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arboricultural consultants



Location:  
**Land at Hareshaw Linn Caravan Park  
Bellingham**

Report Type:  
**Arboricultural Survey  
Arboricultural Impact Assessment  
Arboricultural Method Statement  
Tree Protection Plan**

Ref:  
**ARB/AE/1944**

Date:  
**July 2019**

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# 1 Introduction

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- 1.1 This report has been prepared by Andrew Elliott of Elliott Consultancy Ltd on behalf of the applicant.
- 1.2 Elliott Consultancy Ltd was commissioned to visit the site to inspect the trees and to produce an arboricultural report in accordance with British Standard 5837:2012 '*Trees in Relation to Design, Demolition & Construction*'. An initial inspection of the trees was undertaken on the 9<sup>th</sup> November 2018.
- 1.3 **Scope of the report:**
- This report provides arboricultural information and advice in relation to the proposed development of the site to provide new holiday cabins – as shown within Appendix 6 – within an area previously occupied by scout huts to the south of the main site.
  - It should be used to guide the construction process in order to minimise potential damage to retained trees.
  - Section 4 provides a summary of the design proposals and their impact on the current tree population.
  - Sections 5-7 provide a method statement that details all measures recommended for adequate tree protection including any special construction measures to be utilised.
- 1.4 Trees can be protected by Tree Preservation Order or by merit of location within a Conservation Area; advice should be sought from the relevant planning department if such restrictions have been placed on the site.
- 1.5 **Prior to site works commencing, the Arboricultural Method Statement needs to be passed to the site manager or contractor and used as reference during the development period, with particular attention paid to Sections 5-7, and Appendices 3-7.**

## 2 Site Information

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- 2.1 The site is located to the northeast of the village of Bellingham. The main body of the site is an established static caravan park with further unused land to the west. A section of land to the south that was previously used for scouts / outward bound groups, is to be integrated with the existing caravan park. Figure 1 shows the extent of the site surveyed:



**Figure 1: Survey extent highlighted**

- 2.2 Tree cover within the main site is minimal with all significant tree stock located around the site periphery. The new extension to the site to the south has considerable mature tree stock on its boundary with the caravan park, and with some sections of young to semi-mature tree planting along its boundary with the adjacent residential properties to the south. Tree survey data is included in Appendix 1.
- 2.3 Any visibility constraints encountered are noted within the survey data (Appendix 1).

### 3 Tree Quality Assessment

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3.1 BS5837:2012 notes that all trees apart from those with stem diameters <150mm or classified as Category U should be viewed as a site constraint. When inspected, each tree and or group feature is assigned one of four categories that signify how suitable that tree/group would be for retention within any development proposals, and therefore the degree to which it should constrain the site. The four categories are as follows:

3.2.1 **Category A** trees are those of high quality and value, and of a condition whereby they could make a substantial contribution to the site. Such trees should be retained and offered adequate consideration during the design phase and physical protection during the construction phase in accordance with BS 5837:2012. This means keeping proposed features and alterations to ground levels outside of root protection areas and crown spreads to ensure that trees remain in adequate condition post-development.

3.2.2 **Category B** trees are those of moderate quality and value, and of a condition that still make a substantial contribution to the site. Category B trees should be retained wherever possible and offered adequate consideration during the design phase and physical protection during the construction phase in accordance with BS 5837:2012.

3.2.3 **Category C** trees are considered to be of low quality and value, or lacking stature, but of an adequate condition to remain in the short-term. These trees can also be retained if required but where they form a significant constraint to development their removal should be considered. Where they are to be retained they should be afforded adequate consideration during the design phase and physical protection during the construction phase in accordance with BS 5837:2012.

### 3 Tree Quality Assessment (cont)

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3.2.4 **Category U** trees are of such a condition that any existing value would be lost within 10 years. As a result it is recommended that Category U trees are not considered a constraint for development and are removed prior to construction commencing.

