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Land adjacent to

# The Link,
# Church Lane,
# Weston-under-Penyard

## Tree & Hedge Assessment
and
## Arboricultural Constraints Report

Prepared on the instructions of

Christopher F. Knock
Tinkers Grove Cottage,
The Deer Park,
Eastnor, Ledbury
HR8 1RQ

acting on behalf of the owner:
Dr Green

Based on an inspection
carried out
14 & 15/11/2016

*by*
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Tree Survey and
Arboricultural Constraints Report

## CONTENTS:



*Appendices:*

# 1 Introduction:

1.1 The following report was prepared on the instructions of Mr Christopher Knock, acting as agent for Dr Green, the site owner. It has been requested in relation to a retrospective planning application to create an opening in a hedge to provide an access into an area of land owned by Dr Green in order to facilitate its management. I was requested to assess the condition of the hedge and also the major trees within the area within the site likely to be affected by the construction of a drive to provide a parking and turning area for vehicles brought onto the site.

1.2 The tree survey was carried out by myself on 14th & 15th November 2016. Weather conditions were good and visibility was quite adequate for the purposes of this investigation

1.3 The assessments comprised a brief visual, ground level inspection of the major trees as shown on the accompanying plan and were carried out in accordance with BS5837:2012 (*Trees in relation to Design, Demolition and Construction - Recommendations*, gathering information on their size, maturity, life-expectancy, health, structural condition and assessing their overall significance within the local environment. The 'quality' of each tree is assessed, allocating it to a 'retention category' as defined in Appendix 1 of this report. Root Protection Areas (also defined in Appendix 1) are also calculated. All of the terms, codes and abbreviations used in the report are explained in more detail at Appendix 2.

1.4 Only those features apparent at the time of the inspection could be considered and no liability can be accepted for damage or injury sustained as a result of faults in trees or their parts that were not apparent at this season or which developed subsequent to the survey. Similarly, no liability can be accepted for the condition of trees that are obscured in part or in whole (e.g. by dense Ivy or other foliage), nor for any that proved inaccessible to the inspector.

1.5 It should be stressed that, although the health and safety of the trees is part of the assessment methodology used, this is an *arboricultural constraints* report, as defined by BS5837:2012, and as such is intended for planning purposes only; *it should not be construed as an exhaustive assessment of tree safety*. Faults may be identified and recorded as part of this study, but although measures to deal with immediate and significant hazards may be made, detailed management recommendations will *not* normally be made, not least because these should be determined by future patterns of site usage: it remains the client's responsibility to take appropriate action to maintain appropriate levels of safety.

1.6 The accompanying 'arboricultural constraints plan is based upon topographical survey data, produced by Woodford Surveys (their drawing no. 1316/1697, as supplied by Mr Knock. While this indicated the major trees present a number of smaller specimen s had not been included. These have been added to the plan attached here, their positions plotted by eye only. Tree locations may therefore have to be confirmed by further on-site measurements if their presence appears to be critical in terms of their proximity to any proposed new structure.

## 2 General Observations.

2.1 The site was formerly part of the gardens associated with the adjacent property, The Link. A greenhouse stands in the northern sector but the land is uncultivated and has evidently been somewhat unmanaged in recent years. Church Lane, to the east, is set between 1 and 1.5 metres below the level of the site and the hedge described in detail below is set at the top of this bank.

2.2 The trees under consideration are listed in the tree schedule below where details of their sizes and condition are given. They all appear to self-sown specimens. None are of exceptional quality although tree 2, an oak, is a good specimen with no significant defects. Tree 1, an ash, is also acceptable although it has some damage to a number of roots that have developed at the surface, possibly as a result of poor or impenetrable soil conditions below.

2.3 Trees 3 & 4 are small, young oaks, both growing rather too close to the larger oak, tree 2, and therefore likely to conflict with it as they all grow up.

