

Pre-development tree survey BS5837:2012
for land off Coventry Road, Burbage
LE10 2HP



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For: Lee Ward
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Contents

1. Introduction and site description	3
2. Arboricultural Survey Method	6
2.1 Condition Status	6
2.2 Root Protection Area	8
3. Results	9
4. Discussion	16
4.1 Tree protection	16
4.2 Tree protection & ground protection	19
4.3 Landscape considerations	23
4.4 Mitigation and compensation	24
4.5 Working method statement 1	24
4.6 Working method statement 2	27
4.7 General methods	37

Appendix 1: Site and tree images

Appendix 2: Tree location map

1.0. Introduction and Site Description

Mark Smalley commissioned Dr. Stefan Bodnar to undertake an arboricultural survey (BS5837:2012) on trees within a development site at a site off the Coventry Road at Burbage, a section of a residential garden.

The trees included within the survey and their relationship to the Development Footprint are identified on the drawing in Appendix 2, the aerial photograph relating to the site and photographs of trees involved are included in Appendix 1, together with examples of the trees concerned.

BS 5837:2012 includes an assessment of all trees within the development footprint in addition to those near to the site boundary. The site assessed is indicated in the location plan of trees (Appendix 2). See site plan below in Figure 1.

The trees indicated are mainly planted and self set garden trees, with a line of pollarded common lime along the northern boundary of the site. See aerial photograph, figure 2 below. It is understood that the on-site trees are largely protected by a Tree Preservation Order (TPO), made on 2nd December 1985. A number of trees marked on this are no longer present, including tree7, removed in 1996 and T4 a blue spruce removed in 1994 and replaced with a redwood: see plan Figure 4.

At the time of writing the finalised plans available for development on the site, are shown on Figure 3 and comprise a single detached residential dwelling with a new road entrance from the Coventry Road.



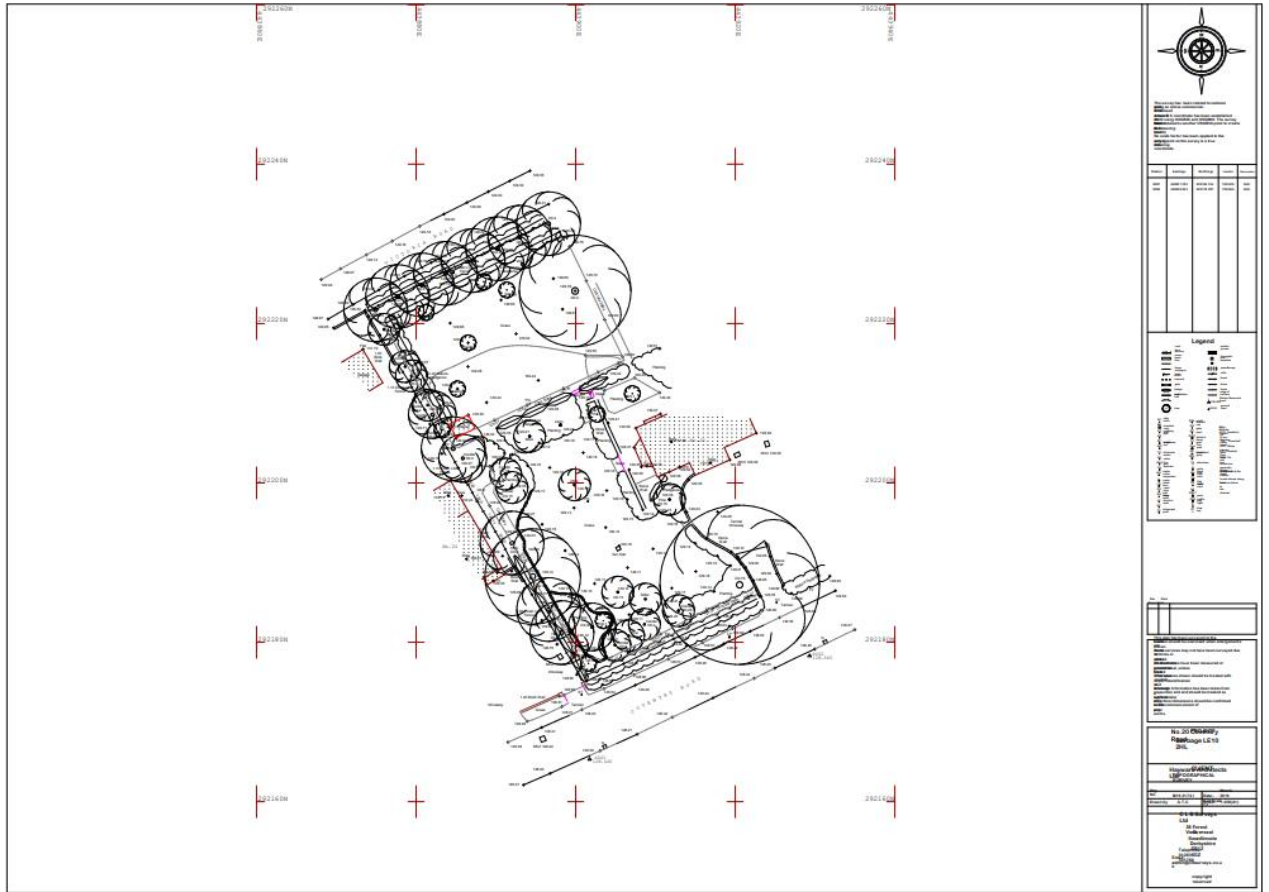
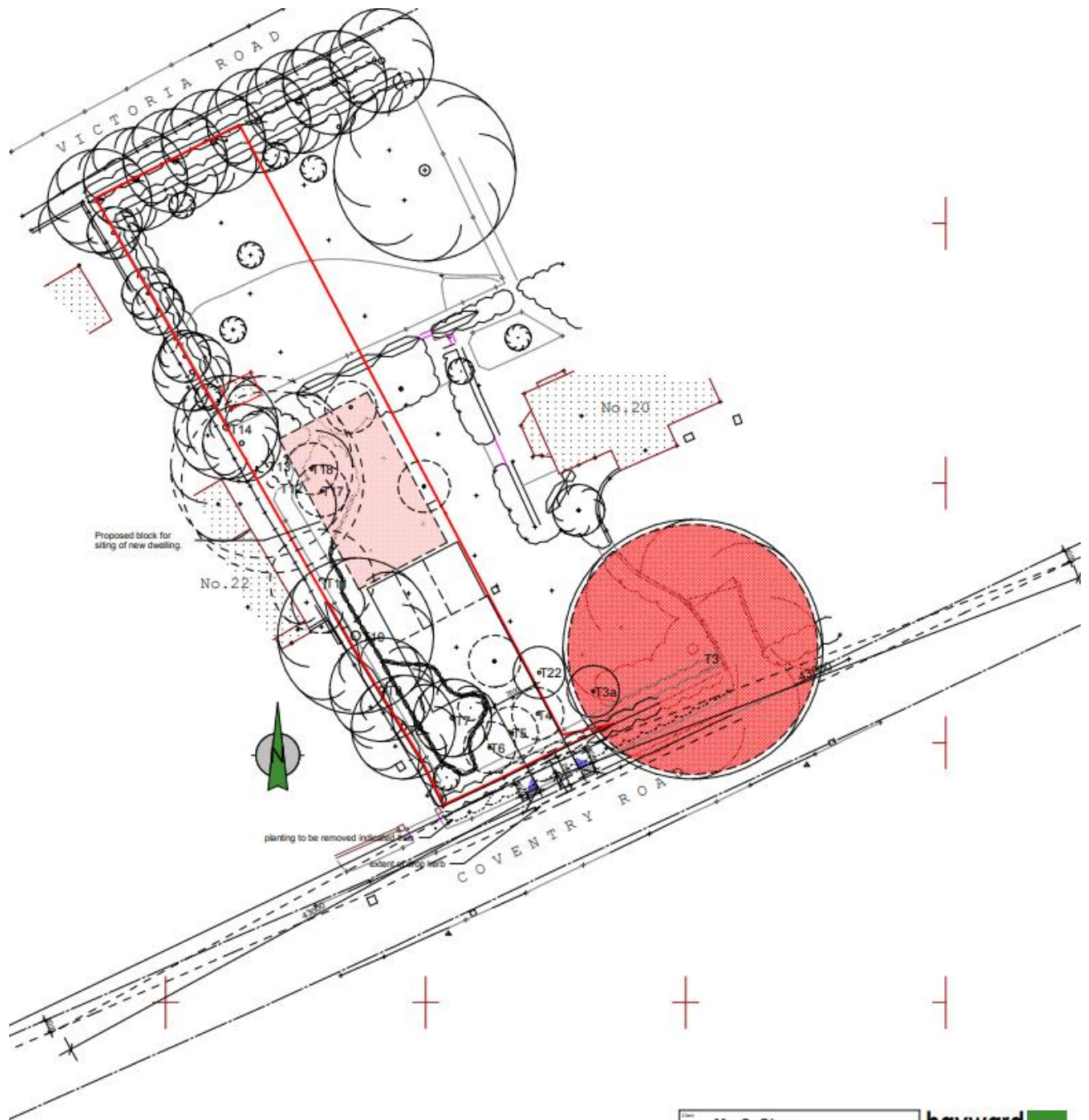