3.3 In addition to the four main categories explained above, each tree/group is assigned a sub-category which signifies its overriding value as determined by the surveyor, which is noted by adding a suffix of 1, 2 or 3 alongside the category letter. 1 signifies that the trees/groups main value is arboricultural e.g. it may be a particularly good example or may be rare. A 2 signifies that the overriding factor was due to the landscape value that the tree/group provides e.g. it may be part of a group feature such as a screen. A 3 indicates that a cultural factor was the overriding value e.g. it may have historical or commemorative importance.

## 4 Design Proposals and Arboricultural Impact

4.1 This section concentrates on the proposals and how they relate to the current trees within the site (proposals are shown within Appendix 6).

### 4.2 Potential Conflict 1: Loss of trees to allow the proposals.

Trees 13, 34, 35, 36, 38, 48, 49, 50, 51, & Group 2 will require removal to allow construction; With a section of Groups 1, & 4, also requiring removal to allow adequate clearance and access to the site.

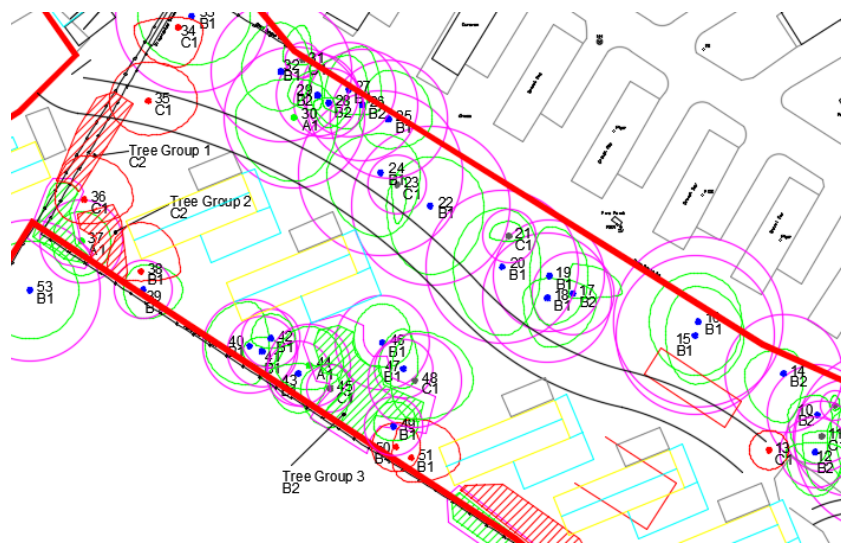


Figure 2: Trees shown in red to be removed or cut back for design.

**Mitigation / Countermeasure:** No countermeasures or mitigation can allow for these trees to be retained due to the requirements of the design. Trees 13, 34, 35, & 36 are all relatively small trees of low value, most having self-seeded, and Group 2 is a low quality group of young Rowan. Trees 38, 50, & 51 were all classified as Category B trees of moderate quality, however the impact of their removal is somewhat masked by the retention of the surrounding trees and the backdrop of the larger mature trees to the north. As such it is considered that the overall impact of these tree removals will be limited when viewed within and immediately adjacent to the site, and minimal in the wider landscape. No tree planting to compensate for this small loss of tree cover is recommended or considered necessary.

### 4.3 Potential Conflict 2: Damage to trees during construction of the access road and footpath.

The location of the new access road into the site from the west, and the proposed path to the new play area, both enter tree root protection areas (RPA's) and damage could occur due to root severance or soil compaction.

## 4 Design Proposals and Arboricultural Impact (cont)

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**Mitigation / Countermeasure:** The locations of both features cross sections of ground that have had considerable past use and both would be expected to have a certain amount of compaction present already. Across much of proposed roadway, there are considerable amounts of building rubble and raised ground levels, and under and around the location of the previous huts the ground has again been significantly compacted etc with large concrete bases and foundations expected. However it is still considered that any new significantly excavated construction for a roadway using a conventional design would be unacceptably damaging to the mature trees that line this section of the site. The use of a low impact roadway surfacing which (following removal of the present cabins, raised areas, and rubble etc) utilised a construction methodology that limited excavation – such as an above-ground cellular system filled with a fully permeable wearing layer (such as gravel), would not be expected to be significantly detrimental to the condition of the trees. An example of a proprietary product – *Terram Cellular System* – is included at Appendix 4 as reference.