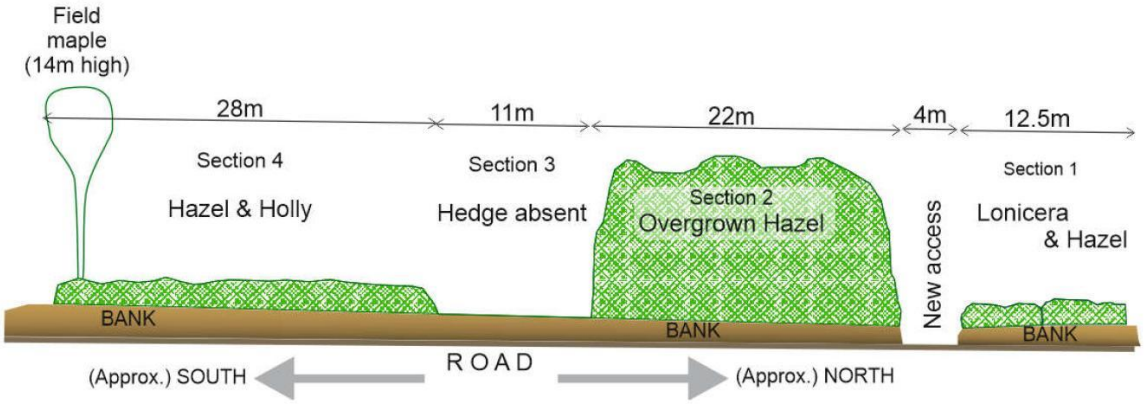
2.4 Item 5 is a group of four trees whose crowns combine to form a single canopy, the group dominated by two silver birches: tree 5A is close to the recently created access and where this grades up from the road to the higher, internal ground level some root loss has clearly occurred. There are currently no indications of ill-health, although the results of root loss can take several weeks or months to become apparent. Some loss of roothold may have occurred, although currently there is no indication of instability. It should be noted that tree roots provide stability by virtue of their tensile strength. Root loss has occurred here on the north-east side; thus any increased tendency to fail would result in the tree falling to the north-west. As I say, there is currently no suggestion that the tree is at any immediate risk of failing but even if it should do so it is most unlikely to affect the public highway.

2.5 Based on these findings I do not find that the removal of the tree is justified at this time: it appears to be a vigorous specimen and although there will undoubtedly be a check in the tree's growth there is a good chance that it will recover both in overall health and also with regard to stability as it adjusts to the new conditions. However it should be monitored for any signs of soil cracks or ground instability at the base which could indicate progressive instability.

2.6 Tree 5B is a tall birch, somewhat drawn-up and disposed to the west but otherwise in good condition. Its nominal root protection area extends into the area excavated for the new access, but as with tree 5A any consideration of removal would be unjustified at this time. Tree 5C is very close to 5B and shows a very *strong* lean to the west. It present no significant risk under present circumstances but is generally a rather poor specimen. Lastly, 5D is a rather overgrown multi-stemmed coppice stool. Also close to the new access, I would suggest it should be re-coppiced to promote new, less leggy growth.

## 3 Hedge

3.1 As already noted, the hedge forming the boundary between the site and Church Lane is set on a bank that ranges up to 1.5 metres above the road surface. It itself is of very variable quality and appearance, as indicated by the diagram below and by photos on the following page.

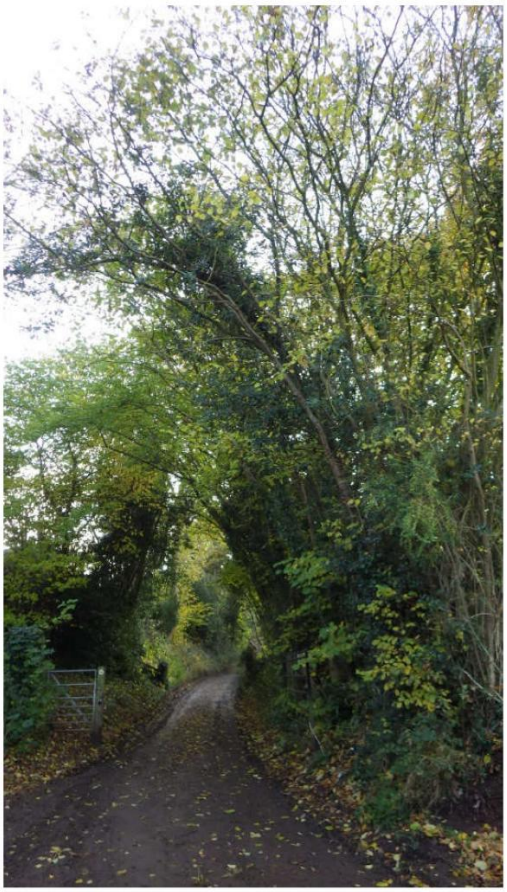



3.1 The northerly part of the hedge is of relatively recent origin as shown by the presence of the non-native garden hedging plant *Lonicera nitida*. The same plant is present on the far (southern) side of the recently created 4 metre-wide gap, suggesting that this was the main species to have been removed to make way for the new access.