Figure 1/1a . Site plans



Figure 2. Aerial image of site



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Project Title proposed dwelling Coventry Road Burghage				
Drawing Title site plan			A2	19/25
Date 1:200				
Author KG	Date Sept 2019	Drawing No. 01E		

Figure 3: Proposed development

(Removal of Trees T4, 5, 6, 22 T3a and T22 indicated)

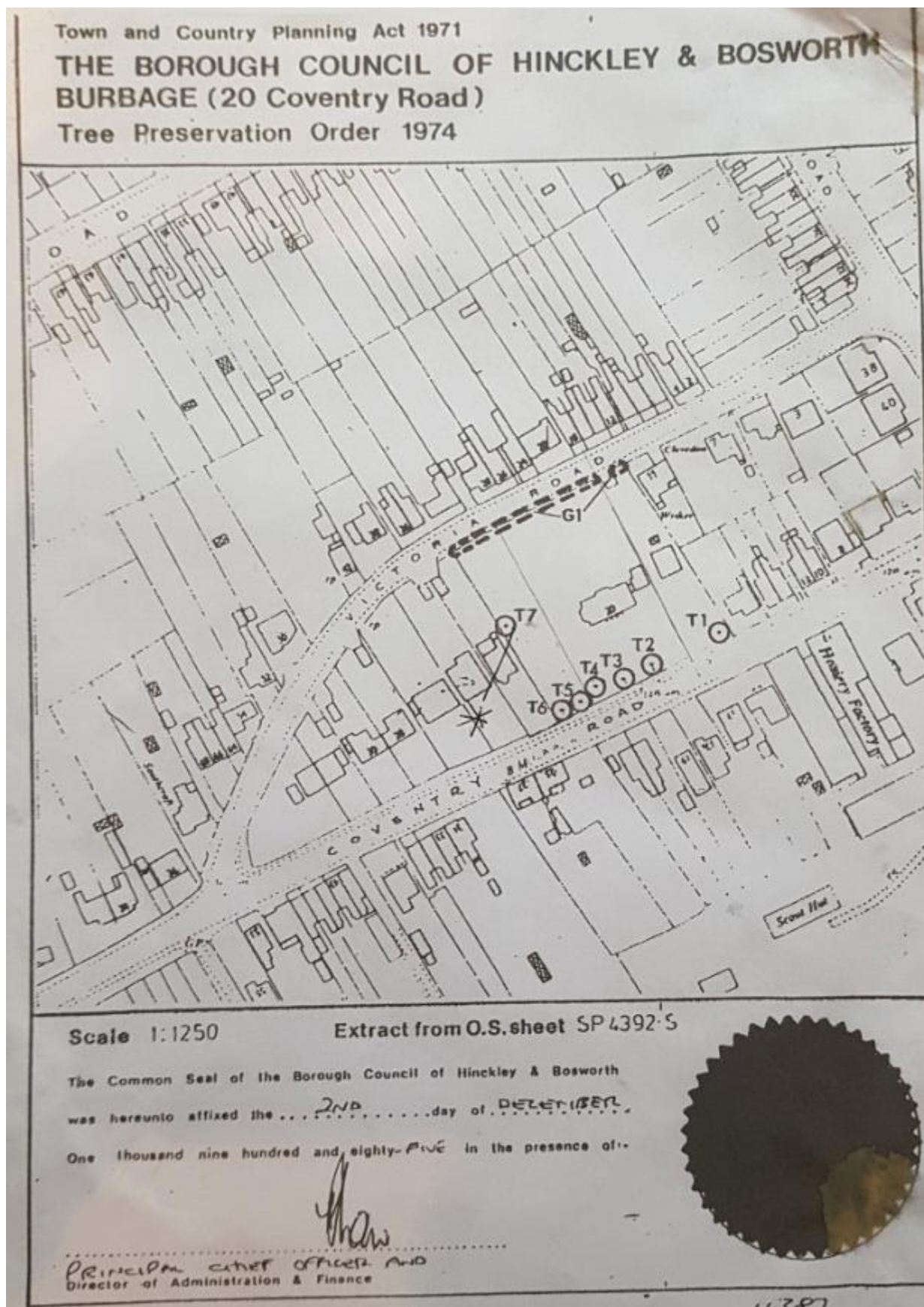


Figure 4: TPO plan

2.0. Arboricultural Survey Methodology

Condition Status

To determine the status of the trees within the site a full arboricultural survey has been undertaken, assessing species and status of all trees present within the footprint of development. The survey has been carried out in accordance with BS 5837 (2012).

The surveyor has extensive experience of arboriculture, through undertaking BS5837 surveys on many sites between 2005 and 2018. Previous to this, he has undertaken Lantra approved courses for arborists, and is competent to the level of a tree officer operating within a Local Authority, being familiar and having used the systems undertaken by tree officers for undertaking safety and condition surveys for Birmingham City Council. Dr. Bodnar possesses numerous ecological qualifications including a full member of CIEEM and a PhD (Community Forestry, 1998). Recent Certificated BS5837 training (May 2015) from Tree Life Arboricultural Consultancy Ltd.

Individual trees above 75mm (diameter at 1.5m above ground level) have had their position confirmed on the survey drawing. The trees were visually assessed and a schedule prepared listing tree number, species, trunk diameter at 1.m above ground level, tree height, crown spread (radius), age, class and estimated remaining years. Any specific observation or recommendations with regard to management were also noted.

A plan drawing indicating the location of each tree assessed is included in Appendix 2.

The condition of each tree was assessed according to the following categories:

Category A

Those trees of high quality and value. Significant trees that are structurally sound and can be retained in the long term (i.e., >40 years) or trees that can be retained in the long term following remedial tree surgery. Colour code on the plan: pale green.

Category B

Those trees of moderate quality and value. Trees that may live 15-40 years. Trees that may live for more than 40 years, but whose removal may be required in that time frame to allow development of retained trees. Trees that are defective but could be retained in the medium term by remedial tree surgery. Colour code on the plan: mid blue.

Category C

Those trees of low quality and value. Trees that can only be retained in the short term (.e, 5-15 years) and that have little landscape impact due to poor form or condition. Trees having a stem diameter of <150mm at 1.5m above ground level that could be replaced. Colour code on the plan: grey.

Category U

Unsuitable for retention. Trees that are dead, dying or diseased that will become dangerous in the near future (within years). Colour code on the plan: red.

Categories A, B and C have further sub-categories with regard to the reasons for tree retention:

- 1: Mainly arboricultural values
- 2: Mainly landscape values
- 3: Mainly cultural values, including conservation.

2.2 Root Protection Area (RPA)

In order to avoid damage to the roots or rooting environment of retained trees, the RPA has been calculated for each of the category A, B and C trees. This is a minimum area of m², which should be left undisturbed around each retained tree.

These figures are calculated utilising the formula below taken from BS 5837 (2012):

Single stem tree

$$\text{RPA m}^2 = \frac{\{ \text{Stem diameter (mm) @ 1.5 x 12} \}^2}{1000} \times 3.142$$

Trees with more than one stem below 1.5m above ground level

$$\text{RPA m}^2 = \frac{\{ \text{Basal diameter (mm) @ 10} \}^2}{100} \times 3.142$$

During construction works the root protection areas – ‘Construction Exclusion Zones’ are to be protected by barriers and ground protection in accordance with Section 9.0 of BS 5837:2012 and as specified and indicated on an approved Tree Protection Plan.

Where construction operations (demolition / hard surfacing) are proposed/ permitted within the Root Protection Area precautions should be taken to maintain the condition and health of the root system in accordance with BS5837:2012.

Construction of hard surfacing within the root protection area should be designed to avoid root loss during excavation. The structure of the hard surface should be designed to avoid localised compaction, including the use of three dimensional cellular confinement system as an integral component of the sub-base.

The hard surfacing in these areas should be a permeable and gas-porous nature such as washed gravel or paving slabs and block pavers (with infiltration spaces). Edge supports such as kerb and edgings on foundations and haunchings are not to be used within the RPA. Consideration should be given to the use of pegged timber edging or propriety or steelpaver or edge restraints.

3.0 Results

A map detailing the location of trees and their BS 5837 : 2012 determined category can be seen in Appendix 2, all other trees on site are noted as being below 150mm stem diameter and therefore, outside the requirements of BS5837:2012. Trees below 150mm stem diameter but above 75 mm stem diameter are included in the topographical survey of the site. Appendix 1 contains images of all the trees and all significant specimens.