### 4.3 Potential Conflict 2: Damage to trees during construction.

During any construction process trees can be damaged due a variety of reasons and construction pressures.

**Mitigation / Countermeasure:** The retained trees can be fenced off with protective fencing, suitable for purpose and in full accordance with BS5837 prior to any works beginning on site. The specification and exact locations for protective fencing are shown in Appendix 3 and on Tree Protection Plan (Appendix 7). It is recommended that Tree Groups 1 & 4 are cut back and reduced in overhang to a more manageable form – this can be undertaken prior to construction and will allow the features to be integrated into the new design without significant damage to the plants themselves.

### 4.4 Potential Conflict 3: Location of utility runs in RPA's.

Damage can be caused to roots during the installation or replacement of utilities runs.

**Mitigation / Countermeasure:** No new utility runs must be located within any of the retained trees root protection areas. Any works to existing utilities will be undertaken with regard for the retained tree cover and will be in accordance with NJUG (National Joint Utility Group) recommendations.



## 4 Design Proposals and Arboricultural Impact (cont)

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### 4.5 **Potential Conflict 4: Damage to trees following construction due to landscaping.**

Trees can be damaged following construction when landscaping is undertaken.

**Mitigation / Countermeasure:** Post development landscaping will be kept to a minimum within the root protection areas. Tractor mounted rotavation or other heavy mechanical cultivation must not be used within the root protection areas of retained trees. All cultivation within RPA's will be carefully undertaken by hand or pedestrian controlled light machinery to avoid root damage.

## 5 Pre-Development and Site Preparation Works

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- 5.1 Refer to Appendix 2 for stage specific tasks.
- 5.2 Prior to any site works the tree work will be undertaken. This work must be undertaken by a suitably experienced Arborist and be in accordance with BS3998 'Tree works – Recommendations' 2010.
- Trees 13, 34, 35, 36, 38, 50, & 51 = Fell.
  - Group 2 = Fell.
  - Sections of Groups 1, & 4 = Remove or prune back as shown on Appendix 6.
- 5.3 Where stumps can remain in-situ they should be ground to below ground level. Where complete removal is necessary, roots will require severance or separation from retained neighbouring tree and hedgerow roots prior to extraction – this can be achieved by severing all of the subject stump root tissue in the top 0.5m of soil (this must only be done outside of the root protection areas of adjacent retained trees), following this stumps can be extracted carefully - monitoring for any deeper root connections starting to cause soil disturbance near retained trees - these roots can then also be severed if encountered.
- 5.4 Following this tree work, tree protection barriers need to be erected in order to protect the trees from damage; this must remain in situ during the entire build process. The fencing needs to be erected according to the locations found on the Tree Protection Plan (Appendix 7). The fence should conform to the specification within Appendix 3, unless a similarly immovable alternative is agreed with the Local Planning Authority (a possible alternative is shown at Appendix 3b). All weather notices should be attached to the fencing marked with the following: '*Construction Exclusion Zone - Keep Out*' (a notice is provided within Appendix 2).
- 5.5 At the beginning of the construction phase, the site manager will appoint a delegated site representative who shall be responsible for continued checking of the protective fencing to ensure it remains compliant with the exclusion zone.