3.2 Further on the plants have the appearance of being of considerable age, an impression reinforced by the presence of a quite wide variety of understorey herbaceous plants (including Hart's-tongue fern, *Asplenium scolopendrium*). The multi-stemmed hazels are growing from large, old coppice stools which have no doubt been cut hard back many times over their lives. Their excessively tall form now suggests that re-coppicing would be advisable as, if left, they are likely to begin to break out and fall across the lane.

3.3 Beyond these tall hazels is an 11 metre wide zone where no hedge is present and beyond that is a 28 metre long length of holly and hazel stools. These have been cut back in the past few years to about 1 metre above ground level with subsequent growth attaining a height of about 2 metres above ground level.

Section 1: coppiced hazel at far north end; shrubby honeysuckle (*Lonicera nitida*) adjacent.
1.5-2m high.
Note the cutting for the new access.



Section 2 (above): Very overgrown hazel (plus x1 Field Maple); growing from rather widely-spaced coppice stools, at about 1 to 3 metre spacing. Plants are now up to 9-10 metres in height, some with ivy. Many slender stems arch widely across the lane

Section 2 & 3

Overgown, rather widely-spaced hazels in section 2 (on right) with section 3 being about 11 metres long where no woody plants are present.

Section 3 with no hedge plants and section 4 beyond, comprising hazel and holly cut to about 1 metre with regrowth to 2 metres overall.

Maple tree at far south-east corner of site, viewed south to north.

X4 stems, approx. 210-300mm in diameter; tree about 14 metres tall.

3.4 Normal management would require the extremely overgrown hazels and field maple in section 2 to be cut back , re-coppiced or perhaps laid, in order to prevent them reaching a stage where they plants will begin to break up and fall across the lane, possibly destabilising the bank. The drawings of the proposed scheme indicate a 'new' hedge along the roadside; I would recommend that along this section cutting back to promote new growth would be considerably less disruptive than planting anew, which would

involve grubbing out the existing hazels. Regrowth from these long-established plants will; be quick, but some Infill planting is likely to be required in the gaps between the stools. New planting *will* be required to make good the large gap currently present at section 3.

3.5 Routine hedge management thereafter will ensure that a good boundary hedge will be present along the property with the new access forming only a small break in its continuity (a smaller break, it should be noted, than currently exists at section 3).

## 4 Tree Schedule

| ID | *Species* | Stem No. | Trunk Diam (mm) | Height (m.) | Crown Spread (metres) | | | | Clearance (metres) | | Life stage | Health & Vigour | Structural Condition | Remaining useful life | *Observations* | Retention CATEGORY | Protection Radius (m) | RPA ($m^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | N | E | S | W | Mean | Lowest ove site + Direction | | | | | | | | |
| 1 | Ash | 1 | 380 | 17.5 | 3.5 | 3.5 | 4 | 6 | 6 | 4 N | M | Good | Good | L | Some dead wood; surface roots damaged in northern quarter, but generally good | B- | 4.6 | 66 |
| 2 | Oak | 1 | 390 | 14.5 | 7 | 6 | 5 | 6 | 5 | 4 N | LM | Good | Good | L | No significant defects noted. | A- | 4.7 | 69 |
| 3 | Oak | 1 | 200 | 15 | 4 | 3 | 2 | 1 | 5 | - | Y | Good | Good | L | Good condition but conflicting with tree 2 | C- | 2.4 | 18 |
| 4 | Oak | 1 | 110 | 8 | 2 | 1.5 | 1.5 | 2 | 3 | - | Y | Good | Good | L | Small; insignificant | C- | 1.3 | 5 |
| 5a | Birch | 1 | 375 | 18 | 6 | 4.5 | 4 | 3.5 | 6 | 5 W | M | Good | Fair | M | Close to existing excavated drive; some root loss but currently Good | C- | 4.5 | 64 |
| 5b | Birch | 1 | 320 | 18 | 2 | 2.5 | 4 | 3.5 | 6 | 5 S | M | Good | Fair | M | Similar to above, with lean to the west; further form excavated area; condition currently Good | C | 3.8 | 45 |
| 5c | Birch | 1 | 130 | 12 | 1 | 0 | 1 | 4 | 4 | - | YM | Fair | Poor | M | Slender, suppressed and leaning rather strongly | U | 1.6 | 8 |
| 5d | Hazel | 6 | [245] | 12 | 1.5 | 1.5 | 3 | 2.5 | 3 | 2 W | M | Fair | Fair | M | Multi-stemmed hazel stool; somewhat overgrown but acceptable | C- | 2.9 | 26 |