Scientific names for species identified:

Species Name	Common Name
<i>Picea pungens</i>	Blue spruce
<i>Sequoiadendron giganteum</i>	Wellingtonia
<i>Prunus sp.</i>	Cherry
<i>Prunus avium</i>	Wild cherry
<i>Fagus sylvatica</i>	Copper Beech
<i>Abies sp.</i>	Fir sp.
<i>Ilex aquilifolium</i>	Holly
<i>Robinia pseudoacacia</i>	False acacia
<i>Chamaecyparis lawsoniana</i>	Lawson cypress
<i>Acer negundo</i>	Box elder
<i>Betula pendula</i>	Weeping birch
<i>Taxus baccatta</i>	Yew
<i>Tilia × cordata</i>	Common lime

Tree no.	Species	Stem diameter (m) DBH	Crown S (m)	Crown W (m)	Crown E (m)	Crown N (m)	Height (m)	Age Class	Estimated remaining contribution (years)	Physiological and Structural Condition	Category	Root Protection area (m²)	Radius of nominal circle (m)
3	Copper beech	800	9	9	9	9	16	Mature	40+	Excellent specimen tree	A2	9.6	290
3a	Cypress	250	2	2	2	2	13	Young	10-15		C2	3	28
4	Wellingtonia	350	2	2	2	2	14	Young	20+	Good specimen	B2	4.2	55
5	Blue spruce	250	2	2	2	2	13	Young	10-15		C2	3	28
6	Lawson Cypress	250	2	2	2	2	13	Young	10-15		C2	3	28

7	False acacia	350	4	4	4	4	13	Early mature	10-15	Fork at 2m, poor form	C1	4.2	55
8	Holly	275	3	3	3	3	10	Early mature	10-15		C1	3.3	34
9	Holly	325	3	3	3	3	10	Early mature	10-15		C1	3.9	48
10	Box elder	400	6	6	6	6	14	Early mature	10-15	Poor form, limb lost at 6m, stem cavities	C1	4.8	72
11	Holly	350	4	4	4	4	12	Early mature	10-15		C1	4.2	55
15	Leyland cypress	250	3	3	3	3	14	Young	10-15		C1	3	28
16	Yew	Twin from base 2 x 225	3	3	3	3	13	Young	10-15		C1	4.2	55
17	Leyland cypress	225	1.5	1.5	1.5	1.5	10	Young	10-15		C1	2.7	23

18	Leyland cypress	225	1.5	1.5	1.5	1.5	10	Young	10-15		C1	2.7	23
19	Leyland cypress	200	1	1	1	1	7	Young	10-15		C1	2.4	18
20	Leyland cypress	200	1	1	1	1	7	Young	10-15		C1	2.4	18
21	Rowan	200	2	2	2	2	10	Young	10-15	Lacks vigour	C1	2.4	18
22	Cherry sp.	200	2	2	2	2	8	Young	10-15		C1	2.4	18
H1 ,	Yew hedge	To 75	1	1	1	1	2	Hedge	10-15		C1	.9	3
H2	Holly hedge	To 75	1	1	1	1	2	Hedge	10-15		C1	.9	3
G1	Commo n lime (12	400	4	4	4	4	9	Pollards	20+		B2	4.8	72

	trees)												
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$$H = Hedge \ G^* = Group$$

4.0 Discussion

4.1 Tree Protection:

4.1.1 Tree Removal and Retention Plans: Development plans should avoid the impact on any trees designated as B or A quality as far as realistically possible. The access drive into the development will lose trees T3a, T4, T5, T6 and T22, all of C quality with the exception of T4, a Wellingtonia, category B. The car parking will fall within the RPZs of trees 8, 9 and 10, and the built form will be within the nominal RPZ of trees 10. Tree 11 will need to be lost to accommodate the build. Removal of Tree 3a will benefit the significant specimen tree (tree 3: Beech, A quality). The plan shows no incursion into the Nominal Root Zone of Tree 3.

A number of the existing trees are either in the fair or good quality, and a number could be carefully incorporated so that they form an appropriate relationship with any new buildings. This would greatly enhance any new development providing an immediate appearance of maturity.

If however, existing trees are poorly sited and suffer from juxtaposition to newly developed structures, then they may cause new occupants anxiety and unacceptable nuisance to the extent that even legal protection will often not ensure their long-term retention. To avoid such problems and to ensure equilibrium between existing trees and new development, the physiological requirements of trees must be carefully considered within the planting layout. Once the right balance is found, this will ensure that they are a true asset to the site and go on to provide a wide range of material considerations for their perceived life expectancy.

In particular, the development should aim to primarily retain trees in the 'A' and 'B' Categories and as many of Group 'C' as can be retained depending on the design plan. If trees are to be removed to accommodate new development, suitable replacement planting within the scheme area could adequately mitigate for losses of category C1 trees. It is recommended that category U trees are removed.

4.1.2 Avoiding Accidental Damage to Trees: Trees may be negatively affected by the construction period by both direct and indirect actions, which are often borne out of ignorance as to the tree's physiological requirements. Careful site planning and management along with the implementation of robust physical protection measures is necessary to ensure the retention of important trees.

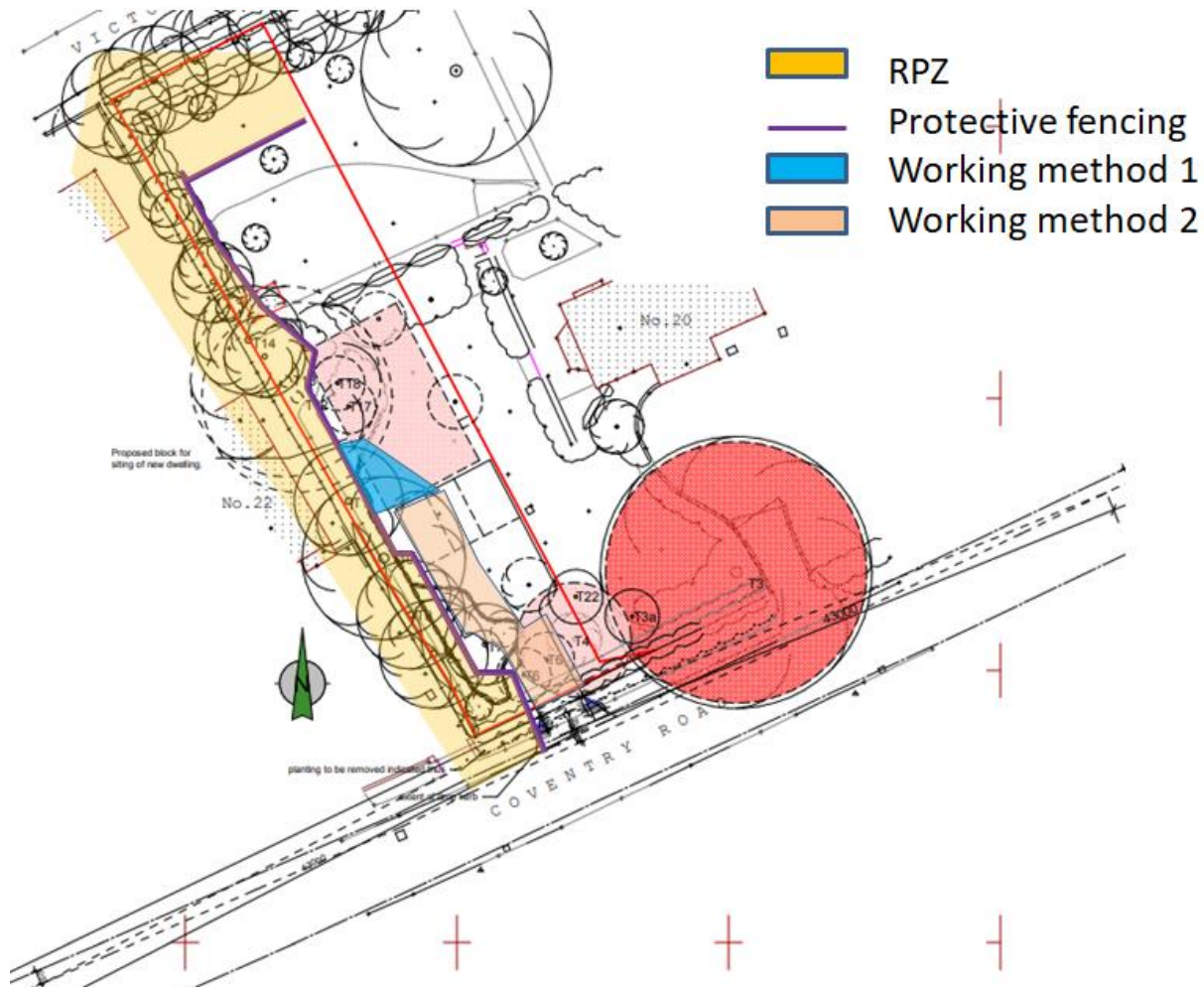
4.13 Soil and Root Protection: It is essential to safeguard a pre-determined volume of soil around the base of the retained trees to ensure that their ongoing biological functioning of the root system along with the interaction with the soil is not impaired. This requires, that prior to the commencement of development activity on site that a robust protective barrier is erected.