## 6 Tree protection measures during access construction

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- 6.1 Refer to Appendix 2 for stage specific tasks.
- 6.2 All ground levels where trees are located should be maintained. Changes to soil levels adjacent to trees can severely affect the trees structural integrity and its ability to gain moisture and nutrients from the surrounding soil. Unavoidable level changes that may affect retained trees, and not already accounted for within this method statement, should be assessed by a qualified arboriculturalist so that any mitigation or special construction techniques can be considered.
- 6.3 Where structures and building rubble is removed from the site, heavy machinery must be limited to areas outside of RPA,s with only light machinery used in the protection areas. If heavier machinery is required within RPA's, ground protection must be used to alleviate compaction – this should include a compressible layer on which ground ground-mats are placed (exact details should sought from ECL once vehicle weights are confirmed).
- 6.4 Building material storage and operations that can contaminate soil, such as cement mixing, must be confined to areas outside the construction exclusion zone.
- 6.5 Fires should not be lit within 5m of the foliage or drip line of the tree. Care should be taken and the fire should not be allowed to become large, and the wind direction noted.
- 6.6 The trees should not be used to attach notices, cables or other services.
- 6.7 The installation of any underground services near or adjacent to trees on the site shall conform to the requirements of National Joint Utilities Group publication Volume 4 (November 2007). Preliminary engineering drawings show utilities connections are to be made outside of retained tree RPA's only.
- 6.8 At the beginning of the construction phase, the site manager will appoint a delegated site representative who shall be responsible for continued checking of the protective fencing to ensure it is compliant with the exclusion zone.

## 7 Post-Construction Considerations

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- 7.1 Refer to Appendix 2 for stage specific tasks.
- 7.2 Only once all construction works have been completed can the protective fencing and any ground protection be removed.
- 7.3 Post development landscaping should be kept to a minimum within the root protection areas of retained trees. No ground excavation or mechanised ground treatments / rotavation will be undertaken within the protected areas, with all landscaping being undertaken by hand or with hand operated machinery.
- 7.4 Since trees are capable of influencing soil hydrology newly planted trees need to be situated where they will not interfere with built structures. Refer to NHBC Chapter 4.2 'Building near Trees' and Arboriculture Research and Information Note 'Tree Roots and Foundations' for further information.

## Appendix 1: Tree Data

### Key to tree survey headings:

- **Tag** – Tree number corresponding to plans & tags
- **Species** – Common name of each tree
- **DBH** – 'Diameter at breast height' in mm taken on stem at 1.5m.
- **Hgt** – Height in metres of each tree
- **Crown spread: North, South, East, West** – Crown spread in metres to x4 cardinal points from centre of stem
- **CH** – Crown clearance from ground to lowest branches
- **EstD** – Estimated dimensions
- **Age** – Age-class of tree: Y = Young, SM = Semi-mature, M = Mature, OM = Over-mature.
- **General observations** – details both Physiological and structural Condition
- **Est Con** – Estimated life expectancy / contribution to the landscape (in years): 0-10, 10-20, 20-40, 40+
- **Recommendations** – Any recommendations that, regardless of land use, require attention.
- **BS. Cat** – Retention category. **A, B, C**, or **U**. For retained trees **A** being of the highest quality, **C** being the lowest. Category **U** trees for removal regardless of design. Category A, B, & C are given sub-categories 1, 2, & 3 – details of which are shown in appendices.

# Tree Survey Data - Hareshaw Linn Caravan Park

No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
1	Sycamore	SM	50	1	14	4	4	4	5	4	N	Tight co-dominant stem union at 2m.	20+	B1	No work required
2	Ash	SM	27	1	14	2	5	4	4	4	N	Suppressed form.	40+	B2	No work required
3	Sycamore	SM	40	1	13	3	3	3	3	2	N		40+	B1	No work required
4	Whitebeam spp	SM	32	1	9	3	4	4	4	2.5	N		40+	B1	No work required
5	Oak spp	SM	24	1	7	1	0.5	5	0.5	2	N	Suppressed form.	40+	C1	No work required
6	Oak spp	SM	38	1	18	3	3	7	0.5	5	N	Suppressed form.	40+	B2	No work required
7	Sycamore	M	78	1	18	8	6	7	5	5	N		40+	A1	No work required
8	Sycamore	EM	51	1	15	3	5	3	3	4	N	Minor crown suppression.	40+	B1	No work required
9	Sycamore	SM	12	1	10	1	0.5	0.5	0.5	8	N	Sparse crown. Suppressed form.	40+	C1	No work required
10	Sycamore	SM	42	1	14	2	5	2	3	3	N	Suppressed form.	40+	B2	No work required
11	Cherry spp	SM	30	1	10	0.5	6	3	2	6	N	Suppressed form. Stem cankers.	20+	C1	No work required
12	Field Maple	SM	31	1	10	1	5	3	3	3.5	N	Suppressed form.	40+	B2	No work required