# APPENDIX 1: Methodology

- The report has been framed as an 'Arboricultural Constraints Report', as defined in BS5837:2012 - *Trees in relation to design, demolition & construction-Recommendations*. Its purpose is to set out and to quantify the degree of constraint offered by existing tree cover with regard to any development or alteration in land-use that may be proposed and is intended to be used to inform feasibility studies and design options. As such it reflects the conditions *as they existed at the time of our inspections*: no account has been taken of any specific development proposals, although it has been assumed that certain unspecified alterations in site usage patterns are likely to occur, which are likely to result in an increase in site occupancy levels. Additional arboricultural input may be required at subsequent stages of design, planning and implementation in relation to the assessment & management of possible arboricultural impacts.

- The survey parameters are as set out in BS5837:2012 and based on the findings each tree or group is allocated to one of four 'Retention Categories' (see Appendix 2, p2). The factors taken into account in categorising the trees include their overall arboricultural quality, their general health and structural stability, their likely useful life-expectancy, their significance to the local landscape and general public amenity value, the degree to which they provide wildlife habitat and enhance local biodiversity and any other social or cultural values that they may embody.

- Also integral to the methodology of BS5837 is the calculation of **Root Protection Areas (RPAs)** for each of the trees in question. The RPA is defined 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.*"

- It should be noted that in most cases the plan accompanying this report will show the *nominal* RPAs of the trees, indicated as circles centred upon the tree of a radius such that they enclose an area equal to the relevant RPA. In practice the distribution of roots around a tree will frequently prove to be uneven due to the presence of a variety of constraining influences. These may be physical barriers such as existing foundations etc, or the existence of localised soil conditions inhospitable to root growth, such as waterlogging or soil compaction. Conversely, soil conditions may be particularly *conducive* to root development in one quarter and this might also lead to an asymmetric distribution of roots around the tree. However in most cases the nominal circular areas as indicated will provide a reasonable guide as to where special measures will be required to protect tree roots and preserve good soil condition.

- The RPAs of the trees will provide the basis for defining **Construction Exclusion Zones (CEZs),** these being areas around all of those trees intended to be retained where access should be prevented throughout the entire process of site preparation and construction. In certain cases the CEZ will exceed the size of the RPA in order to accommodate the aerial parts of wide-spreading trees.

- Access within the CEZ should be prevented through the erection of barriers, constructed in accordance with BS5837:2012. Where access within an RPA is unavoidable, appropriate ground protection should be installed. Outline details of the design of suitable barriers and ground protection are given in Appendices A & B. These protection measures should be put in place prior to any site clearance or construction work commencing on the site and they should remain *in situ* until all works have been completed. Some activities within the CEZs may be acceptable but should not be put in hand until appropriate arboricultural advice has been sought.

## APPENDIX 2: Terms & Definitions
### (including codes & abbreviations used in Tree Schedule)

**DIMENSIONS** :

- **STEM-No.** indicates the number of main stems (i.e. whether the trunk divides at or below 1.5m; used in the calculation of RPA. "m-s" = multi-stemmed).
- **DIAMETER** (in millimetres (rounded to the nearest 5mm), obtained from the girth measured at approx.1.5m. For trees with 2 to 5 sub-stems, a notional figure is derived from the sum of their cross-sectional areas. For multi-stemmed trees the notional diameter may be estimated on the basis of the average stem size x the number of stems. (The hash symbol [#] indicates measurements that have been estimated, where direct measurement was not possible)
- **HEIGHT**, estimated and expressed in metres.
- The **CROWN SPREAD** is expressed in terms of the crown radii estimated at the four cardinal points (or as otherwise specified) and given in metres.
- **CLEARANCES** are indicated as an estimate of the *mean, overall* height of the canopy above ground level with an additional figure for the height above ground of the *lowest significant branch* within the site, together with the direction of its growth.

