

Shropshire Council Natural & Historic Environment

Development Guidance Note 7

Trees and Development



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1. Purpose

1.1 The rationale behind this guidance note is simple – the right tree in the right place benefits and adds value to a development; whereas retaining trees inappropriately or removing them needlessly leads to conflict and is ultimately unsustainable.

1.2 Following the principles and recommendations of this document will enable the successful retention of significant trees and the appropriate planting of new trees on development sites, resulting simply in better development in Shropshire. This document aims to:

- provide advice, guidance and further ‘signposting’ about the material to be submitted in support of a planning application, with respect to trees on and / or adjacent a development site; so as to
- enable the timely and proper evaluation and determination of planning applications, by ensuring the correct type and quality of arboricultural information is submitted, so avoiding unnecessary delays and expense; and
- provide clarity and promote consistency for and amongst developers (commercial and householders), planning agents, architects and designers, Council officers and members and the general public, in fact anyone with an interest in the topic of trees and development.

***Note:** the term ‘tree’ is used throughout this document, but much of the guidance can and should be applied equally to groups of trees, woodland and hedges.*

2. Planning Policy Context

2.1 Trees are a material consideration in the planning process. Relevant national and local planning policy and guidance will be relied upon to determine planning applications and defend decisions at appeal.

2.2 This guidance note should be read in conjunction with other relevant national and local planning policy documents and guidance, including:

- The National Planning Policy Framework (DCLG, March 2012); [National Planning Policy Framework - Publications - GOV.UK Planning Practice Guidance](#)
- the Shropshire Council Core Strategy 2006 - 2026 (adopted February 2011); particularly policies CS6: Sustainable Design and Development Principles and CS17: Environmental Networks; [Core Strategy 2006-2026 – Shropshire Council](#)
- the Shropshire Council Site Allocations and Management of Development (SAMDev) Plan (adopted 17th December 2015); particularly policies MD2: Sustainable Design and MD12: Natural Environment; <http://shropshire.gov.uk/media/1900363/SAMDev-Adopted-Plan.pdf>

- the Shropshire Council Natural Environment Supplementary Planning Document (in preparation), which expands upon the policies concerning biodiversity, landscape and trees contained within the adopted Core Strategy;
- Shropshire Council has adopted neighbourhood plans and sections of neighbourhood plans for several locations within the county. Communities are also at various stages along the process of preparing community-led plans for other parts of the county. Where such community-led plans have been adopted, their policies are treated as a material consideration in the planning process; [Neighbourhood planning – Shropshire Council](#)

3. General Principles

3.1 In determining planning applications Shropshire Council will consider the impacts of a proposed development upon the existing trees on or adjacent the site and equally, how existing trees, or those planned but yet to be planted, may affect and influence the proposed development.

3.2 Shropshire Council welcomes applications which recognise and take due account of trees as a material consideration and can clearly show how the proposed development assesses and responds to the constraints and opportunities they pose.

Applications are more likely to be successful and development ultimately sustainable, when trees are considered from the earliest stages of project concept and design.

3.3 British Standard 5837: 2012 ‘Trees in relation to design, demolition and construction – Recommendations’ is a key technical reference document that assists and guides Shropshire Council in the determination of planning applications. <http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030213642>

3.4 The good practice recommended within BS 5837: 2012 is intended to assist in creating a harmonious relationship between trees and nearby construction, or other forms of development, that can be sustained in the long term. It is applicable whether or not planning permission is required.

3.5 BS 5837:2012 follows a logical sequence of events that has tree care at the heart of the process. However, the full sequence of events might not be applicable in all instances. In this regard, applicants may wish to obtain the advice of an independent arboricultural consultant, or make use of Shropshire Council’s pre-application advice service, which has the advantage of encompassing all relevant planning issues, not just arboricultural factors (see sections 4.1 - 4.3 below).

3.6 Figure 1 of BS 5837: 2012 is a flow diagram which details the full sequence of steps that may be necessary at each stage of the planning, design and construction process. It identifies site operations and makes recommendations for good practice which are cross-referenced to relevant parts of the Standard. There are **3 key phases** to consider:

- **Feasibility and planning**
- **Detailed / technical design**
- **Implementation and aftercare**

These key phases are discussed in subsequent sections of this document. A simplified adaptation of Figure 1 of BS5837: 2012 is reproduced as Appendix 1 to this document.

4. Feasibility and Planning

4.1 Potential applicants are encouraged to make use of Shropshire Council’s pre-application advice service, particularly with complex or potentially difficult cases. [Get help with an application – Shropshire Council](#) From an arboricultural perspective, amongst other benefits, it will identify relevant tree-related issues to be considered specifically at the site in question; it will also provide bespoke advice as to the type, level and quality of arboricultural information to be submitted with any future planning application, as appropriate to the proposed development. This may be helpful, for example, in situations where the applicant proposes an alternative approach to that recommended within the relevant British Standards.

4.2 The type and level of detail of information required to enable Shropshire Council to properly consider the arboricultural implications and effects of development proposals varies between stages and in relation to the type and scale of development proposed. The presence and abundance of trees and the nature of the tree cover within and adjacent the site is also a critical factor.

4.3 Table B.1 of BS 5837: 2012 gives advice on appropriate information to be provided. Shropshire Council expects applications to be submitted in accordance with this Table, which is reproduced as Table 1 below.

Table 1: Delivery of tree-related information into the planning system

Stage of Process	Minimum Detail*	Additional Information*
Pre-application	Tree survey	Tree retention / removal plan
Planning Application	Tree survey (in the absence of pre-application discussion); Tree retention / removal plan (finalised); Retained trees and RPAs shown on proposed layout; Strategic hard and soft landscape design, including species and location of new tree planting; Arboricultural impact assessment.	Existing and proposed finished levels; Tree protection plan; Arboricultural method statement – heads of terms; Details for all special engineering within the RPA and other relevant construction details.

Reserved matters / planning conditions	Alignment of utility apparatus (including drainage), where outside the RPA or where installed using a trenchless method; Dimensioned tree protection plan; Arboricultural method statement – detailed; Schedule of works to retained trees, eg access facilitation pruning; Detailed hard and soft landscape design.	Arboricultural site monitoring schedule; Tree and landscape management plan; Post-construction remedial works; Landscape maintenance schedule.
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* the term ‘minimum detail’ is intended to reflect information expected, whilst the term ‘additional information’ identifies further details that might reasonably be sought, especially where construction is proposed within the Root Protection Area (RPA, see sections 4.5.3 - 4.5.5 below).