No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
13	Ash	Y	20	2-5	9	2	2	2	2	0.5	N	Self-seeded and multi-stemmed at base.	40+	C1	No work required
14	Sycamore	EM	50	1	4	3	5	2	4	2	N	Suppressed form - past tree etc	40+	B2	No work required
15	Sycamore	M	68	1	17	5	5	5	3	3	N	co-dominant with Tree 16. Minor suppression.	40+	B1	No work required
16	Sycamore	M	72	1	18	5	6	5	5	5	N	Co-dominant stems with compression union at 2m.	40+	B1	No work required
17	Sycamore	SM	35	1	15	3	0.5	5	0.5	3	N	Suppressed form.	40+	B2	No work required
18	Sycamore	M	54	1	16	2	5	5	3	4	N		40+	B1	No work required
19	Sycamore	M	48	1	17	5	5	4	2	2	N		40+	B1	No work required
20	Sycamore	M	64	2-5	18	6	7	4	5	3	Y	Co-dominant stems with bark inclusion at base to 2m.	20+	B1	No work required
21	Sycamore	SM	22	1	10	2	0.5	2	2	2	N	Suppressed form.	40+	C1	No work required
22	Sycamore	M	68	2-5	18	5	7	6	5	3	N	Twin stems.	40+	B1	No work required
23	Sycamore	SM	26	1	14	1	4	1	0.5	5	N	Suppressed form.	40+	C1	No work required
24	Sycamore	M	71	2-5	18	4	7	4	6	2	Y	Co-dominant stems with bark inclusion at 1.5m.	20+	B1	No work required

No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
25	Sycamore	EM	50	1	18	5	3	5	3	5	N		40+	B1	No work required
26	Sycamore	EM	47	1	15	6	1	2	4	5	N	Suppressed form.	40+	B2	No work required
27	Sycamore	EM	40	1	18	4	4	2	4	6	N		40+	B1	No work required
28	Sycamore	SM	30	1	18	0.5	3	2	2	7	N	Suppressed form.	40+	B2	No work required
29	Sycamore	SM	34	1	18	3	2	0.5	3	4	N		40+	B2	No work required
30	Sycamore	M	60	1	18	4	7	5	6	2	N		40+	A1	No work required
31	Sycamore	SM	16	1	13	4	0.5	1	2	5	N	Suppressed form.	40+	C1	No work required
32	Sycamore	M	60	2-5	16	5	4	3	4	2	N	Twin stems at 1m.	40+	B1	No work required
33	Sycamore	M	65	1	16	6	5	6	6	3	Y	Epicormic growth at base.	40+	B1	No work required
34	Sycamore	SM	39	1	12	1	4	3	5	2	N	Suppressed form.	40+	C1	No work required
35	Ash	SM	28	1	10	4	4	5	4	0.5	N	Self-seeded. Poor branch unions - 1 has failed at 4m.	40+	C1	No work required
36	Ash	SM	30	1	12	5	3	5	3	1.5	N	Co-dominant stems with bark inclusion at 3m. Self-seeded.	20+	C1	No work required