414 Suitable Barriers: The specifications for this barrier should be as per the British Standard 5837 of 2012 (Trees in Relation to Construction – recommendations). In brief, this consists of 2.3m high panels attached to an adequately braced scaffold structure to deter un-authorized dismantling and robust enough to rebut physical impacts from site plant and machinery. In practice Heras weld-mesh type panels perform well when attached to the above mentioned scaffold structure.

415 Bird breeding season: All site clearance should ideally take place outside of the bird breeding season. Bird breeding season is between mid March and mid July, although certain species can breed outside these months and if breeding birds are found then work should cease and the advice of an ecologist sought. If clearance is undertaken within the bird breeding season then all site features should preferably be checked immediately prior to clearance by a suitably qualified ecologist.

4.2 Tree Protection & Ground Protection

A tree protection plan is shown below:



In addition to standard tree protection fencing, for areas that fall within the development area (building, method statement 1 will apply (see details section 4.5) and for the car parking area, a no-dig will apply (see details section 4.6).

4.21 All trees that are being retained on site are to be protected by barriers and/or ground protection before any materials or machinery are brought onto the site, and before any demolition, development or stripping of soil commences. Where all activity can be excluded from the RPA, vertical barriers are to be erected to create a construction exclusion zone. The default barrier specification is to be in accordance with BS 5837:2012 'Trees in Relation to Design, Demolition and Construction - Recommendations' as illustrated in Figure 3 below.

4.22 The protected area is to be regarded as sacrosanct, and, once installed, barriers and ground protection is not to be removed or altered without prior recommendation by the project arboriculturist

and, where necessary, approval from the Local Planning Authority.

4.33 All weather tree protection posters (an example is detailed in Figure 4 below) are to be securely fixed to the tree protection fencing in plain view.

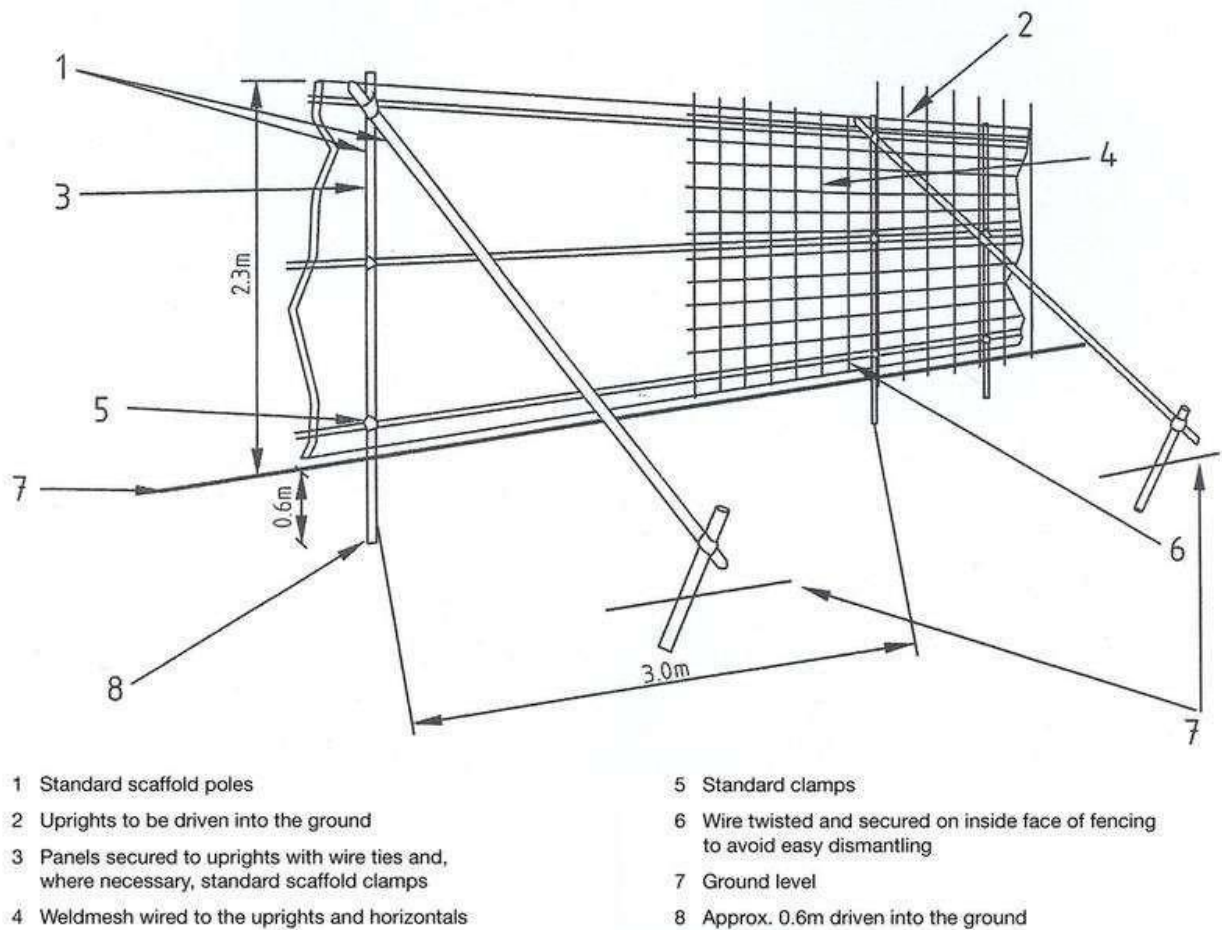


Figure 3. Example of protective fencing required for all Root Protection Areas.



Figure 4. Example of an all weather tree protection poster.

4.24 Care is to be exercised when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid contact with structural roots. If the presence of underground services precludes the use of driven poles, an alternative specification that provides an equal level of protection is to be prepared in conjunction with the project arboriculturist as illustrated within Figure 3 above

4.25 Where the set-back of the tree protection barrier exposes unmade ground to construction damage, temporary ground protection is to be installed as part of the implementation of physical tree protection measures prior to work starting on site.

4.26 Temporary ground protection is to be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil. Detail is shown in Figure 5 below: Scaffolding and root protection within the RPA.

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 2t, 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 2t 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.