4.4 Surveys and preliminary constraints

4.4.1 A topographical survey, soil assessment and tree survey may be necessary to gain an understanding of the arboricultural constraints to a proposed development. All surveys should be undertaken by people competent to do so, with the necessary specialist knowledge, skills, training and / or experience.

4.4.2 Where clearance of undergrowth is necessary to facilitate the survey process, it must be undertaken in a manner which avoids damage to trees and their roots, or other ecological or archaeological features.

All plans should be to scale and state to which ISO A paper size the scale relates, as well as showing a scale bar and a north point.

4.4.3 The topographical survey should include the following features:

- ✓ spot levels at the base of trees and at appropriate intervals throughout the site, interpolated as contours; any abrupt level changes that might affect distribution of the root system should also be recorded;
- ✓ the position of all trees within the site with a stem diameter or 75mm or more measured at 1.5m above ground level;
- ✓ the position of hedges and offsite trees as above which overhang the site or are located within an estimated distance from the site boundary of 12 times their stem diameter;

- ✓ for individual trees, the crown spread taken at four cardinal points; for woodlands or substantial tree groups – the overall extent of the canopy;
- ✓ the canopy extent, basal ground levels and height of shrub masses, hedges and stumps;
- ✓ other relevant landscape features and artefacts which may affect trees and their roots, such as water courses and water features, buildings, hard surfaces and other structures, boundary features and treatment, abrupt changes in levels, trenching scars near trees, overhead and underground utility apparatus and drainage infrastructure.

4.4.4 The soil assessment should be of a level sufficient to inform decisions relating to tree root protection, new tree planting and foundation design (to take account of retained, removed and new trees that may have effects and implications for the proposed development, particularly on shrinkable clay soils).

4.4.5 The tree survey should be undertaken by a competent arboriculturalist to record information about trees on and adjacent the site. The purpose of the tree survey is to identify the quality and (non-fiscal) value of the existing tree stock, allowing informed decisions to be made concerning which trees should be removed or retained as a result of any proposed development. The completed tree survey should be made available to designers prior to and / or independently of any specific development proposals, so as to inform sustainable site layout from the start.

4.4.6 Shropshire Council, unless agreed otherwise, expects tree surveys to be undertaken in accordance with the parameters, measurement conventions and tree categorization method contained within BS 5837: 2012 (see sections 4.4.2, 4.5, Annex C and Tables 1 and 2 of that document). Table 1 of the Standard, which defines the criteria by which trees and hedges should be categorized, is reproduced as Appendix 2 to this document.

The risk of project delay due to material constraints being identified at a late stage is avoided by early procurement and use of a tree survey as a critical component of sustainable design.

A preliminary arboricultural site appraisal can be useful to inform likely developable area, potentially enabling tree-related issues to be dealt with as reserved matters or conditions to any planning permission granted.

4.4.7 In the absence of formal pre-application advice or preliminary arboricultural appraisal, Shropshire Council does not generally use planning conditions to secure a tree survey, as by this stage of the planning process it may be too late to influence layout or design, potentially resulting in uncontrolled arboricultural impacts.

4.5 Concept and design of development

4.5.1 Site layout and design should take into account and respond to the constraints and opportunities posed by trees, along with other relevant factors. Above ground constraints may arise from features including the current and ultimate height and canopy spread of the tree; species characteristics such as evergreen or deciduous and density of foliage; and seasonal 'nuisance' factors such as propensity for fruit fall, honeydew drip etc.

4.5.2 The attributes listed above can significantly affect land use or living conditions and it is important to avoid creating situations whereby trees cause unreasonable obstruction to sunlight or daylight, become overbearing or oppressive to future occupants or site users, or otherwise incompatible with the end use of the site.

An indication of potential direct obstruction of sunlight can be illustrated on a plan by plotting a segment, with a radius from the centre of the stem equal to the height of the tree, drawn from due north-west to due east, indicating the shadow pattern through the main part of the day. (Proprietary software is also available for the calculation and plotting of tree shadow extent and path).

4.5.3 The chief below ground constraint is represented by the Root Protection Area (RPA). BS 5837: 2012 defines the RPA as a layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority.

4.5.4 For single stem trees the RPA should be calculated as an area equivalent to a circle with a radius 12 times the stem diameter. Other calculations are used for multi-stemmed trees, based on an average of their stem sizes. For all trees, the RPA is capped at a maximum size of 707m², with a nominal circular radius of 15m, for stems of 1,250mm diameter or above (see section 4.6 of BS 5837: 2012).

4.5.5 Note, however, that there may be occasions when an RPA other than as recommended under the British Standard is appropriate; for example, ancient and veteran trees are heavily reliant on intimate associations between their fine roots and soil microflora and thus particularly susceptible to disturbance of the root zone. A growing body of expert opinion suggests that the RPA for such trees should be increased beyond the 15m radius recommended in the British Standard.

4.5.6 The default position should be that structures are located outside the RPA of trees to be retained. However, technical solutions might be available to prevent tree damage, where there is an overriding justification for construction within the RPA. If works within the RPA are proposed, it must be demonstrated that the tree(s) can remain viable and that the area lost to encroachment can be compensated for elsewhere, contiguous with the RPA.

4.5.7 The probability of successful tree retention will be maximised by taking the conditions and characteristics of trees into account during the design process for a proposed development, with due allowance and space for their future growth and maintenance requirements. Factors to be considered include shading of house and garden / amenity space, privacy and screening, direct damage to structures, future pressure for removal and seasonal nuisance. Other factors to be taken into account include:

- ✓ the presence of regulatory restrictions such as tree preservation orders or conservation areas;
- ✓ Access, working and storage space needed for construction of the proposed development;
- ✓ The effects of any proposed facilitation pruning on retained or overhanging trees;
- ✓ Infrastructure requirements in relation to trees; for example overhead or underground utility cables and service runs, SuDS and other foul and surface water drainage pipes, gullies, tanks and soakaways, land drains, lighting, solar collectors, CCTV or telecommunication signal transmitters and receivers.

4.5.8 Shropshire Council encourages wherever possible that underground utility apparatus should be routed outside the RPA in 'service corridors' throughout the site, using ducts and shared trenches to facilitate this approach. This minimises the land take associated with underground services and reduces the potential for damaging incursions within the RPA during installation and maintenance of the various types of utility apparatus.