**LIFE STAGE** is defined as follows:

| | |
|---|---|
| ***P*** | recently Planted; sapling: A tree that is still establishing and which would be relatively easy to replace or even transplant. Likely to be vulnerable to damage from (e.g.) strimmers, mowing equipment, drought, vandals, etc. (Easily replaced thus a negligible constraint). |
| ***Y*** | Young, establishing trees. Should be growing fast, usually primarily increasing in height more than spread, but as yet making limited impact upon the landscape. |
| ***EM*** | Early-mature. Established young trees, normally of good vigour and still increasing in height, but beginning to spread laterally. Beginning to make an impact upon the local landscape & environment. |
| ***M*** | Mature: Well-established trees, still growing with some vigour, but tending to fill out and increase spread. Bark may be beginning to crack & fissure. In the middle half of their safe, useful life-expectancies. |
| ***LM*** | Late-Mature: In full maturity. Still retaining some vigour but growth slowing. |
| ***O*** | Old: Fully mature with vigour declining. Likely to possess features that could be regarded as potential faults, such as large, ponderous branches, old wounds etc. etc., but also likely to be of high amenity value. |
| ***A*** | Ancient: Old trees can survive for very many years with healthy growth continuing although the tree may be of low vigour. Crown size usually becomes reduced, either through natural branch-loss or through management (e.g. pollarding). Decay is usually present. Such trees may embody certain hazards but they are also likely to be of considerable conservation value (i.e. "Veteran" trees). |

**HEALTH & VIGOUR:** Essentially a snapshot of the general health of the tree based upon its general appearance, its apparent vigour and the presence or absence of symptoms associated with poor health, physiological stress etc. (Fungal infections may be recorded here but *decay giving rise to structural weakness* would be recorded under 'Structural Condition' – see next parameter):

| | |
|---|---|
| **Good** | no significant health issues; normal shoot extension growth. |
| **Fair** | indications of slight stress or minor disease (e.g. the presence of minor dieback/deadwood, reduced shoot extension growth or the presence of epicormic shoots) |
| **Poor** | Significant stress or disease noted; larger areas of dieback than above |
| **Bad** | Severe decline; widespread dieback and/or severe stress; life-threatening disease. |
| **Dead** | (or Moribund) |

**STRUCTURAL CONDITION:** Defects affecting the structural stability of the tree, including decay, significant dead wood, root-plate instability or significant damage to structural roots, weak forks (e.g. those where bark is included between the members) etc. etc. Classified as:

| | |
|---|---|
| **Good** | No obvious structural defects: basically sound |
| **Fair** | Minor, potential or incipient defects |
| **Poor** | Significant defect(s) likely to lead to actual failure in the medium to long-term |
| **Bad** | Defects liable to cause significant failure in the short term, or to lead to a major or total collapse in the foreseeable future |
| **Severe** | Tree that has already suffered or is at imminent risk of a major collapse. |

**REMAINING USEFUL LIFE EXPECTANCY**: An estimate of the length of time in years that a tree might be expected to continue to make a useful contribution to the locality at an acceptable level of risk (based on an assumption of continued routine maintenance)

| | | | |
|---|---|---|---|
| **V** - | very short: less than 10 years | **S** - | short: 10-20 years |
| **M** - | moderate: 20-40 years | **L** - | long: 40 or more years |

## RETENTION CATEGORY:

Trees are placed into one of four basic categories using the letter codes **A, B, C or U**, as recommended in BS5837:2012, supplemented where appropriate by a Plus [+] or Minus [-] suffix. The categories indicate the surveyor's assessment of the 'Retention Value' of each tree, how much importance should be placed on its retention or conversely, how much (or how little) would it be missed if it was to be removed.

It would normally be presumed that trees in categories A and B should be retained wherever possible, but with the highest priority given to category A trees. Those in category U may be lost without significant detriment, while category C trees are intermediate, potentially retainable but not of *major* significance in terms of their importance to the site or the wider locality. The **Plus [+] and Minus [-] suffixes** denote trees that do not fall easily into one or other of the categories but are intermediate between two. However **A+** and **U-** have special meaning, defined below.

Note: *These are NOT health and safety assessments: the classifications do not take into account any requirement for remedial tree care or ongoing maintenance apart from that which may affect the trees' general suitability for retention.*

**A** HIGH RETENTION VALUE (●) Trees or groups of such quality and significance such that their retention and protection should be given a particularly high priority within the design process. Category A trees would generally be expected to have a safe, useful life-expectancy of at least 40 years (although exceptions may be made in the case of specimens of exceptional cultural, historic or scientific value).

**'A+'** denotes a specimen of exceptional importance, the protection of which should be given the very highest priority. Includes Veteran[1] and champion trees, specimens of particular cultural and/or historical significance and any other tree whose value and significance extends well beyond its immediate locality.

**B** MODERATE RETENTION VALUE (■): Trees or groups the retention of which would be highly desirable, although the selective removal of certain individuals may be acceptable provided full consideration is given to alternative courses of action and/or appropriate mitigation is provided.