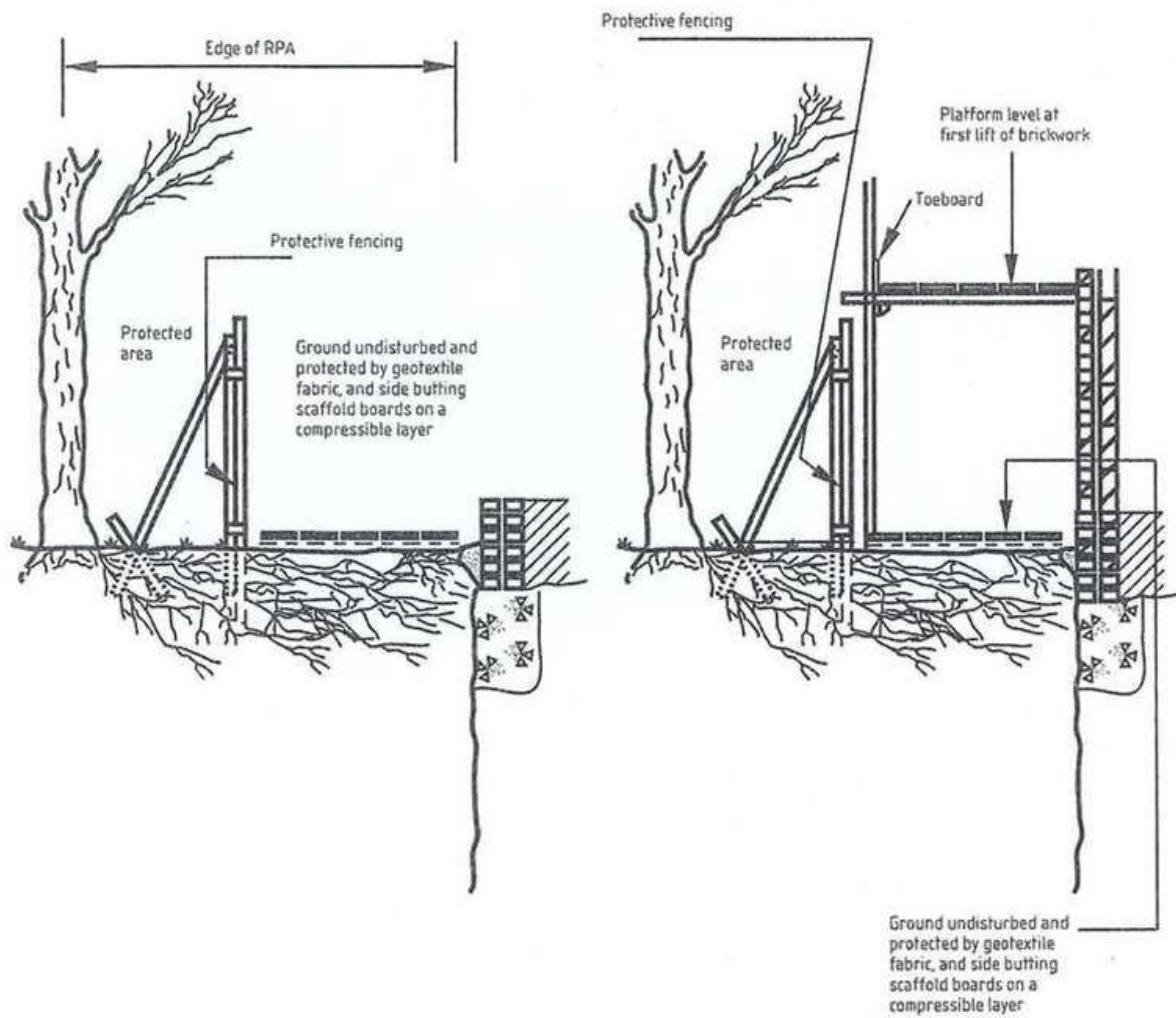


Figure 5. Scaffolding and root protection within the Root Protection Area.

4.3 Landscape considerations:

Consideration should be given to landscape impacts and reinforcing site boundaries. Further consideration should be given to the appearance of frontages and screening. The appropriate landscape mitigation and compensation will need to be discussed at the pre- application stage with the appropriate Local Authority Planning Landscape Officer. It is recommended that compensation planting is undertaken and located to enable the landscape value of this area to be reinforced, if any trees with landscape value are to be removed from the site.

4.4 Mitigation and Compensation:

In compensation for the loss of any trees and hedgerows at least an equal number of new trees and length of native hedgerow will need to be planted. The trees will be species of both native and non-native origin, that have wildlife benefits and are sympathetic both to the existing tree structure and suitable for their likely eventual size limitation. All trees will be planted as 9-10cm Light Standards. All appropriate British Standards will be applied in terms of planting specifications.

4.5 Working method statement 1 for working within RPZ of trees (construction area)

The following methods general principles are proposed to minimise impacts:

1. Use an air-spade to expose roots by removing soil for the area concerned
2. Up to 25mm roots can be severed.
3. Roots above 25mm diameter will be re-aligned. This will require some minimal soil removal to accommodate these (again by air spade) outside the area to be removed.
4. There is to be no major root pruning within 3m of the main stem.

Further details

BS3998:2010

This will be carried out in accordance with BS3998:2010. BS3998:2010 is a document, revised in 2010, which lays out the way in which all tree work should be carried out. The tree surgeons employed to undertake the arboricultural work will be trained and aware of these procedures.

Root pruning

Root pruning shall be done with a sharp tool, in such a way that does not pull on the roots, but leaves smooth cuts. It is preferable to expose the roots prior to root pruning. After pruning, fill the area with quality topsoil and water until thoroughly soaked. Once exposed, roots must be covered within 8 hours. If roots will be left exposed for longer than 8 hours, they must be kept moist.

Details:

- 1) Root pruning is when tree roots are cleanly severed from the tree in order to prevent damage which would be caused by excavation
- 2) The soil around the roots is removed by hand or utilizing an air knife so the roots can be seen before pruning. This is called making a “root pruning trench”

- 3) Once exposed, the roots are cleanly cut, then top soil is put into the root pruning trench to encourage root regrowth in that area
- 4) The most important stability roots are found at 3x the diameter of the tree. This is called a tree's "structural root plate"
- 5) The location of the root pruning trench will be marked on the ground
- 6) The pruning trench should be cleared in a way that exposes the roots while leaving them intact. i) Use hand tools or an air spadeii)
- 7) If a root larger than 25mm is exposed, leave this root intact and contact Landscape Services
- 8) Once the roots are exposed, use a SHARP tool (Root Pruning Saw) to cleanly cut all roots which are up to 25mm diameter to the depth of the proposed disturbance
- 9) Post Pruning: Tree roots must be kept moist. If roots ends will be left exposed for more than 8 hours, cover the hole with moist burlap. Fill the hole with high quality top soil, mulch the area with triple shredded hardwood to a depth of 3", and water well.

Use of Air Spade

The Air-Spade is a rugged and durable hand-held tool that produces a stream of supersonic air moving at Mach 2. The Air-Spade effectively penetrates and dislodges most types of soil, but is harmless to non-porous objects such as plant roots, buried pipes, or cables. A variety are shown below:



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The Air Spade is particularly useful for root investigation and excavations or when working in areas containing services or tree roots, which could be damaged by conventional digging. Using compressed air we can expose roots and services without damage, so that they can be located, inspected and bypassed. When root pruning is required, using compressed air allows for pruning without damage to retained roots. Images of air spade in use below:



Tree Surgeons Qualifications

The tree surgery works detailed below are to be undertaken by a qualified Arboricultural Contractor who must be listed in the Arboricultural Association's Approved Contractors Directory (ref: www.trees.org.uk).

- The Contractor shall hold NPTC (National Proficiency Training Council) Certification.
- The Contractor shall have Chapter 8 Traffic Management Certification.
- The Contractor shall demonstrate at the time of tendering an understanding of Health & Safety Site Specific Risk Assessments & Method Statements for Tree Work. This assessment shall be completed prior to appointment to undertake the works.

Tree surgery works are to be undertaken in one phase unless otherwise instructed by the client

Pre-notification

The tree officer at the Local Planning Authority shall be informed in writing by the Contractor of the date when tree works will commence. He shall be given at least 5 full working days notice prior works commencing to give him the opportunity to be present.

4.6 Working method statement 2 for working within RPZ (parking area)

In accordance with guidance within BS5837:2012, for the areas of new permeable hard-standing, these will be for none of the retained trees exceed 20% of the existing un-surfaced ground.

Where this is shown on the tree protection plan, use of a Cellular confinement system Cellweb, specification is given below. All no-dig access work will take place on Day 1 prior to any other site works commencing. The material shall be installed in accordance with the product specification and supplier recommendations.

Cellweb®/TRP is available in four different depths (75mm, 100mm, 150mm and 200mm), providing temporary ground protection against additional loads from pedestrian traffic to construction plant and HGV delivery lorries. It is intended to use the 200mm thickness in this instance. Preliminary calculations and technical recommendations based on this will ensure that the geotextile is capable of supporting proposed loadings “without being distorted or causing compaction of the underlying soil”. (BS 5837: 2012). Cellweb 200mm will be used in this instance with clean, angular 20-40mm infill.

Installation of ‘No-Dig’ area:

1. Upon completion of all construction work and removal of all plant and material from site, the areas shall be constructed using a no-dig three dimensional cellular confinement system in accordance with the engineers and manufacturers recommendations see example drawing below. The tree protection fencing which may be on or adjacent to the proposed no-dig area may need moving at this time to facilitate this.
2. Construction shall ideally be undertaken in dry weather when ground is driest and least prone to compaction
3. Ground vegetation should be killed using a translocated herbicide such as glyphosate. To prevent severe oxygen depletion in the soil during the process of decomposition, all dead organic material shall

be removed

4. All major protrusions such as rocks and demolition material shall be removed minimizing ground disturbance. All hollows will be filled with sharp sand.
5. Permeable matting will then be laid and the cellular confinement system laid on top and pegged in place.
6. The cellular confinement system will then be installed in accordance with the manufacturer's guidelines using no-fines aggregate. Fill the cells working from the area furthest from the tree first. Further filling should be carried out using the filled Cellweb as a platform
7. Edging will be constructed with tanalised boards attached to pegs driven into the ground. Pegs should be long enough to give adequate support during construction
8. Install a permeable wearing course, e.g. block pavements or porous tarmac placed on the aggregate. Paving slabs or brick pavements should be dry-bedded on the sub-base and joints left unsealed
9. The project arboriculturalist will be responsible for monitoring the installation of the cellular confinement systems within any of the RPAs where it is specified.
10. Under no circumstances is limestone aggregate to be used

Removal of all Temporary Tree Protective Fencing

Tree Protective fencing will only be removed upon completion of all construction work and once all machinery associated with the works has left site.

Landscaping within the RPA of trees

1. Landscaping works will be implemented in accordance with a scheme approved by the LPA
2. There shall be no rotovation of ground within any area designated as a Root Protection Area (RPA) and Construction Exclusion Zone (CEZ) and enclosed by Temporary Protective Fencing.
3. No hard landscaping works or excavation for cables or any other service should be installed within the Root Protection Area (RPA) and Construction Exclusion Zone (CEZ) without the written consent of the Local Planning Authority.