4.5.9 Above ground utility apparatus (including CCTV and lighting) should be sited to avoid the need for detrimental or overly repetitive tree pruning, bearing in mind the current and future crown size and branch distribution of existing and planted trees.

4.5.10 Particular care is needed with the retention of large, mature, veteran and ancient trees. <http://www.ancienttreeforum.co.uk/ancient-trees/ancient-tree-care-management/> Adequate space must be allowed for their safe, long-term retention and Shropshire Council encourages where possible that such trees are located within areas that are destined to become public space, rather than relatively small (compared to the size of the tree) residential gardens or other private land.

4.5.11 The issue of tree size and proximity may have a bearing particularly in the case of development involving the sub-division of residential gardens. Shropshire Council tree officers will normally resist inappropriate development that requires, or would lead to, the loss of significant trees. The latter situation might arise, for

example, through large trees being brought into close proximity of new housing within former garden space, creating conflicts of dominance and overbearing presence where none existed with the original property.

4.5.12 For any development it is important to evaluate the nature and extent of direct and indirect effects of the proposed design upon trees and where necessary make recommendations for mitigation. This is achieved through an Arboricultural Impact Assessment (AIA). An AIA is a key process where trees are a material consideration, although the principles apply whether or not planning permission is required.

4.5.13 An AIA takes account of the effects of any tree loss and any potentially damaging activities that might affect retained trees. The latter might include the removal of existing and / or the installation of new structures, hard surfacing and services, and excavations or changes in ground level. In addition to the impacts of such permanent works, account must also be taken of build-related factors such as site access and parking, adequate working space, the location of site office and welfare facilities and provision for the storage of materials, including topsoil and overburden. The AIA should include:

- ✓ evaluation of tree constraints (utilising tree survey, topographical survey and soil assessment as appropriate);
- ✓ tree retention & removal plan;
- ✓ schedule of tree works, including access facilitation and other pruning. Tree works should be in accordance with British Standard 3998: 2010 'Tree work – Recommendations';
<http://shop.bsigroup.com/ProductDetail/?pid=00000000030089960>
- ✓ evaluation of the extent of impact on existing trees and of proposed tree losses;
- ✓ identification of areas to be set aside and protected for future landscaping;
- ✓ draft Tree Protection Plan (see sections 4.5.14 - 4.5.18 below) and issues to be addressed in an Arboricultural Method Statement (see section 5 below).

4.5.14 A Tree Protection Plan (TPP) is a scale drawing superimposed on a finalised layout plan based on a topographical survey. It shows the trees to be retained and those to be removed, the RPAs of the former and the precise location of tree and landscape protection measures to be employed during the development, with descriptive text as required.

4.5.15 Protection measures may comprise temporary but solid barriers erected to form a construction exclusion zone (see information box below) around retained

trees and / or future planting space, and / or ground protection or other physical measures to be installed to protect vulnerable sections of trees and their RPAs, where construction activity cannot be fully excluded.

A Construction Exclusion Zone is the area around a retained tree, or land reserved for future planting, from which access is prohibited for the duration of a project. It prevents damage being caused from construction-related activities.

4.5.16 Sections 6.2.2 and 6.2.3 of BS 5837: 2012 deal with the subject of tree barriers and ground protection in some detail. Figures 2 and 3 of that document illustrate a default specification for protective barriers and above ground stabilising systems respectively. These diagrams are included at Appendix 3 to this document.

4.5.17 Tree protection details should be incorporated into relevant plans, method statements used for design purposes and construction drawings issued for use on site, to ensure that all interested parties and operatives are aware of the areas where work may and may not take place.

4.5.18 To avoid disturbance of the physical tree protection measures it is essential to plan for all construction operations to be undertaken in the vicinity of retained trees and future planting space. Factors to consider may include:

- ✓ site construction access;
- ✓ nature and intensity of construction activity;
- ✓ contractors' parking;
- ✓ phasing of construction works;
- ✓ space needed for foundation excavations and construction works;
- ✓ availability of special construction techniques;
- ✓ the location and space needed for all temporary and permanent apparatus and service runs ;
- ✓ all changes in ground level, including for example, allowance for foundations and backfilling behind retaining walls;
- ✓ working space for cranes, plant, scaffolding and access during works;
- ✓ space for site office and welfare facilities (including their power supply and drainage);
- ✓ type, extent and effects on tree roots of any landscape works within the CEZ;
- ✓ space for storage (temporary or long-term) of materials, spoil and fuel and the mixing of cement and concrete;
- ✓ the effects of slope on the movement of potentially harmful liquids spillages towards or into protected areas.

4.6 Principles of new planting

4.6.1 New tree planting proposals are an essential consideration in the layout, design and future use of a development site and its context and integration within the

surrounding landscape. The purpose of proposed new planting should be understood from the start of the design process, so that long-term structural landscape objectives inform decisions regarding appropriate locations and species.

4.6.2 British Standard 8545: 2014 'Trees: from nursery to independence in the landscape - Recommendations' is a key technical document which gives advice and recommendations for all stages of the tree planting process, covering issues of planning, design, production, handling, planting and management.

<http://shop.bsigroup.com/ProductDetail/?pid=00000000030219672>

4.6.3 Whilst the whole document may not be applicable to every development, Shropshire Council expects tree planting proposals to conform with those sections of BS 8545: 2014 as are relevant to the scheme in case.

4.6.4 High quality landscaping and tree planting can enhance and add value to a development; whereas poor design, species choice, ground preparation and planting can lead to future maintenance problems, conflict with residents and premature failure or removal of trees. The type and quality of new planting is thus far more important than simply the number of trees planted.

4.6.5 Planted trees must be of a species and variety that at maturity achieve a size and form compatible with the scale and design of the development. It is important to consider not just the eventual height, canopy spread and appearance of a planted tree, but also its requirements for sufficient rooting space.

4.6.6 Many of the benefits associated with trees increase with the size and age of the tree. Long-lived, large-canopied species are particularly important and Shropshire Council will seek to ensure an adequate representation of such trees within developments having sufficient space to accommodate them.

Shropshire Council SAMDev Policy MD2: Sustainable Design requires residential development to provide 30m² open space per person that, amongst other things, contributes to the provision and enhancement of semi-natural landscape features.

