mm of woodchip with panels above to protect tree roots



Eve Trakway K Trakpanel

Appendix 5 Examples of temporary ground protection

The following is a list of suppliers of temporary ground protection including polymer, metal or wooden panels. Other companies supply similar products and the following are given only as an example.

- www.ground-guards.co.uk
- www.evetrakway.co.uk
- www.trakmatseurope.com
- www.centriforce.com
- www.marwoodgroup.co.uk
- www.groundtrax.com

Cellular confinement no-dig systems can also be used.

Examples of proprietary ground protection panels



Groundtrax polymer panel

Appendix 6 Site guidance for working in root protection areas(RPAs)

1 GENERAL GUIDANCE FOR WORKING IN RPAs

- . 1.1 What is the purpose of this guidance? This guidance sets out the general principles that must be followed when working in RPAs. Where more detail is required, it will be supplemented by illustrative specifications in other appendices in this document. Before work starts on site, the purpose of this guidance is to demonstrate to the council that tree protection issues have been properly considered and to provide a written record of how they will be implemented. Once the site works start, this guidance is specifically for the site personnel to help them understand what has been agreed and explain what is required to fully meet their obligations to protect trees. All personnel working in RPAs must be properly briefed about their responsibilities towards important trees based on this guidance.
- . 1.2 What are RPAs? RPAs are the areas surrounding important trees where disturbance must be minimised if they are to be successfully retained. All RPAs close to the construction area are illustrated on the tree protection plans accompanying this guidance. Damage to roots or degradation of the soil through compaction and/or excavation within RPAs is likely to cause serious damage. Any work operations within RPAs must be carried out with great care if trees are to be successfully retained.
- . 1.3 When should this guidance be followed? Anyone entering a RPA must follow this guidance if important trees are to remain unharmed. Anyone working in a RPA must take care to minimise excavation into existing soil levels and limit any fill or covering that may adversely affect soil permeability. There are two main scenarios where this guidance must be followed when entering and working within a RPA:
 - 1. Removal of existing surfacing/structures and replacement with new surfacing, structures and/or landscaping.
 - 2. Preparation and installation of new surfacing, structures and/or landscaping.

Broad definitions of surfacing, structures and landscaping are set out in the following sections.

- . 1.4 Where does this guidance apply? This guidance should always be read in conjunction with the site plans illustrating the areas where specific precautions are necessary. Each area where precautions are required is annotated on the plans as identified on their keys. All plans are illustrative and intended to be interpreted in the context of the site conditions when the work is started. All protective measures should be installed according to the prevailing site conditions and agreed as satisfactory by the appropriate supervising officer before any demolition or construction work starts.
- . 1.5 What references is this guidance based on? This guidance is based on the assumption that the minimum general standards for development issues are those set out in British Standards Institution (2005) BS 5837: Trees in relation to construction – Recommendations and the National Joint Utilities Group (2007) Volume 4, Issue 1: Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees. It is interpreted in the context of our experience of managing trees on development sites.
- . 1.6 Preventing adverse impact to the RPA beyond the immediate work area: Any part of the RPA beyond the agreed work area must be isolated from the work operations by protective barriers or ground protection to at least the minimum standard described in BS 5837 for the duration of the work.
- . 1.7 Excavation and dealing with roots: All excavation must be carried out carefully using spades, forks and trowels, taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using compressed air may be an appropriate alternative to hand digging, if available. All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of smaller roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage. If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Once roots have been located, the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots to be removed should be cut cleanly with a sharp saw or secateurs 10–20cm behind the final face of the excavation. Roots temporarily exposed must be protected from direct sunlight, drying out and extremes of temperature by appropriate covering. Roots greater than 2.5cm in diameter should be retained where possible. Roots 2.5–10cm in diameter should only be cut in exceptional circumstances. Roots greater than 10cm in diameter should only be cut after consultation with the

appropriate supervisory officer.

- . 1.8 Arboricultural supervision: Any work within RPAs requires a high level of care. Qualified arboricultural supervision is essential to minimise the risk of misunderstanding and misinterpretation. Site personnel must be properly briefed before any work starts. Ongoing work must be inspected regularly and, on completion, the work must be signed off by the arboriculturist to confirm compliance by the contractor. In the context of this guidance, an appropriate supervising officer would normally be an arboriculturist.