Category B trees will be of generally good quality but may also show some defects or impairments where these are remediable and/or do not detract significantly from their significance or viability. Includes trees with clearly identifiable conservation or other cultural benefits.

They would generally be expected to have a safe, useful life-expectancy in excess of 20 years.

**C** MINOR RETENTION VALUE (▲): Trees or groups that are not of sufficient value to be regarded as a significant constraint to development.

Includes trees that are of poor quality or form; trees whose health or structural stability is deteriorating and is unlikely to be capable of effective remedial treatment, or where the cost of ongoing management would be excessive. Also trees clearly inappropriate to their location, likely to cause damage to nearby properties or to give rise to significant nuisance; trees being grossly suppressed by other nearby trees as well as those the removal of which would *benefit* better quality adjacent trees. Also included here are trees that are simply undistinguished and make little impact within the local landscape and environment.

Category C trees will normally have potential life expectancy of 10 years (although they may perhaps require attention) so, while not of a quality such as to significantly constrain development (i.e. their loss would not detract markedly from the site), they may nonetheless be retained where it proves appropriate, such as where they may be of benefit while new plantings become established.

Young, small and insignificant trees will be included here, even if of good health, on the basis that such trees can be relatively easily replaced or transplanted.

**U** UNSUITABLE: (★) Trees likely to prove to be unsuitable for retention for more than 10 years should any significant increase in site usage arise as a result of development: dead or moribund trees, those at risk of collapse or in terminal decline and/or with serious, irremediable defects.

Also trees that will be left unstable by other essential works (such as the necessary removal of other nearby trees); trees infected by pathogens that could materially affect other trees and low quality trees that are significantly suppressing better specimens

*Some category U trees may be of significant conservation value which it might be desirable to preserve.*

**'U-'** denotes a tree where *removal or major preventative work is regarded as being required based on the circumstances that obtain at the time of inspection, irrespective of any development proposal.*

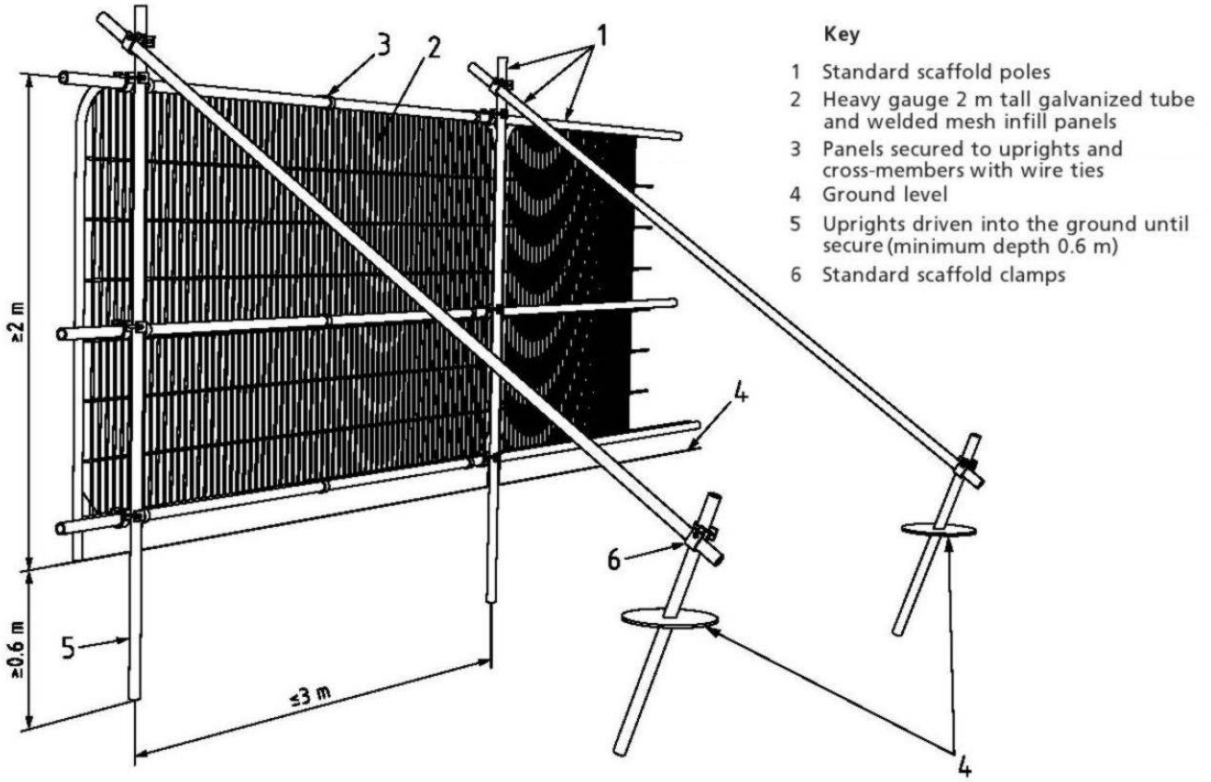
[1] A Veteran tree is one that is of exceptional age relative to others of the same species and which because of its advanced years possesses special biological, aesthetic and/or cultural interest. It should exhibit crown retrenchment and signs of decay in the trunk, branches or roots, thereby providing a range of diverse habitats for a wide variety of organisms.
[See *Ancient Tree Guide no. 4* (2008): Ancient Tree Forum, c/o The Woodland Trust, Grantham.]