Trees, woodland and hedgerows can be defining components of a rural landscape and one of the most visually significant natural features within the 'streetscene' of an urban environment.

4.6.7 Under BS 5837: 2012 the RPA for the largest of trees is capped at 707m², which represents the open space provided by a development of 23 bedrooms (based on the SAMDev Policy MD2 standard of one person per bedroom). Put another way, where open space is allocated for tree planting in accordance with policy MD2, sufficient space should be reserved for one of the largest tree species for every 6 four bedroom properties, or every 8 three bedroom properties in a development.

5. Detailed / Technical Design

5.1 This second key stage of the development process requires information sufficiently detailed to be confident in the outcome for trees to be retained on and adjacent a development site.

5.2 Any operations proposed within, or that might foreseeably affect, the RPA (or crown spread where this is greater) should be described within an Arboricultural Method Statement (AMS), in order to demonstrate that the operation(s) can be undertaken with minimal risk of adverse impact on the retained tree(s).

5.3 The AMS should be appropriate to the proposals and may apply to operations associated with all stages of development, including for example site preparation and access works, demolition, construction and installation of drainage infrastructure and overhead and / or underground services.

5.4 An AMS might typically address some or all of the following, incorporating other specialist information as required:

- ✓ chronology (timing and phasing) of works
- ✓ demolition / lifting and removal of existing structures and hard surfacing and installation of new hard surfacing (consider implications for levels);
- ✓ facilitation / remedial tree works (including pre-emptive root pruning if required and dismantling techniques so as to avoid damage to retained trees and soil compaction within the RPA);
- ✓ installation of tree and ground protection measures (including, if required and when justified, for temporary access of plant and machinery within the RPA during the development and if required for pre-commencement tree works);
- ✓ excavations (consider requirement for specialised trenchless techniques);
- ✓ specialist foundations and 'no-dig' load bearing sub-bases (consider finished levels);
- ✓ retaining structures (to accommodate changes in levels);
- ✓ preparatory works for landscaping, including root zone decompaction / soil amelioration (that may affect the RPA of existing trees or ground for future planting);
- ✓ an auditable system of arboricultural site monitoring and operational supervision.

5.5 It may be necessary to submit details of an AMS in draft form or as heads of terms to allow for changes in final layout and design that might occur after permission has been granted. In these cases a competent arboriculturalist should set out the parameters for construction to which the finalised specifications will apply (for example, where and when construction activities should and should not occur and the location of service corridors and drainage infrastructure). Such parameters should be based on consideration of the physiological needs of the tree and also take into account 'liveability' factors that affect the successful juxtaposition of trees and development, as discussed for example in sections 4.5.1, 4.5.2 and 4.5.7 above.

5.6 Demolition and construction

5.6.1 Section 7 of BS 5837: 2012 deals in detail with the broad subject of demolition and construction in proximity to trees. The simplest way to avoid damage when working near trees is to keep the RPA completely undisturbed. Where work is unavoidable within the RPA of a significant (usually category 'A' or 'B') tree, it should be designed, planned and carried out on the principle that the tree and soil structure take priority.

5.6.2 A competent arboriculturalist and an engineer, with practitioners from other disciplines if appropriate, should work together as necessary to develop technically feasible, non-damaging design solutions for works within the RPA.

In general, the older the tree the less successfully it will tolerate and adapt to disturbance or alteration of its growing conditions. Mature trees recover slowly, if at all, from damage to their woody roots.

5.6.3 The precautions for avoiding physical damage to tree roots specified in section 7.2 of BS 5837: 2012 should be followed, where demolition or construction works justifiably impinge into the RPA. Manual excavation, preferably using compressed air soil displacement, should be used rather than mechanical means.

5.6.4 Where root severance is absolutely necessary, it should be undertaken using clean, sharp tools. Roots greater than 25mm diameter and clumps of finer roots are essential for tree stability and health. They should not be severed without first seeking advice from an arboriculturalist.

5.6.5 When demolishing a structure (including underground structures) within the RPA, all plant and vehicles should either operate outside the RPA or run on suitable ground protection. Demolition should be undertaken inwards within the footprint of the existing building.

5.6.6 Where an existing hard surface is to be removed, hand-held tools or appropriate machinery (for example excavators with non-toothed buckets) should be used, working backwards over the area. A supply of top soil or other suitable backfill

(for example sharp sand or other loose, inert, granular material) should be on-hand, to cover any exposed roots as quickly as possible.

5.6.7 Where permanent hard surfacing within the RPA is considered essential, it should be designed to accommodate the heaviest load and wear to which it might be subjected and to avoid localised compaction by evenly distributing the load. Three dimensional cellular confinement systems may provide an appropriate sub-base. Alternatively, piles, pads or elevated beams can be used to span or support surfaces within the RPA.

5.6.8 BS 5837: 2012 recommends that new permanent hard surfacing should not exceed 20% of any existing unsurfaced ground within the RPA. Section 7.4 and Annex A.1.5 of that document provide further advice regarding the design and installation of surfacing and associated kerbs and edging within the RPA.

5.6.9 The use of porous surfaces is encouraged, for example washed gravel, paving slabs and pavements with built-in infiltration spaces, concrete with purpose built falls and openings, and porous bitumen. However, because the interstices and infiltration spaces of some hard surfaces can become blocked with fines, their use should also be restricted to 20% of the RPA.

5.6.10 As the converse of avoiding causing damage to trees, development should also take account of the potential for existing or new planted trees to have a direct or indirect impact upon built structures. Annex A and Table A.1 of BS 5837: 2012 provides further information in this respect.

5.6.11 Trees may cause direct damage by, for example, disruption of utility apparatus, displacement of structures and abrasion or impact from branches or stems (either through ongoing growth or branch / whole tree failure). Allowance for future tree growth should be factored into the construction process, considering for example the use of flexible surfaces near trees and bridging over roots for walls and structural slabs, retaining sufficient root expansion space.

5.6.12 Trees may cause indirect damage in shrinkable clay soils by withdrawing moisture from the ground, resulting in volume change of the soil and ground movement. Non-cohesive soils such as sand and gravel are not shrinkable and their volume does not alter with moisture content; trees cannot cause indirect damage on these soils.