No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
37	Silver Birch	EM	35	1	18	3	4	3	3	4	N		40+	A1	No work required
38	Silver Birch	EM	34	1	18	5	1	4	4	1	N	Suppressed form. lean north.	40+	B1	No work required
39	Silver Birch	EM	24	1	15	3	3	4	2	3	N	Minor suppression.	40+	B1	No work required
40	Scots Pine	EM	41	1	13	5	4	2	5	0.5	N		40+	B1	No work required
41	Scots Pine	EM	31	1	14	2	2	2	2	2	N	Minor suppression.	40+	B1	No work required
42	Scots Pine	EM	24	1	14	3	1	3	2	2	N	Co-dominant stems with bark inclusion at 3m. Minor suppression.	40+	B1	No work required
43	Silver Birch	EM	28	1	12	1	4	3	3	1	N	Minor suppression.	40+	B1	No work required
44	Silver Birch	EM	35	1	20	4	3	4	4	4	N		40+	A1	No work required
45	Beech	Y	20	1	9	3	4	2	3	0.5	N	Suppressed form.	40+	C1	No work required
46	Sessile Oak	EM	39	1	16	4	3	3	3	2	N		40+	B1	No work required
47	Silver Birch	SM	25	1	16	4	2	2	3	3	N		40+	B1	No work required
48	Norway Maple	SM	39	1	14	5	4	6	3	1.5	N	Suppressed form. Poor form. Weak unions due to poor integrated fibres characteristic of species - evidence of past failure.	20+	C1	No work required

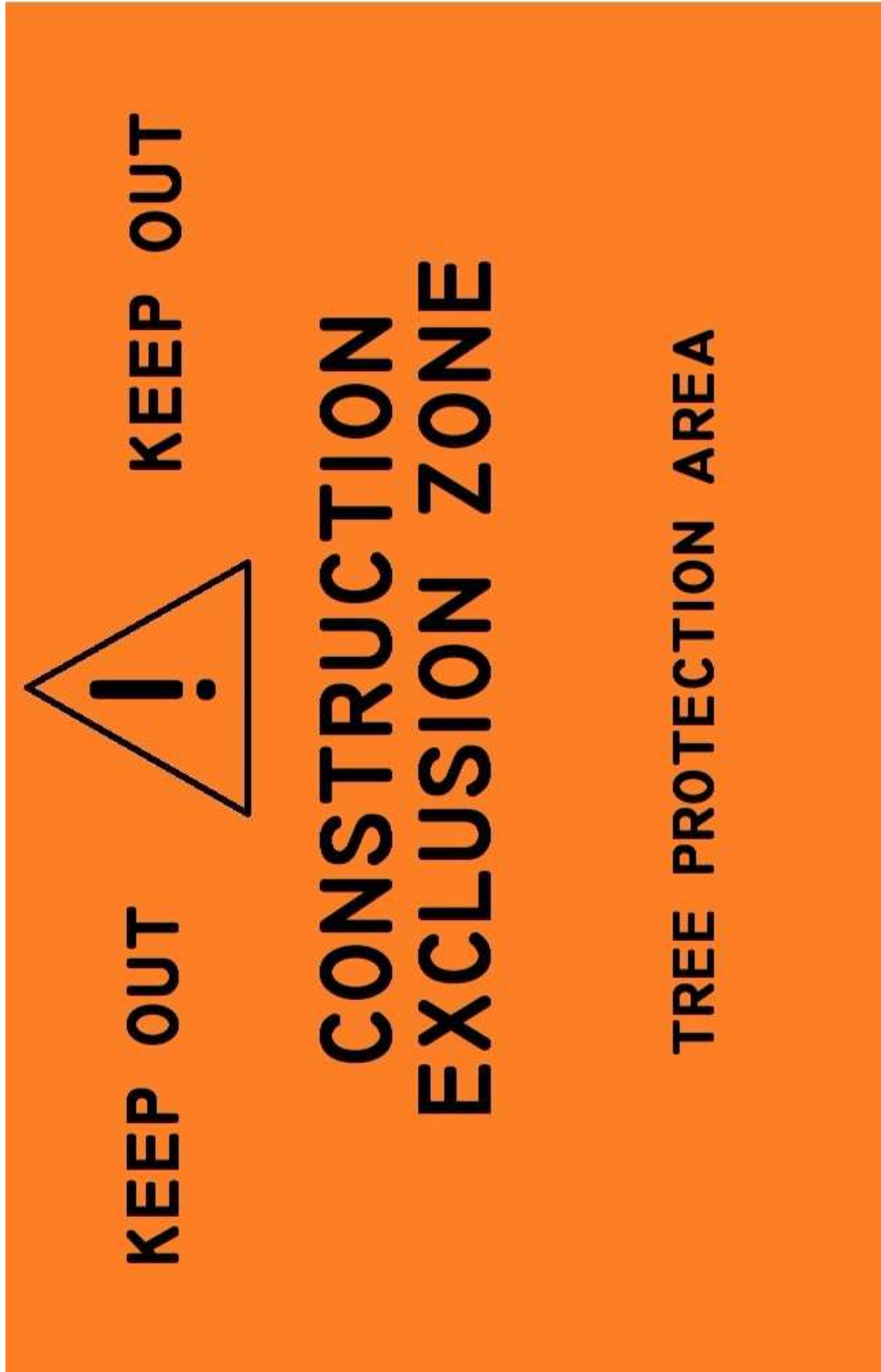
No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
49	Silver Birch	SM	24	1	20	3	2	3	2	2	N		40+	B1	No work required
50	Larch spp	EM	41	1	20	3	3	3	3	2	N		20+	B1	No work required
51	Silver Birch	EM	30	2-5	17	4	3	5	2	3	N	Minor suppression. Small stem at base.	40+	B1	No work required
52	Sycamore	Y	30	1	8	4	4	4	3	0.5	N	Self-seeded.	40+	B1	No work required
53	Cherry spp	M	60	1	10	5	5	5	5	3	Y	Off site.	20+	B1	No work required
54	Sycamore	EM	49	1	11	4	3	4	3	4	N		40+	B1	No work required