Technical information for Cellweb RPR

Fact Sheet 1: Use of Cellweb TRP® in Root Protection Areas (RPA's)



Introduction

Cellweb TRP® is a cellular confinement system that confines aggregate materials and makes them stronger. This behaviour allows the depth of pavement construction to be reduced. It also minimises compaction of soils below road pavements constructed using the Cellweb TRP® tree root protection system. Cellweb TRP® is used around the world to provide cost effective road and railway construction, as well as Tree Root Protection.

Cellular confinement was developed by the US Army Corps of Engineers during the 1970s to allow construction of roads for military equipment quickly and easily using whatever local soil material was available (especially across beaches). Since then the method has been developed and it is now routinely used in road and rail construction as well as in tree root protection. There is an extensive research base that demonstrates the performance of cellular confinement and it is a method of pavement construction that is recognised by the US Federal Highways Administration.

Characteristics of Cellweb TRP®

Pokharel et al (2009) stated that about one fifth of pavement failures in the US occur due to either weak subgrades or inefficient load transfer from the sub-base. Cellweb TRP® can improve the strength of road pavement construction to deal with these problems. It is a three dimensional interconnected honeycomb of cells made from HDPE. The cells are filled with aggregate sub-base and laterally confine the material when it is loaded, thus increasing the bearing capacity of the layer. This results in a thinner layer of aggregate being required to achieve the same performance.

It also allows uncompacted open graded aggregate to be used in the sub-base construction which is a vital part of any tree root protection system.

Cellweb TRP® is available in a range of height and aspect ratios to suit different load applications.

Use of Cellweb TRP® in RPAs

The use of Cellweb TRP® tree root protection system for building roads, car parks and other vehicular pathways includes a sub-base infill material of clean angular stone which does not need to be compacted. This immediately provides a layer of material that will absorb compaction energy applied to the top of materials placed over it. Compaction of soils by construction machinery does not extend to a great depth. This is the reason why earthworks materials are normally placed in thin layers because compaction only occurs in the top few hundred mm at most. With the lightweight compaction plant used on most development sites the maximum depth that compaction will extend to is between 150mm and 200mm. Thus, if an 80mm layer of asphalt is placed over a 150mm deep Cellweb TRP® system the compaction reaching the base of the construction and the natural soil will be minimal. This effect was demonstrated by Lichter and Lindsey (1994) where a trial area was trafficked by a front-end loader and only suffered significant compaction of the soil to a depth of 100mm.

The use of Cellweb TRP® also spreads the wheel loads from traffic. There has been extensive research published on the performance of these systems from the original work by the US Army Corps of Engineers (Webster 1981) to more recent studies such as that by Emersleben and Meyer (2008).



The research shows that Cellweb TRP® acts as a stiff raft to distribute wheel loads and reduce their magnitude at the base of the construction by 30% to 36% (without any asphalt or other surfacing). Once the surface is taken into account, the pressure applied by traffic to soil below roads or pavements constructed using no-dig methods will be significantly reduced and thus compaction will also be reduced. Note, compaction is not prevented but it is reduced, thus maintaining the soil bulk density at levels that are suitable for tree root growth.

The effectiveness of the Cellweb TRP® no-dig construction in reducing soil compaction has been demonstrated in trials carried out by the Environmental Protection Group Limited. Two parking bays were constructed over a fine sand soil, one with a Cellweb TRP® cellular confinement sub-base. The parking bays were surfaced with asphalt and then used by cars for four weeks on a daily basis. It is well known that compaction of soils occurs in the first few passes of a vehicle, so the maximum adverse effects on compaction of soil below the pavement should have been achieved. In situ density tests were carried out



For The Installation of Cellweb Tree Root Protection System.



When considering damage to tree roots, in applications of vehicular access and parking, the risk of oxygen depletion caused by compaction of subsoil's, site clearance damaging the root source and type of reinforcement are areas which need to be given due consideration.

Other risk factors are:

- Creating an impermeable surface
- Causing a rise in the water table due to construction
- Increasing ground level
- Contamination of subsoil's

2. Dig (site strip)

Site stripping does damage some root structure prior to construction; however, the use of no-dig construction elevates the access road requiring edge protection.

3. No dig

- | | |
|---|--|
| 3.1. Remove surface vegetation | Use a suitable herbicide suitable for the specific vegetation and not harmful to the tree root system |
| 3.2. Place geotextile separation filtration layer | Use a Treetex T300 non woven Geotextile over the prepared sub-grade. Overlap dry joints by 300mm. The three dimensional cell structure, is formed by ultrasonically welding polyethylene (perforated) strips / panels together to create a three dimensional network of interconnecting cells. A high degree of frictional interaction is developed between infill and the cell wall, increasing the stiffness of the system |
| 3.4. Edge restraint | A treated timber edging is usually acceptable. |

4. Cellular Confinement and Backfill Material.



Expand the Cellweb 2.56m wide panels to the full 8.1 metre length. Pin the Cellweb panels with staking pins to anchor open the cells and staple adjacent panels together to create a continuous mattress. Infill the Cellweb with a no fines angular granular fill (typically 4-20mm) within each open cell. The use of cellular confinement reduces the bearing pressure on the subsoil by stabilising aggregate surfaces against rutting under wheel loads. Comparisons between cellular confinement and traditional aggregate and geogrid-reinforced structures demonstrate a 50% reduction in construction thickness of the granular material.

5. Surfacing Options

Block Paving:

- 5.1. Lay second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections
- 5.2. Lay sharp sand bedding layer compacted with a vibro compaction plate to recommended depth.
- 5.3. Place block paviors as per manufacturers instructions.

Tarmac:

Place 25mm surcharge of the granular material above the Cellweb system and lay the bitumen base and wearing courses.

Loose Gravel:

- 5.4. Ensure Cellweb is completely filled.
 - 5.5. Place decorative aggregate to required depth
- NOTE: A treated timber edge should be provided to restrict gravel movement.

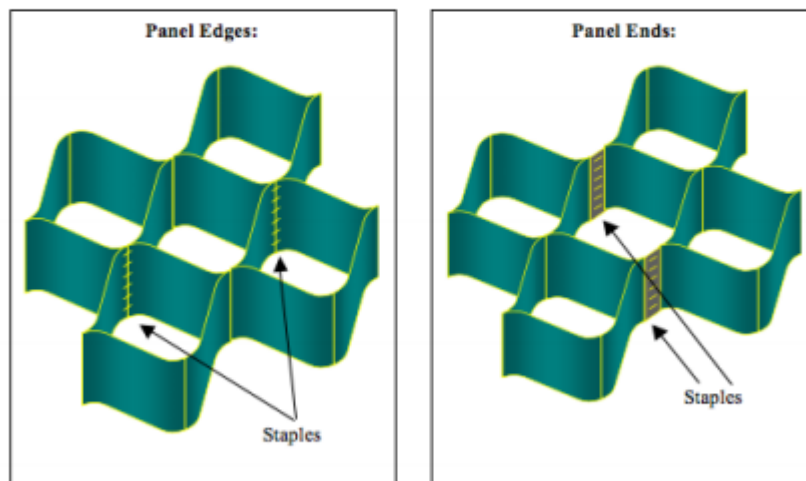
Grass Blocks:

- 5.6. Place second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections
 - 5.7. Place 50/50 rootzone bedding layer to the required depth
 - 5.8. Lay recycled Duo Block 500 Grass Protection System infilled with 50/50 rootzone mix.
 - 5.9. Seed as per architects instructions.
- (Alternatively the Grass Blocks may be infilled with gravel.)

Concrete Slab

- 6.0 Lay Cellweb as previous and place second layer of Treetex Geotextile directly over the filled panels. Pour concrete base as specified.