5.6.13 Subsidence may be caused when water is withdrawn from the soil causing it to shrink. Heave takes place when previously dehydrated shrinkable soil takes up water and swells. Heave may be caused by felling or removal of trees or severance of roots. In shrinkable soils the foundation design should take account of the risk of indirect damage through subsidence or heave. Chapter 4.2 of NHBC Standards (updated 2016) gives further guidance.

<http://www.nhbc.co.uk/Builders/ProductsandServices/Standardsplus2016/#39>

5.7 Foundations and utilities

5.7.1 Special engineering may be required for foundations within the RPA, where traditional strip footings can result in extensive root loss. Damage may be minimised by using the smallest appropriate sleeved bored or screw piles (with site investigation to determine optimal location to avoid roots) or above ground beams, cantilevered as necessary.

5.7.2 Slabs for larger structures should be constructed with a ventilated air space between the slab and the existing soil surface (to allow for gas exchange) and an appropriate irrigation system (such as redirecting roof run-off under the slab). Approval in principle for such a foundation should be sought from the building control authority prior to this approach being relied upon.

5.7.3 Particular attention should be paid to existing and proposed finished levels and cross-sectional details for any foundations designed to minimise adverse impact on trees. Specialist advice should be sought from an arboriculturalist and an engineer.

5.7.4 Where underground utility or drainage apparatus is to pass within the RPA, detailed plans for the proposed routeing should be drawn up in conjunction with the project arboriculturalist. Ideally trenchless techniques should be used so as to minimise root damage, with entry and retrieval pits located outside the RPA. Inspection chambers and other infrastructure, such as telecommunications cabinets or drainage soakaways and gully pots, should also be located outside the RPA.

As a minimum standard, whether or not planning permission is required, the installation of underground utility apparatus should be undertaken in accordance with NJUG Volume 4, Issue 2 (National Joint Utilities Group, November 2007).
<http://www.njug.org.uk/publications/51/>

6. Implementation and Aftercare

6.1 This is the third and final stage of the development process, encompassing site works and monitoring, new planting and other landscaping and post-development maintenance operations.

6.2 Arboricultural Monitoring

6.2.1 Arrangements for arboricultural monitoring and supervision should be written into an approved Arboricultural Method Statement. Details should be provided regarding who is to be responsible for this role and their arboricultural competency to carry it out.

6.2.2 Shropshire Council advises developers to engage the services of an arboriculturalist to monitor the installation of tree protection measures and subsequently ensure all work undertaken in proximity to trees complies with any approved Tree Protection Plan and Arboricultural Method Statement.

6.2.3 For developments involving significant trees, a tree protection protocol should be devised and integrated into the site induction process at a pre-commencement meeting involving the developer, the project arboriculturalist, the site manager and the Council tree officer as appropriate. In addition to the Tree Protection Plan and Arboricultural Method Statement, the protocol should ideally contain a contact list (key Council officers, arboriculturalist, architect, site agent, site manager etc) and contingency plans covering actions to be taken in the event of accidents or unforeseen incidents involving or affecting trees.

6.2.4 Tree protection measures should be inspected by a competent person upon installation and thereafter on a regular and programmed basis until the development is completed. For monitoring purposes the observations, recommendations and actions arising from such inspections should be recorded on a suitable form.

6.2.5 Shropshire Council encourages self-monitoring but will also monitor developments, utilising random inspections by tree officers and other authorised officers as occasion warrants.

Compliance with tree protection conditions to a planning permission is better than ignoring or acting in breach of them; the latter may result in time-consuming investigations and formal action being taken by the Council, with costly delays and other potentially damaging effects for the scheme and the developer.

6.3 Management of the rooting environment

6.3.1 It is common practice for tree planting and other landscaping measures to be implemented towards the end of the construction phase. Soil that has been compacted will not provide suitable conditions for the survival and growth of vegetation, whether existing or new.

6.3.2 The risk of compaction is greatest in soils with a significant clay content and in wet conditions. It can result from short term loadings, such as the passage of a single vehicle, or from longer term activities such as materials storage.

Compaction adversely affects soil drainage, gas exchange, nutrient uptake and organic content and seriously impedes root growth. It is a common cause of post-construction tree loss on development sites.

6.3.3 Wherever possible, areas for new planting should be protected from ground compaction or contamination in advance of and during development, as part of an approved tree protection plan.

6.3.4 Where soil compaction has occurred, arboricultural advice should be taken before carrying out remedial works, which may include sub soil aeration using compressed air, forking, spiking, tilled radial trenching and the addition of bulky, peat-free organic matter as a soil conditioner or mulch. Mechanical cultivation such as ploughing, winged tine ripping and rotavation should only be adopted outside the RPA of existing trees.

6.3.5 Open soil and shrub planting areas around newly planted trees should be mulched to inhibit weed growth, reduce groundwater evaporation, resist soil compaction and loss of porosity and mitigate extremes of soil temperature. The depth of mulch should not be so much as to inhibit aeration of the root system or cause overheating – normally 80-100mm or so.

6.3.6 Suitable mulches should be free of weeds and non-organic waste and debris and may include well-composted wood chip and pulverised bark, leaf mould or green waste conforming to BSI Publically Available Specification 100.

<http://www.wrap.org.uk/content/bsi-pas-100-compost-specification-1>

6.3.7 The use of slow release organic fertiliser or other soil additives (for example 'sugar solution', or preparations containing mycorrhizal fungi) might on occasion be beneficial to aid the establishment of newly planted trees, in conjunction with other techniques to ameliorate poor growing conditions. Arboricultural advice and detailed soil analysis should inform the use of such techniques.

6.3.8 Section 8 of BS 5837: 2012 and section 6 of BS 3998: 2010 provide further information and guidance on mulching, decompaction, drainage, irrigation and management of the rooting environment generally.

6.4 Drainage

6.4.1 It is both good practice and, in many cases, a regulatory requirement to maintain existing groundwater conditions within and reduce run-off from, a development site. This can be achieved, for example, through the use of permeable hard surfaces and techniques associated with sustainable drainage systems (SuDS). Such techniques can be designed and implemented to benefit both existing and new trees and SuDS provide a wide range of opportunities to enhance the biodiversity, landscape and amenity value of a site

6.4.2 Shropshire Council, as a Lead Local Flood Authority (LLFA), is currently developing a SuDS Handbook, in collaboration with nine other LLFAs in the area. The Handbook sets out the role of SuDS in achieving sustainable development and shows how early consideration of surface water drainage issues ensures that an effective SuDS scheme can easily be delivered on every site.