2 REMOVING SURFACING/STRUCTURES IN RPAs

- . 2.1 Definitions of surfacing and structures: For the purposes of this guidance, the following broad definitions apply:
 - Surfacing: Any hard surfacing used as a vehicular road, parking or pedestrian path including tarmac, solid stone, crushed stone, compacted aggregate, concrete and timber decking. This does not include compacted soil with no hard covering.
 - Structures: Any man-made structure above or below ground including service pipes, walls, gate piers, buildings and foundations. Typically, this would include drainage structures, car-ports, bin stores and concrete slabs that support buildings.
- . 2.2 Access: Roots frequently grow adjacent to and beneath existing surfacing/structures so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and/or the compaction of soil around them from the weight of machinery or repeated pedestrian passage. This is not generally a problem whilst surfacing/structures are in place because they spread the load on the soil beneath and further protective measures are not normally necessary. However, once they are removed and the soil below is newly exposed, damage to roots becomes an issue and the following guidance must be observed:
 - 1. No vehicular or repeated pedestrian access into RPAs unless on existing hard surfacing or custom designed ground protection.

2. Regular vehicular and pedestrian access routes must be protected from compaction with temporary ground protection as set out in BS 5837.
 3. RPAs exposed by the work must be protected as set out in BS 5837 until there is no risk of damage from the development activity.
- Page 40/52

2.3 Removal: Removing existing surfacing/structures is a high-risk activity for any adjacent roots and the following guidance must be observed:

1. Appropriate tools for manually removing debris may include a pneumatic breaker, crow bar, sledgehammer, pick, mattock, shovel, spade, trowel, fork and wheelbarrow. Secateurs and a handsaw must also be available to deal with any exposed roots that have to be cut.
2. Machines with a long reach may be used if they can work from outside RPAs or from protected areas within RPAs. They must not encroach onto unprotected soil in RPAs.
3. Debris to be removed from RPAs manually must be moved across existing hard surfacing or temporary ground protection in a way that prevents compaction of soil. Alternatively, it can be lifted out by machines provided this does not disturb RPAs.
4. Great care must be taken throughout these operations not to damage roots as set out in 1.7 above.
5. If appropriate, leaving below ground structures in place should be considered if their removal may cause excessive root disturbance.

3 INSTALLATION OF NEW SURFACING IN RPAs

- . 3.1 Basic principles: New surfacing is potentially damaging to trees because it may require changes to existing ground levels, result in localised soil structure degradation and/or disrupt the efficient exchange of water and gases in and out of the soil. Mature and over-mature trees are much

more prone to suffer because of these changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in RPAs. Generally, the most suitable surfacing will be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction and require little or no excavation to limit direct damage. The actual specification of the surfacing is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading and the frequency of loading. The detail of product and specification are beyond the scope of this guidance and must be provided separately by the appropriate specialist.

3.2 Establishing the depth of excavation and surfacing gradient: The precise location and depth of roots within the soil is unpredictable and will only be known when careful digging starts on site. Ideally, all new surfacing in RPAs should be no-dig, i.e. requiring no excavation whatsoever, but this is rarely possible on undulating surfaces. New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and need not be damaging to trees if carried out carefully and large roots are not cut. Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of a turf layer up to 5cm is unlikely to be damaging to trees. It may be possible to dig to a greater depth depending on local conditions but this would need to be assessed by an arboriculturist if excavation beyond 5cm is anticipated. On undulating surfaces, finished gradients/levels must be planned with sufficient flexibility to allow on-site adjustment if excavation of any high points reveals large unexpected roots near the surface. If the roots are less than 2.5cm in diameter, it would normally be acceptable to cut them and the gradient formed with the preferred minimal excavation of up to 5cm. However, if roots over 2.5cm in diameter are exposed, cutting them may be too damaging and further excavation may not be possible. If that is the case, the surrounding levels must be adjusted to take account of these high points by filling with suitable material. If this is not practical and large roots have to be cut, the situation should be discussed with the supervising officer before a final decision is made.

3.3 Base and finishing layers: Once the sub-base has been formed, the load spreading construction is installed on top without compaction. In principle, the load spreading formation will normally be cellular and filled with crushed stone although the detail may vary with different products. Suitable surface

finishes include washed gravel, permeable tarmac or block pavers set on a sand base. However, for lightly loaded surfacing of limited widths (<3m) such as pedestrian paths, pre-formed concrete slabs may be appropriate if the sub-base preparation is as set out above. In some situations, limited width floating concrete rafts constructed directly on to the soil surface may be acceptable but the design must not include any strip-dug supports.

- . 3.4 Edge retention: Conventional kerb edge retention set in concrete filled excavated trenches is likely to result in damage to roots and should be avoided. Effective edge retention in RPAs must be custom designed to avoid any significant excavation into existing soil levels. For most surfaces, the use of pre-formed edging secured by metal pins or wooden pegs is normally an effective way of minimising any adverse impact on trees from the retention structure.
- . 3.5 Installing new surfacing on top of existing surfacing: In some instances, existing surfacing can be retained and used as a base for new surfacing. Normally, this will not result in significant excavation that could expose roots so special precautions are not necessary. However, if large roots already protrude above the proposed sub-base level, then the precautions and procedures set out above must be observed.