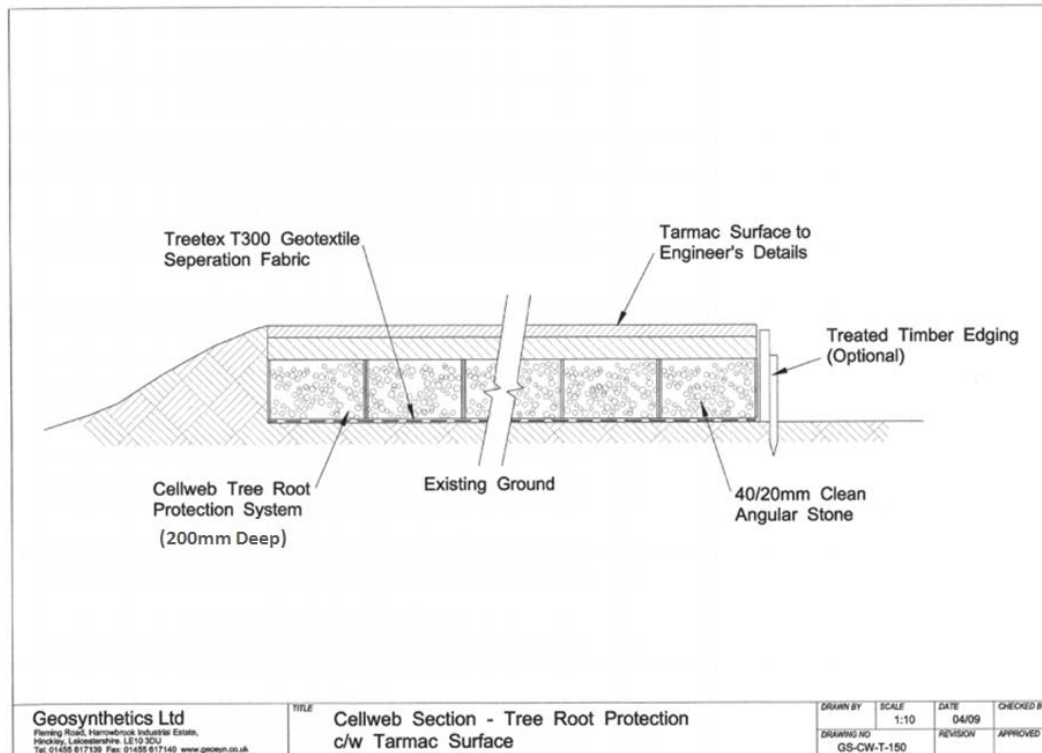
Below are illustrations of the correct stapling procedure for joining both edges and ends of panels together.



Geotextile Separator Technical Data



	NORM	UNIT	VALUE length/cross
Static puncture (CBR-test) X	EN ISO 12236	N	3300
Wide-width tensile test (Strip-test, 200 mm) Elongation at break	EN ISO 10319	kN/m	23 / 23
		%	60
Dynamic perforation (Cone drop test)	EN 918	mm	18
Water permeability	EN ISO 11058	m/sec	100 x 10 ⁻³
Pore size d_{90%}	prEN ISO 12956	micron	901
Thickness at 2,0 kPa	EN ISO 9863-1	mm	2.2
Weight	EN ISO 9864	g/m ²	315
Fibre bonding	Needle punched only		
Raw material	Polypropylene (PP)		
The above technical values are mean values based on measurements in current production and test results from independent test institutes. Geosynthetics Limited accept no responsibility for improper use or misinterpretation of the technical specifications published in connection with TREE-TEX GEOTEXTILES.		Wet or dry, the properties of Treetex Geotextiles remain unchanged, and are resistant to attacks of dry, rot or fungi. Treetex Geotextiles are resistant to acids and alkalis.	
REV. 09/2010			



Cellweb® TRP Weight Capabilities

This chart is provided as a guide line for generic average site conditions only. For a site specific calculation, please ask a member of Geosynthetics to provide a questionnaire. This information will provide our engineers the capability to produce a site specific technical recommendation and CAD detail.

- **75mm Cellweb confinement system**
For foot and cycle traffic. This also provides a control measure for crust compaction
- **100mm Cellweb confinement system**
For domestic traffic, such as cars and transit vans up applicable up to a 6t gross weight
- **150mm Cellweb confinement system**
For emergency access and refuse collection applicable up to a 30t gross weight
- **200mm Cellweb confinement system**
For H.G.V and construction traffic applicable up to a 60t gross weight

In some specific conditions 2 layers of Cellweb 100mm can be installed for the construction phase of traffic. On completion of the construction phase, the top 100mm can be removed. The bottom 100mm can remain insitu to provide a permanent access for cars and transit vans.

For higher demand weight applications, the Cellweb system can be layered to create a 300mm system.

Depth of Cellweb	Unit	Gross Vehicle Weight (GVW)	Application
200 mm	Kg	< 60,000	HGV & Unusual – Crane / piling rig
200 mm	Kg	< 50,000	Heavy Construction Traffic
150-200 mm	Kg	< 30,000	Standard Construction Traffic & Refuse vehicle
150 mm	Kg	< 16,000	Emergency Access & Tractors
100-150 mm	Kg	< 9,000	Delivery Vans
100-150 mm	Kg	< 6,000	Car Park: Cars & Light van
100 mm	Kg	< 3,000	Domestic Traffic: Cars
75 mm	Kg	< 1,000	Pedestrians (with cyclist) path

Note: This is a general guidance for the depth of Cellweb according to Gross Vehicle Weight for a firm and stable subgrade (CBR>3%). If the ground conditions are poor and/or unstable please Geosynthetics Ltd to provide a site specific design.



Cellweb®TRP

Why protect trees?

Trees provide a wealth of benefits within the urban environment including cleaning the air, prevention of flooding and moderation of the climate.

As a result within the UK it is an offence to cut down, lop, uproot, top, wilfully damage or destroy a protected tree without authorisation. Fines, if the defendant is found guilty in a Crown Court are unlimited.

To minimise the environmental impact and avoid legal proceeding we offer the, independently tested Cellweb®TRP system.



What is Cellweb®TRP?

Cellweb®TRP is a cellular confinement system specifically designed for tree root protection. The system creates a stable, load bearing surface for traffic or footfall whilst eliminating damage to roots through compaction and desiccation.

The Cellweb®TRP system comprises of the three specific elements, Cellweb®TRP, Treetex™ pollution control geotextile and an infill of clean angular stone. The system has been designed combining the best possible product to create an unparalleled solution to tree root protection applications.

Cellweb®TRP is a no dig solution that ensures that the load placed upon it is laterally dissipated rather than transferring to the soil and roots below. The use of Treetex™ pollution control geotextile allows for drainage and separation whilst preventing contaminants from reaching the roots.

Clean Angular Stone

Type 4/20

Specification for open graded sub-base for use as storage below pervious pavements (also Type C filter material for filter drains and soakaway backfill in accordance with SHW Clause 505) Type 4/20

Material to BS EN 13242 or BS EN 12620

Material to comprise crushed rock, concrete or blast furnace slag or similar approved. Crushed gravel is not permitted.

Properties	Test Method	Value
Grading	BS EN 13242	Grading 4/20 (Preferred) or 4/40, Gc 80/20, GTc 20/15
Fines Content	BS EN 13242	f_4
Shape	BS EN 13242	Fl_{20}
Resistance to Fragmentation	BS EN 13242	LA_{30}
Durability:		
- Water absorption to BS EN 1097-6:2000, Clause 7	BS EN 13242	WA_{24}
- For $WA > 2\%$, magnesium sulfate soundness	BS EN 13242	MS_{18}
Resistance to Wear	BS EN 13242	M_{10}^{20}
Acid-soluble sulfate content:		
- Aggregates other than air-cooled blast-furnace slag	BS EN 13242	$AS_{0.2}$
- Air-cooled blast-furnace slag	BS EN 13242	$AS_{0.1}$
Total Sulfur:		
- Aggregates other than air-cooled blast-furnace slag	BS EN 13242	$\leq 1\%$ by mass
- Air-cooled blast-furnace slag	BS EN 13242	$\leq 2\%$ by mass
Volume Stability of blast-furnace and steel slags:		
- Air-cooled blast-furnace slag	BS EN 13242	Free from dicalcium silicate and iron disintegration in accordance BS EN 13242:2002, 6.4.2.2
- Steel slag	BS EN 13242	V_s
Leaching of contaminants	BS EN 13242	Blast furnace slag and other recycled materials should meet the requirements of the Environment Waste Acceptance Criteria for inert waste when tested in accordance with BS EN 12457-3

If compaction is required should be in 150mm layers with 4 passes of a smooth wheeled roller max weight of 1000kg/m width **without vibration**.

Aggregate gradings for sub-base materials to BS EN 12620

Sieve Size (mm)	Percentage Passing (%)	
	Coarse aggregate 4/40	Coarse aggregate 4/20
80	100	-
63	98-100	-
40	90-99	100
31.5	-	98-100
20	25-70	90-99
10	-	25-70
4	0-15	0-15
2	0-5	0-5
1	-	-

This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentation. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge becomes available. Since we cannot anticipate all variations in actual end use conditions, Geosynthetics Limited makes no warranties and assumes no liabilities in connection with this information. Nothing in this publication is to be considered as a licence to operate under or a recommendation to infringe any patent right.

DR: 97A/2/16.12.14



Cellweb® TRP Installation Guide



Step 1: Prepare Surface



Step 2: Lay out Treetex™



Step 3: Lay out Cellweb® TRP

- Cellweb® TRP is a NO DIG tree root protection measure and it is recommended that no excavation be performed without prior approval and guidance from the Local Authority Arboricultural Officer.
- Soil compaction from vehicles, machinery and materials is to be strictly prohibited during construction within Root Protection Areas (RPAs).
- Approval must be obtained from the Local Authority that the design and the method of construction is acceptable.
- Further information is available from the following two documents;
 - British Standard BS5837: 'Trees in Relation to Design, Demolition and Construction' (2012).
 - Arboricultural Advisory and Information Service: Practice note 12 – 'Through the Trees to Development' (APN12).