6.4.3 The SuDS handbook includes guidance on SuDS design and examples of best practice. Information specific to Shropshire Council LLFA is incorporated in an appendix to the document. Shropshire Council encourages the integration of trees and other natural habitats and features with SuDS considerations from the earliest stages of development concept and design. A copy of the SuDS Handbook is expected to be available shortly. Further information can be found on the Shropshire Council website: <https://www.shropshire.gov.uk/environmental-maintenance-and-enforcement/drainage-and-flooding/flood-risk-management-and-the-planning-process/>

6.5 Planting in hard surfaces

6.5.1 Due allowance should be made for the future growth of stem and roots of a tree in determining the design and finished dimensions of a tree planting pit in a hard surface, particularly its edge and kerb treatments. Proprietary root deflectors may assist in preventing future distortion of the finished surface.

6.5.2 Where a load-bearing surface is to be laid over pits it should:

- incorporate a purpose-designed tree grille with appropriate support around the edges; and / or
- incorporate a below ground structural system to take the maximum anticipated load, whilst providing sufficient volume of rootable soil to maintain the species of tree planted to maturity and beyond; or
- utilise structural soil from an approved source (ie a composite material that is certified as capable of enabling root growth and development while supporting likely surface loadings).

6.5.3 Appropriate methods of tree protection (such as guards or bollards) and support (such as stakes and ties or underground guys) and a suitable means of watering should be incorporated into the design of a tree planting station.

6.5.4 It may be possible to integrate SuDS with tree planting, by utilising roof and surface water run-off and other grey water (suitably filtered or otherwise treated to remove impurities detrimental to tree growth) to irrigate planted trees. A wide range of proprietary products and systems are readily available to assist in the design and installation of successful, high quality planting schemes for all types of development.

6.5.6 Where there is a risk of a tree pit receiving surface water run-off that might be contaminated by de-icing salt or traces of motor oils and fuels, hard surfaces should be designed and laid to fall away from the pit.

6.6 Post-development tree management

6.6.1 Prior to completing a development and vacating the site, the developer should rectify any damage caused to retained trees and hedgerows, through appropriate pruning or replacement planting as agreed with the LPA. Any remedial tree works must be carried out by a competent arborist in accordance with BS 3998: 2010 – Tree Work Recommendations.

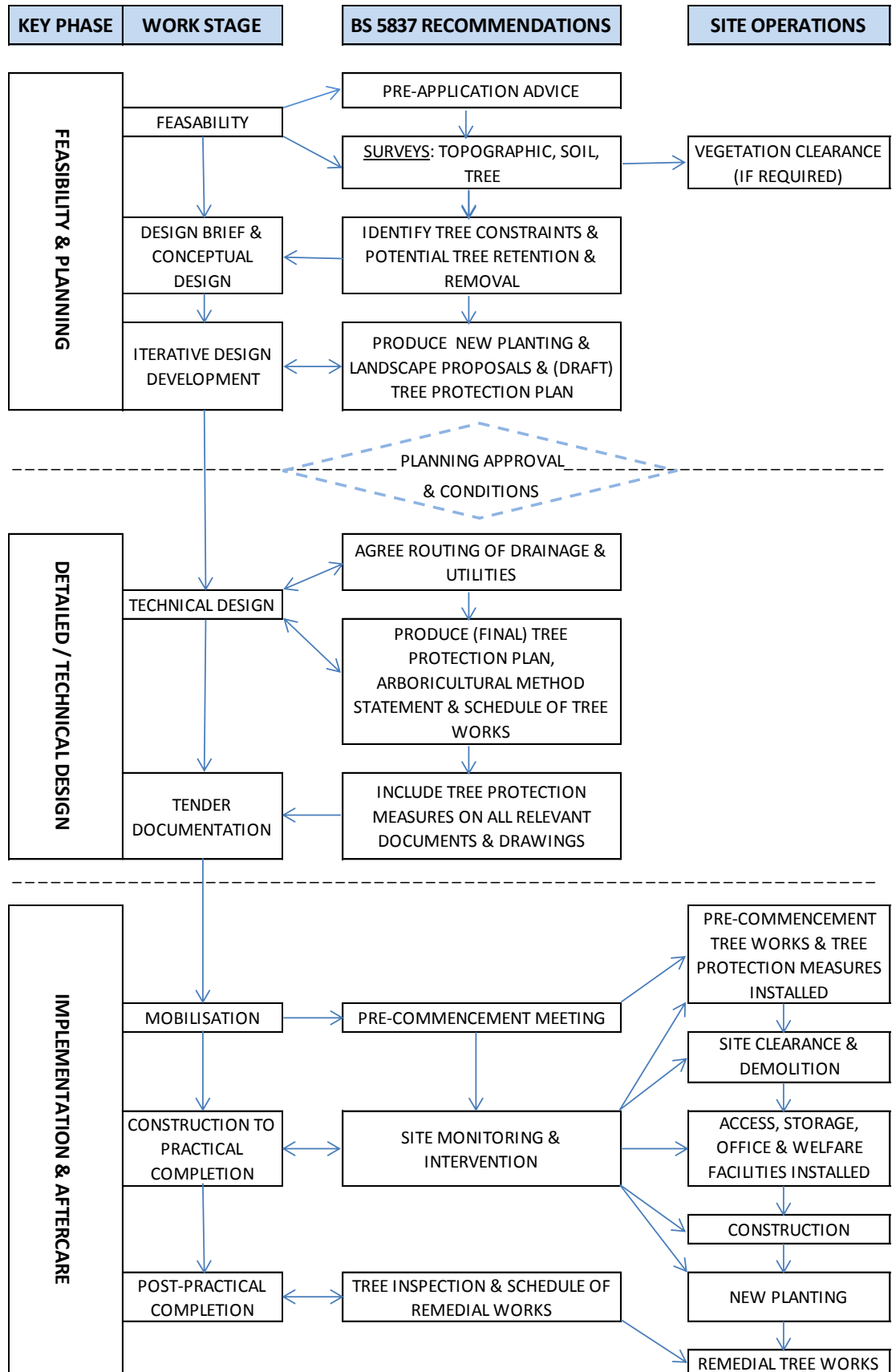
6.6.2 Regular maintenance of newly planted trees is of particular importance for at least three years during the critical post-planting period and might, where required by planning conditions or obligations, or other legal agreement, be for 5 years or more.