4 INSTALLATION OF NEW STRUCTURES IN RPAs

- . 4.1 Basic principles: New structures in RPAs are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Mature and over-mature trees are much more prone to suffer because of these changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in RPAs. This can be done by constructing the main structures above ground level on piled supports and redirecting water to where it is needed. The detailed design and specification of such structures is an engineering issue that should be informed and guided by tree expertise.
- . 4.2 Small sheds and bin stores: These light structures do not normally require substantial foundations and can have permeable bases. Ideally, their bases should be of a no-dig, load-spreading construction set directly on to the soil surface. They require a flat base and so an undulating site will need levelling to provide a suitable surface. Excavation of any high points by up

to 5cm and filling depressions with permeable fill to provide a flat base will normally be acceptable provided no roots greater than 2.5cm in diameter need to be cut. If large roots are found, the preferred course of action would be to raise the base level of the structure by filling rather than cutting roots. However, if this is not practical and large roots have to be cut, the situation should be discussed with the supervising officer before a final decision is made. Above the base, there will often be a protective covering fixed onto a frame that can rise directly from the base or be fixed to supports either banged into the ground or set in carefully dug holes. Provided the supports are well spaced, i.e. greater than 1.5m apart, and of a relatively narrow diameter, i.e. not in excess of 15cm, it is unlikely they will cause any significant disturbance to RPAs.

4.3 Walls, gate piers, buildings and bridges on new foundations:

Conventional strip foundations in RPAs for any significant structure may cause excessive root loss and are unlikely to be acceptable. However, disturbance can be significantly reduced by supporting the above ground part of the structures on small diameter piles and beams or cast floor slabs set above ground level. The design should be sufficiently flexible to allow the piles to be moved if significant roots are encountered in the preferred locations. Before the actual installation of the new structure starts, all RPAs that may be affected should be covered with temporary ground protection as set out in BS 5837. Gaps in the ground protection should be left where it is expected to install the piles or dig the holes for gate piers. Pile locations should be initially hand dug to a depth of 75cm to establish if there are any significant roots over 2.5cm in diameter that could be damaged. If significant roots are found, then the pile location must be moved slightly and a new exploratory hole dug. Once the piles have been installed, the lowest points of the supporting beams for the structure must be above the ground level between the piles and there should not be any further excavation. The beams between the piles can be pre-cast and imported to the site ready to fix or can be cast in position using shuttering for the sides and a biodegradable void-former for the base. Gate piers generally require larger holes and have less flexibility for relocation if large roots are found. Localised loss of roots may be unavoidable so each situation should be assessed on its own merits by an appropriate supervising officer once the careful excavations have been completed. Any roots found should be dealt with as set out in 1.7 above. When installing any of these structures, the ground protection must remain in place until the construction is completed and there is no risk of damage to RPAs.

- . 4.4 Walls on existing foundations: A free-standing wall on an existing foundation is unlikely to require any additional excavation and so its construction should have no adverse impact on RPAs if the appropriate protection is in place. However, replacing walls that retain the soil of RPAs normally requires some limited excavation back into the exposed soil face to provide a working space of at least 10–20cm behind the inside wall face. This should be done carefully and limited to no more than required to construct the new wall. Any roots found should be dealt with as set out in 1.7 above. Once the wall is completed, any voids behind it should be filled with good quality top soil and firmed into place but not over compacted. Specific difficulties with large roots that emerge during the course of the construction should be referred to the supervising officer.
- . 4.5 Services: For the purposes of this guidance, services are considered as structures. Excavation to upgrade existing services or install new services in RPAs may damage retained trees and should only be chosen as a last resort. In the event that excavation emerges as the preferred option, the decision should be reviewed by the supervising officer before any work is carried out. If excavation is agreed, all digging should be done carefully and follow the guidance set out in 1.7 above.

5 SOFT LANDSCAPING IN RPAs

5.1 Upgrading existing soft landscaping or replacing existing surfacing/ structures with new soft landscaping: For the purposes of this guidance, soft landscaping includes the re- profiling of existing soil levels and covering the soil surface with new plants or an organic covering (mulch). It does not include the installation of solid structures or compacted surfacing. Soft landscaping activity after construction can be extremely damaging to trees. No significant excavation or cultivation, especially by rotovators, should occur within RPAs. Where new designs require levels to be increased to tie in with new structures or the removal of an existing structure has left a void below the surrounding ground level, good quality and relatively permeable top soil should be used for the fill. It should be firmed into place but not over compacted in preparation for turfing or careful shrub planting. Ideally, all areas close to tree trunks should be kept at the original ground level and have a mulched finish rather than grass to reduce the risk of mowing damage.