*A **CONSTRUCTION EXCLUSION ZONE** should be established around all trees intended for retention, based upon the Root Protection Areas (RPAs) of those trees. These zones should be adequately protected by appropriately designed **Protective Barriers** & **Ground Protection** throughout the all demolition & construction processes.*

## A: PROTECTIVE BARRIERS

- Vertical barriers should be erected and ground protection installed **before any materials or machinery are brought onto the site and before any demolition, development or stripping of soil commences**. Areas of new or retained structure planting should be similarly protected, based on the extent of the soft landscaping as shown on the approved drawings. The project arboriculturist should confirm that barriers and ground protection have been erected and set out correctly prior to the commencement of other operations, and that they are fit for purpose
- Where required, pre-development tree work may be undertaken before the installation of tree protection, with the agreement of the project arboriculturist and the local planning authority.
- **Once erected, barriers and ground protection should be regarded as sacrosanct,** and should not be removed or altered without prior recommendation by the project arboriculturist and approval of the local planning authority.
- Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). On all sites, special attention should be paid to ensuring that barriers remain rigid and complete.
- In most cases, barriers should consist of a scaffold framework in accordance with the illustration below, comprising a vertical and horizontal framework, well braced to resist impacts, with vertical poles spaced at a maximum interval of 3m. Onto this, weldmesh panels should be securely fixed.

**Default specification for protective barrier**




- Where driven vertical poles are impractical due to the likelihood of causing damage to tree roots or to underground services, above-ground stabilizing systems may be specified.
- Alternative specifications may be acceptable but should be specified in conjunction with the project arboriculturist but they must always ensure an adequate degree of protection for the conditions likely to obtain on site. Weldmesh panels on rubber or concrete feet may be sufficient where protection is only required from pedestrians, cars, vans and manually operated plant, but in such cases the panels should be securely joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence. The panels should be supported on the inner side by stabilizer struts.
- It may be appropriate on some sites to use temporary site office buildings as components of the tree protection barriers.

## B: GROUND PROTECTION

- Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier. In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed during demolition. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate
- However, where the set-back of the tree protection barrier would expose unmade ground to construction damage, new temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site. Such temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.
- The ground protection might comprise one of the following:

  a) *for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;*

  b) *for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;*

  c) *for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.*

- In all cases, the objective should be to avoid compaction of the soil, which can arise from the single passage of a heavy vehicle, especially in wet conditions, so that tree root functions remain unimpaired.

## C: ADDITIONAL PRECAUTIONS OUTSIDE THE EXCLUSION ZONE:

- Once the exclusion zone has been protected by barriers and/or ground protection, construction work can commence. All weather notices should be erected on the barrier with words such as:

**Construction exclusion zone – NO ACCESS**

In addition the following should be addressed or avoided.

- Care should be taken when planning site operations to ensure that wide or tall loads, or plant with booms, jibs and counterweights (including drilling and piling rigs) can operate without coming into contact with retained trees. Such contact can result in serious damage to them and might make their safe retention impossible. Consequently, any transit or traverse of plant in close proximity to trees should be conducted under the supervision of a banksman to ensure that adequate clearance from trees is maintained at all times. In some circumstances it may be impossible to maintain adequate clearance thus necessitating access facilitation pruning. Local Planning Authority consent for such pruning may be required.
- Material which will contaminate the soil, e.g. concrete mixings, diesel oil and vehicle washings, should not be discharged within 10 m of the tree stem.
- Fires should be avoided on sites if at all possible. Where they are unavoidable they must not be lit in a position where heat could affect the trunk, branches or foliage of any tree. The size of the fire and the wind direction should be taken into account, and fires must be attended at all times.
- Notice boards, telephone cables or other services should not be attached to any part of the tree.
- It is essential that allowance should be made for the slope of the ground so that damaging materials such as concrete washings, mortar or diesel oil cannot run towards trees..