6.6.3 A detailed maintenance schedule should be prepared in conjunction with the landscape design proposals and appropriate arrangements made for its implementation. It might be delivered, for example, through a management body funded by a maintenance charge levied upon occupants, or adoption by a local council or other suitable body, funded by a commuted sum linked to a 'section 106' planning obligation.

6.6.4 Post-planting maintenance operations might typically include the following:

- ✓ weed control (through use of approved chemicals in accordance with manufacturers recommendations, or preferably from an environmental perspective, mulch mats or a suitable organic mulching material);
- ✓ watering;
- ✓ inspection and adjustment of tree support systems;
- ✓ straightening and re-firming of unstable trees;
- ✓ formative pruning;
- ✓ 'topping up' of mulch, where used;
- ✓ replacement planting of losses and failures.

Appendix 1: The design and construction process and tree care (adapted from Figure 1 of BS 5837: 2012)



Appendix 2: Cascade chart for tree quality assessment (Table 1 of BS 5837: 2012)

Category and definition	Criteria (including subcategories where appropriate)		
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	<ul style="list-style-type: none"> 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 <p><i>NOTE</i> Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.</p>		
	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)
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
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

Appendix 3: Tree protection barrier specification and above-ground stabilisation systems (Figures 2 & 3 of BS 5837: 2012)

Figure 2 Default specification for protective barrier

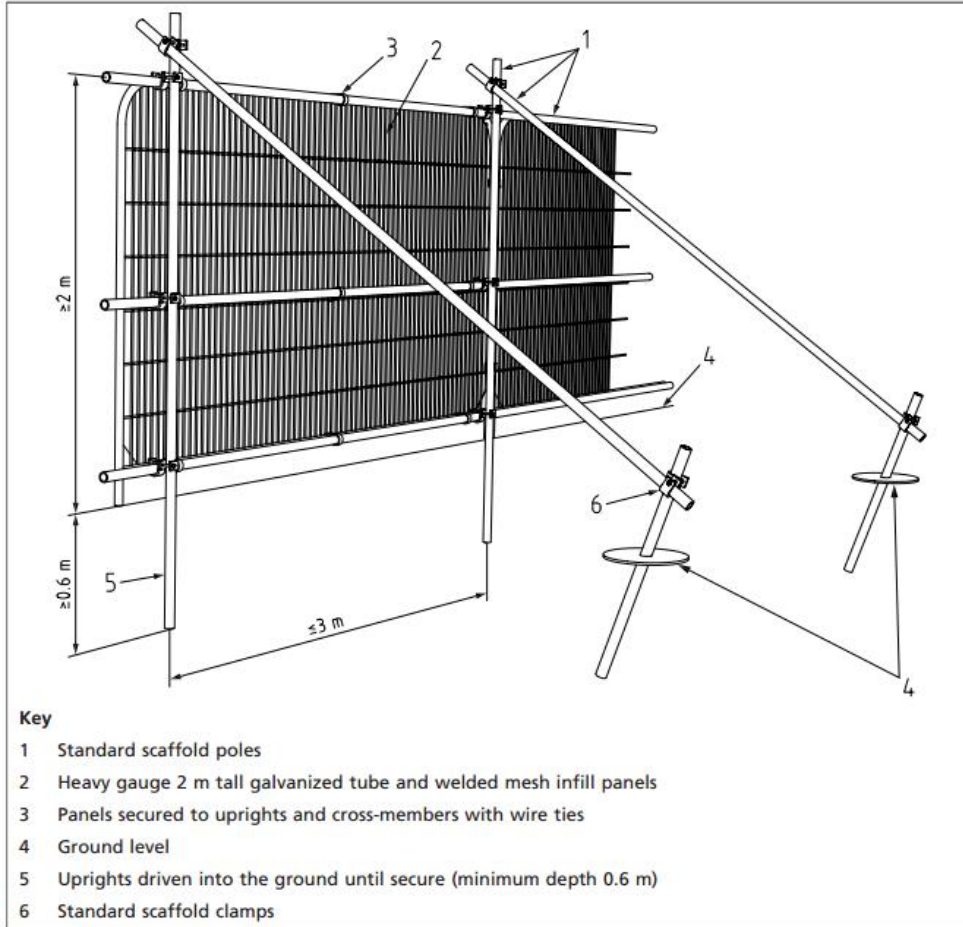
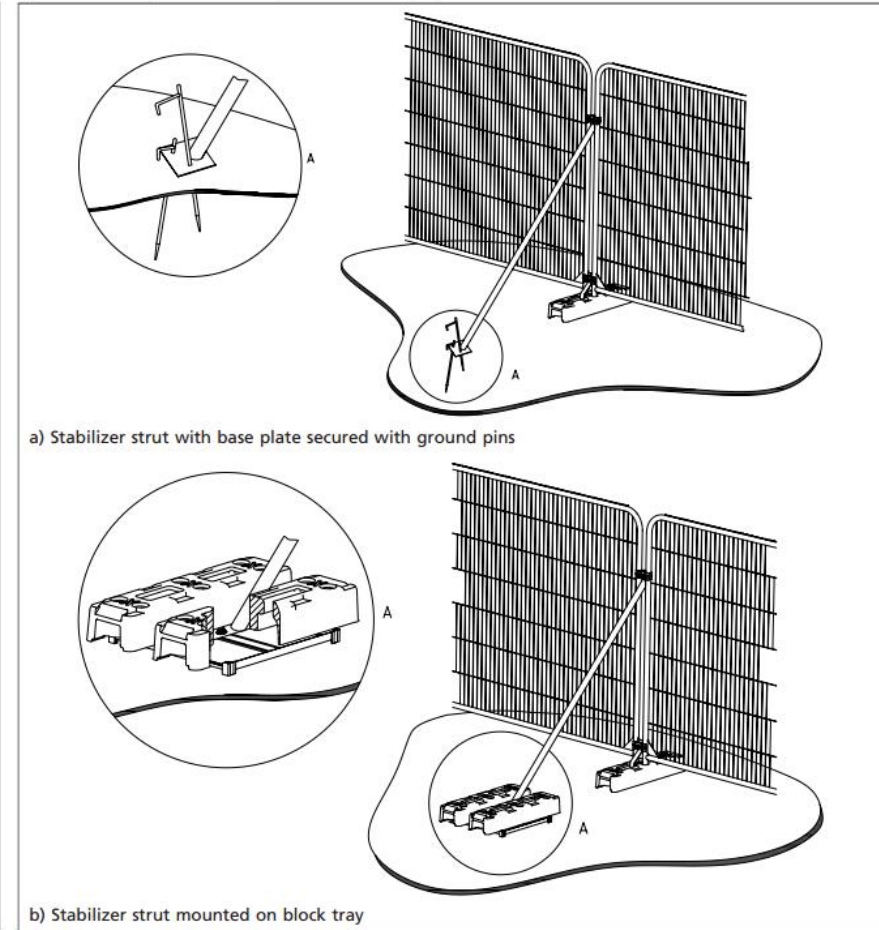