## Group Data - Hareshaw Linn Caravan Park

Group Number	Dominant Species	Lesser Species	DBH	Average Height	Age	Average Spread	Condition/Comments	Recommendations	EstCont	BS Cat
1	Hawthorn Elm spp Rowan		15	6	SM	2	Outgrown hedge plants. Multi-stemmed.	No work required	20+	C2
2	Rowan		12	6	SM	2	x5 small trees. Suppressed form.	No work required	20+	C2
3	Lime spp Oak spp Beech Ash		14	8	SM	2	Small planted group - 2m spacings. Larger trees picked up individually within tree data.	No work required	40+	B2
4	Hawthorn Hazel		20	5	SM	4	Outgrown hedge plants extending 4-5m into site. Multi-stemmed.	No work required	20+	C2

Group Number	Dominant Species	Lesser Species	DBH	Average Height	Age	Average Spread	Condition/Comments	Recommendations	EstCont	BS Cat
5	Maple spp Birch spp		50	14	EM	5	Off site. 3-4m overhang at 3m height. Trees appears to be 2m off fence. X1 Maple x2 Birch.	No work required	20+	B2
6	Hawthorn		20	5	M	3	Scrub cover of small trees and multi-stemmed bushes on banking.	No work required	40+	B2
7	Silver Birch		35	16	EM	4	Small plantation of Birch - 2-4m spacings. Appear in reasonable condition. Separated from proposals by large covered store.	No work required	20+	B2

**Appendix 2: Construction Exclusion Zone Notice**



## Appendix 3: Protective Fencing Specification

Tree Protection Fence – for use around the construction areas near buildings etc



### Appendix 3b: Only to be Used If agreed with LPA



Terram Cellular Confinement System  
For the protection  
of tree roots

# Cellular Confinement Systems

The perfect no-dig ground reinforcement system. Provides above-ground load bearing for paths and driveways whilst preventing soil compaction and protecting tree roots.

## Damage to tree roots during driveway construction

The conventional method for constructing paths, drives and roads involves excavating soil to enable the installation of a sub-base that will adequately support traffic loads. Unfortunately this method of construction can badly damage trees since a by-product of the excavation is root severance. Most people don't realise that trees are very sensitive to disturbances in the soil around them. The reason for this is that, contrary to popular belief, trees do not have massive roots that go down deep into the soil but rather have lots of relatively small roots (frequently only a few centimetres in diameter) which spread out from the tree very close to the soil surface for quite large distances (often equal to the height of the tree).