## D: ROADS, DRIVEWAYS AND PATHS NEAR TREES (including outline notes on 3-dimensional 'Cellular Confinement' load-support systems)

1. The overriding principles to be adhered to in the design of hard surfaces near trees are: (i) the preservation of the character of the soil in a form no more compacted or otherwise disturbed, disrupted or contaminated than it is at present; (ii) to maintain gaseous exchange between the upper layers of soil and the atmosphere; (iii) to ensure adequate (but not excessive) water supply to the soil; and (iv) the avoidance of damage to retained trees as a result of root severance, crushing or abrasion.
2. Tree roots are concentrated in the upper metre of the soil, with the great majority 300-600 mm below the soil surface. Beyond 3 or 4 metres from the trunk most of the roots are small in diameter and not readily apparent as originating from trees. They are nevertheless vital to the tree's well-being, as well as being very easily damaged by even rather shallow soil disturbance, such as may be required in establishing a path or driveway.
3. Wherever possible paths etc should be routed well outside the Root Protection Area (RPA), when problems should not arise. Note, however, that the position of a path or road on a layout plan may indicate the surface only: *Allowance must be made for any kerbing, and the footing into which kerbs will be set, when considering possible conflicts between trees and nearby paths, roadways etc*.
4. Where there is no alternative other than for such a route to impinge upon the RPA of a tree, the possibility of damage can be significantly reduced through the use of No-Dig techniques, where an adequately load-bearing sub-base and hard-wearing surface is established over existing roots without them being disturbed. A variety of techniques are available including geocellular raft systems (such as ArborRaft[2]) as well as three-dimensional cellular confinement systems[3]. Alternatively, piles, pads or elevated beams can be used to support surfaces to bridge over the RPA or, following exploratory investigations to determine location, to provide support within the RPA while allowing the retention of roots greater than 25 mm in diameter. The design of all such systems should be specified in liaison with the project arboriculturist.
5. Temporary haul roads must be similarly designed and specified, taking into account the extra loading that is likely to be imposed by construction traffic. Where proposed *permanent* new surfaces will be used for construction access, it is essential that this extra loading and wear is taken into account during the design process. A temporary sacrificial wearing surface may be required for the duration of construction activity.
6. Wherever possible, new surfaces should permit the percolation of moisture into the soil and allow free gaseous exchange. Suitable permeable wearing course include washed gravel (either loose or in laid gravel-retention grids, but note that self-binding gravels and 'hoggin' is NOT suitable) or paving slabs or block pavers with built-in infiltration spaces. These must be laid dry-jointed, bedded onto a free-draining sub-base such as sharp sand or coarse, no-fines aggregate. Porous asphalt and resin-bonded gravels will provide good porosity initially but will eventually become blocked by fines and should be laid following the principles used for impermeable surfaces (see below).
7. New permanent impermeable hard surfacing should not exceed 20% of any existing un-surfaced ground within the RPA. The hard surface should be resistant to or tolerant of deformation by tree roots, and should be set back from the stem of the tree and its above-ground root buttressing by a minimum of 500 mm to allow for growth and movement. Resulting gaps may be filled using appropriate inert granular material.
8. Prior to and during installation, the soil structure in the area beneath the proposed new surfacing must be protected from compaction, using temporary ground protection where necessary (see appendix 2B). During installation the new surface should be "rolled out", using machinery working forward from the surface as it is constructed.
9. If it proves necessary, existing surface vegetation should be killed using an *appropriate herbicide* that will not leach into the soil and will not affect tree roots. All herbicides must be applied strictly in accordance with the manufacturer's instructions.
10. The soil should not be skimmed to reduce ground levels. However loose organic matter and/or turf should be removed carefully, using hand tools. If the surface needs to be levelled or raised, this should be achieved using a suitable granular fill material (e.g. no-fines gravel, washed aggregate etc.)

[2] Manufactured by Infrafgreen Solutions

[3] Suppliers of proprietary cellular confinements systems include Infragreen Solutions ('InfraWeb' TRP), Geosynthetics ('CellWeb') and Terram ('Geocell') and Greenfix ('Geoweb')