Figure 3 Examples of above-ground stabilizing systems



Appendix 4: Checklist of 'dos and don'ts' on development sites

DO	DON'T
<p>✓ Install tree barriers and / or ground protection <u>before</u>:</p> <ul style="list-style-type: none"> • any materials or machinery are brought onto site; • any demolition, soil stripping or development takes place; <p>and <u>after</u>:</p> <ul style="list-style-type: none"> • approved tree works are carried out, in accordance with an approved schedule of works and / or arboricultural method statement. 	<ul style="list-style-type: none"> × Permit access of vehicles or plant; × locate site offices, compounds or welfare facilities; × make excavations or alter ground levels; × store materials, waste, topsoil, overburden, machinery or equipment; × mix concrete, mortar or other materials potentially toxic to trees; × refuel vehicles or other machinery; × discharge washings or other liquids and materials potentially hazardous to trees; <p>within the tree protection barriers without prior approval of the project arborist or local planning authority (LPA).</p>
<p>✓ Ensure tree barriers and ground protection are robust and fit for purpose, as appropriate to the level and proximity of work taking place.</p>	<ul style="list-style-type: none"> × Move or alter tree barriers and ground protection once installed, even temporarily, without prior approval of the project arborist or local planning authority (LPA).
<p>✓ Protect during development soft landscape areas designated for future structural planting.</p>	<ul style="list-style-type: none"> × Fix or hang signs, notices or service cables / pipes to trees.
<p>✓ Consider working space for wide / tall loads and plant with jibs, booms and counterweights in planning site operations.</p>	<ul style="list-style-type: none"> × Light fires on site if at all possible; if unavoidable – don't locate where heat could affect foliage or branches.
<p>✓ Utilise existing hard surfacing as temporary ground protection where feasible and lay new hard surface over existing sub-base if possible, in order to avoid disturbance to tree roots beneath.</p>	<ul style="list-style-type: none"> × Leave any tree roots exposed without wrapping or covering to prevent desiccation or frost damage and don't use builders sand to backfill around tree roots - its high salt content is toxic.
<p>✓ Use 'top down, pull back' demolition for structures within the RPA. New hard surfacing should be constructed working forward ie 'rolling out'.</p>	<ul style="list-style-type: none"> × Sever roots greater than 25mm diameter or clumps of finer roots, without prior consultation with an arboriculturalist.

Appendix 5: Bibliography and additional information

- British Standard 3998: 2010 Tree work – Recommendations (BSI, December 2010)
- British Standard 5837: 2012 Trees in relation to construction – Recommendations (BSI, April 2012)
- British Standard 8545: 2014 Trees: from nursery to independence in the landscape – Recommendations (BSI, February 2014)
- BSI PAS 100 Specification for composted materials (WRAP / The Association for Organics Recycling, November 2002)
- NJUG Volume 4 – Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees (National Joint Utilities Group, November 2007)
- NHBC Standards – Building Near Trees: Chapter 4.2 (National House Building Council, updated 2016)
- Site Layout Planning for Daylight and Sunlight: a Guide to Good Practice (Building Research Establishment, 1998)
- Low Rise Building Foundations: The Influence of Trees on Clay Soils (Building Research Establishment, 1999)
- Tree Roots in the Built Environment (Department for Communities and Local Government, 2006)
- Ancient and other veteran trees: further guidance on management (D. Lonsdale (ed.), The Tree Council, February 2013)
- Ancient woodland and veteran trees: protecting them from development (Natural England and Forestry Commission standing advice for planning authorities; GOV.UK) <https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences>

Appendix 6: Useful contacts

- Shropshire Council

Shirehall, Abbey Foregate, Shrewsbury, Shropshire, SY2 6ND

Tel: 0345 678 9000 (Customer Service)

Email: customer.service@shropshire.gov.uk

Tree Team

Tel: 01743 252564 / 252584

Email: natural.environment@shropshire.gov.uk

(Information and advice regarding trees on development sites and Tree Preservation Orders/Conservation Areas; a list of approved arboricultural contractors is also available).

- Arboricultural Association

The Malthouse, Stroud Green, Stonehouse, GLOS GL10 3DL

Tel: 01242 522152

Email: admin@trees.org.uk

(The AA aims to advance the study and raise the standards of arboriculture. It maintains directories of approved contractors and registered consultants).

- Institute of Chartered Foresters

59, George Street, Edinburgh, EH2 2JG

Tel: 0131 240 1425

Email: icf@charteredforesters.org

(The ICF is the Royal Chartered body for forestry and arboriculture professionals. It maintains a list of registered consultants).

- International Society of Arboriculture

Email: isa@isa-arbor.com

(The ISA aims to improve the understanding of trees and the practice of arboriculture. It maintains a directory of certified arborists).

Appendix 7: Shropshire Council Development Guidance Notes

- Guidance Note 1: When is an Ecological Assessment Required?
- Guidance Note 2: Ecological Survey Timing
- Guidance Note 3: Ecological Reports – Format, Content, Quality and When to Consult the Shropshire Ecological Data Network
- Guidance Note 4: Habitat Regulation Assessment
- Guidance Note 5: Ecological Mitigation, Compensation and Enhancements
- Guidance Note 6: European Protected Species: The 3 Tests
- Guidance Note 7: Trees and Development
- Guidance Note 8: Landscape and Visual Impact Assessments
- Guidance Note 9: Ecology and non-planning consents (Listed Building Consent, Permitted Development Rights etc).
- Guidance Note 10: Ecology and Renewable Energy
- Guidance Note 11: Ecology and Building Control
- Guidance Note 12: Environmental Networks in Shropshire