Installation Method

1. Prepare the Surface

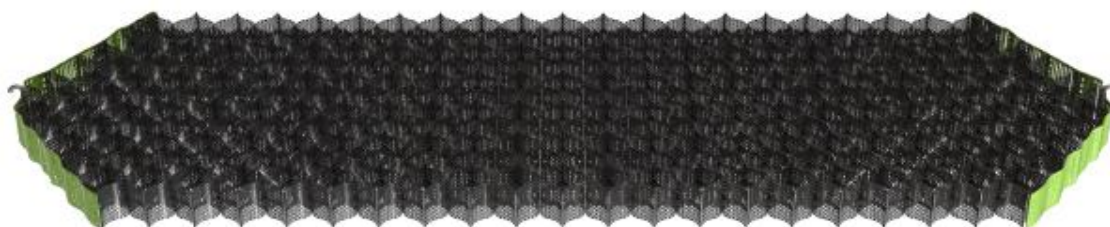
- Remove the surface vegetation using appropriate hand held tools or herbicide (see Note 1).
- Remove any surface rocks, debris and organic material.
- Create a level surface by filling any hollows with clean angular stone or sharp sand.
- Do not level off high spots or compact the soil through rolling.

2. Lay out the Treetex™ Non-Woven Geotextile

- Lay out the Treetex™ over the prepared area, overlaying the edges of the required area by 300mm.
- Overlap any joins by 300mm minimum or more, depending on soil structure (see Note 2).

3. Lay out the Cellweb® TRP Cellular Confinement System

- Lay out the collapsed Cellweb® TRP on-top of the Treetex™.
- Place one of the supplied J pins into the centre cell at the end of the panel and secure into the ground.



4.7 General methods

Site Compound and Working Area

The works are to be restricted to within the site boundary which is to incorporate an area for the site compound, site offices and associated contractors staff parking.

The site compound, site offices and associated contractors staff parking areas are to be located outside of any RPA's of retained trees. The exact location for these facilities during the construction period is to be detailed by the contractor and approved prior to any site works commencing.

Haul Routes

The route for the haulage, site access and egress is to be via the existing hardstanding access route. To limit offsite ground compaction and damage to the main drive, a temporary trackway system is to be provided if weather conditions dictate, should these conditions occur during any resurfacing works. The planning of site operations should take sufficient account of wide loads, tall loads and plant with booms, jibs and counterweights (including drilling rigs), in order that they can operate without coming into contact with retained trees. Any transit or traverse of plant in proximity to trees should be conducted under the supervision of a banksman, to ensure that adequate clearance from trees is maintained at all times. Access facilitation pruning is to be undertaken as specified in this document to maintain this clearance.

Temporary Topsoil Storage

The stripped topsoils are to be stored in temporary mounds outside of the construction exclusion zones of the retained. In accordance with BS 4428 topsoil heaps should not exceed 3m in height.

Underground Services

In general it is considered that all services will be routed away from the Root Protection Zones of retained trees.

There may be instances where the proposed underground services impact on the RPA's of existing trees and hedgerows (refer to the project engineer's services plan). Particular care should be taken in the routing and installation of all underground services.

Excavations for proposed services within or immediately adjacent to the RPA's of retained trees are to be excavated using hand-held tools or compressed air soil displacement in accordance with clause 7.2 of BS 5837:2012;

The installation of underground service routes within the RPA's of existing trees to be retained are to

be installed using trenchless solutions such as micro-tunnelling, surface launched directional drilling or impact moling as per Table 3 within clause 7.7 of BS5837:2012, with entry and retrieval pits being sited outside of the RPA.

Shallow service runs are to be excavated using hand held tools being careful to protect and cause minimal damage to retained tree roots.

Where utility operations do not require planning permission, including those performed by statutory undertakers, they are still be undertaken in accordance with these principles. As a minimum standard, such operations are be undertaken in accordance with NJUG Volume 4, issue 2 [N1].

REPORT ENDS

Appendix 1: Images of trees and shrub vegetation



Tree 3



Trees 3a to 8



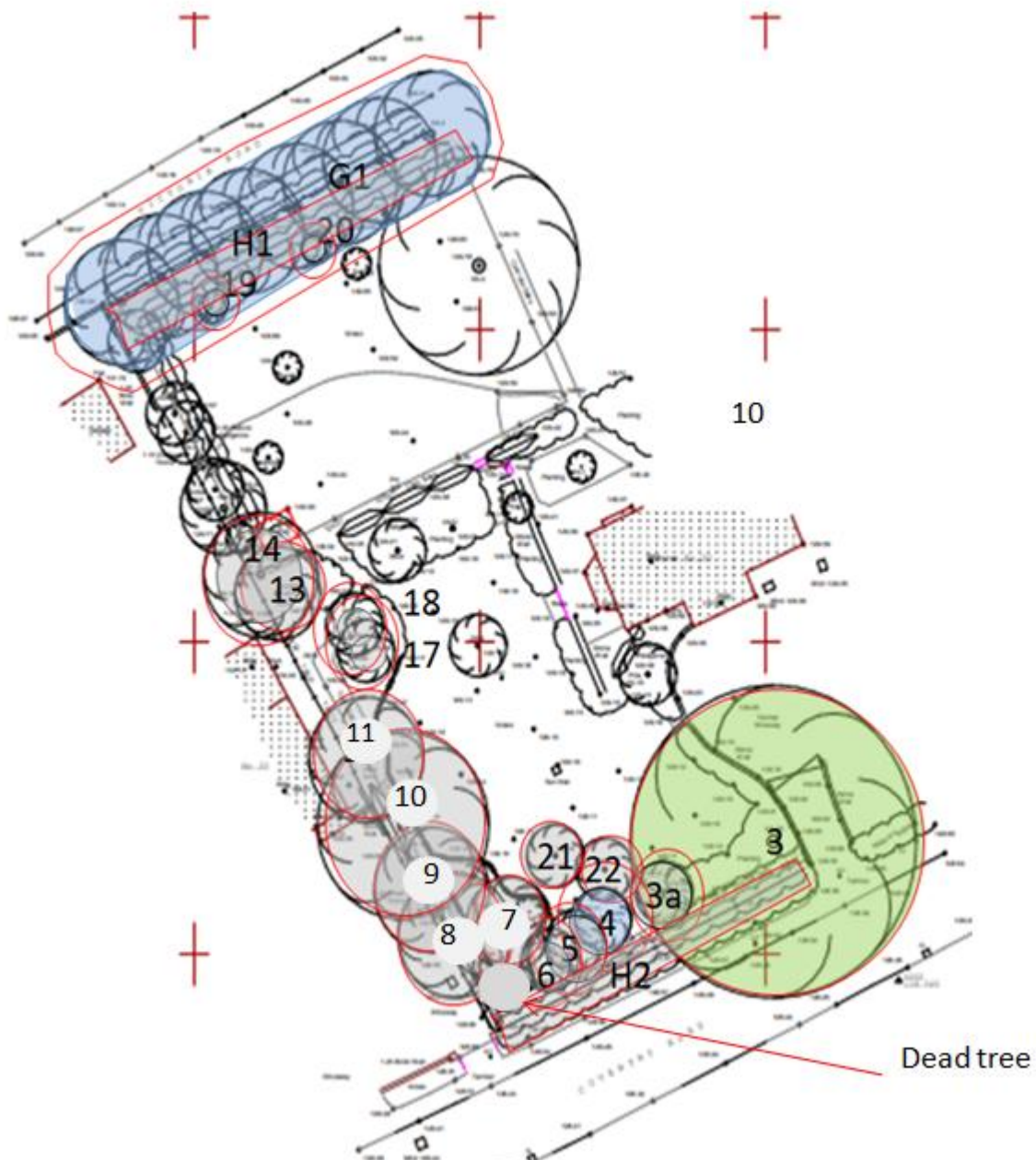
Trees 11 and 12



Tree 19, hedge 1 and group 1 (behind)

Appendix 2: Tree location map

Coloured tree shapes shown are indicative of canopy spread. Red line indicates nominal RPZ



Category A

Those trees of high quality and value. Significant trees that are structurally sound and can be retained in the long term (i.e. >40 years) or trees that can be retained in the long term following remedial tree surgery. Colour code on the plan- pale green.

Category B

Those trees of moderate quality and value. Trees that may live 15-40 years. Trees that may live

for more than 40 years, but whose removal may be required in that time frame to allow

development of retained trees. Trees that are defective but could be retained in the medium term by remedial tree surgery. Colour code on the plan- mid blue.

Category C

Those trees of low quality and value. Trees that can only be retained in the short term (.e, 5-15 years) and that have little landscape impact due to poor form or condition. Trees having a stem diameter of <150mm at 1.5m above ground level that could be replaced. Colour code on the plan- grey.

Category U

Trees that are dead, dying or diseased that will become dangerous in the near future (within years). Colour code on the plan- red.