If you imagine a tree system as a wine glass standing on a dinner plate you will have a roughly accurate idea of the above and below ground proportions of a tree (Figure 1). It may come as a surprise to learn that about 80-90% of all tree's roots are in the upper metre of soil (Figure 2). These roots serve two purposes: anchorage and absorption of moisture. If even relatively small roots are severed, for example by digging a trench, the tree can begin to suffer symptoms of drought stress as it is no longer able to obtain all its water needs. In addition the tree may become unstable as cutting the roots is a bit like cutting the guy ropes on a tent.

It is not only root severance that may harm trees but also compaction of the soil. If the root zone of a tree is not protected during development then the soil may become compacted by vehicles or heavy machinery moving repeatedly over the ground (Figure 3). The effect of compaction is to close up pores in the soil which contain air and water. The tree's roots then begin to suffer from both a lack of oxygen and a lack of moisture, and, as the soil becomes denser, roots find it hard to penetrate the soil. All this can lead to a dieback of the root system and frequently dieback of the tree. Raising of soil levels has a similar damaging effect as it deprives roots of oxygen and creates a build up of harmful carbon dioxide around the roots.

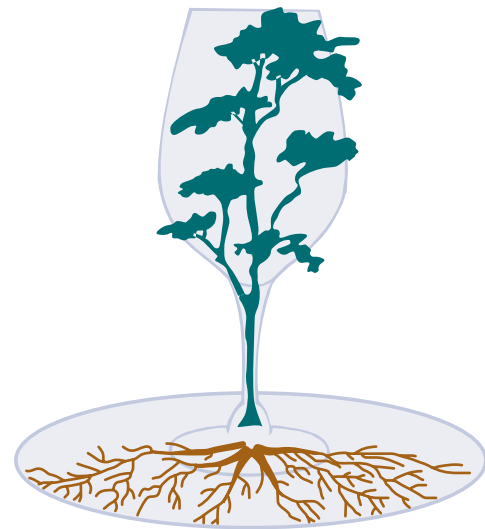


Figure 1

## So, How Do Tree Roots Grow?

People often wrongly assume that tree roots are thick and grow down into the soil for many metres (Figure A). In reality tree roots:

- Are usually only large near to the trunk and get thinner the deeper and further from the tree they go. At a distance of just 3-4 metres from the trunk most roots are no bigger than a few centimetres in diameter.
- Spread outwards from the trunk, more or less parallel with the soil surface, rather than growing downwards (Figure B).
- Can spread horizontally in any direction for a distance equivalent to at least the tree's height.
- Are usually relatively shallow; 80-90% of a tree's roots are in the upper metre of soil. Few roots reach depths of more than about 2-3 metres and at this depth they are only a few millimetres in diameter.



Figure A: Incorrect

Figure B: Correct

Figure 2



## British standard for trees in relation to construction and APN1

In recognition of the fact that trees are sensitive to disturbance the British Standards Institution has published recommendations on how to protect trees during development. In line with the earlier British Standard (BS 5837: 1991) the most recent guide, published in September 2005 (see further reading), recommends that there should be a 'root protection area' in which development should not be permitted.

In most cases this area has a radius equal to twelve times the trunk diameter and forms an exclusion zone around the tree protected by means of robust fencing. This guidance had the effect of prohibiting the installation of roads, driveways and parking areas near to trees. But In 1996 the Arboricultural Advisory and Information Service published Arboricultural Practice Note 1 Driveways Close to Trees (APN1) which suggested that driveways could be installed within the root protection area provided roots and the soil were not damaged.

The conditions set out for a suitable system were as follows:

- Roots must not be severed
- Soil should not be compacted
- Free movement of oxygen and carbon dioxide into and out of the soil should be maintained
- Water infiltration into the soil should not be impeded

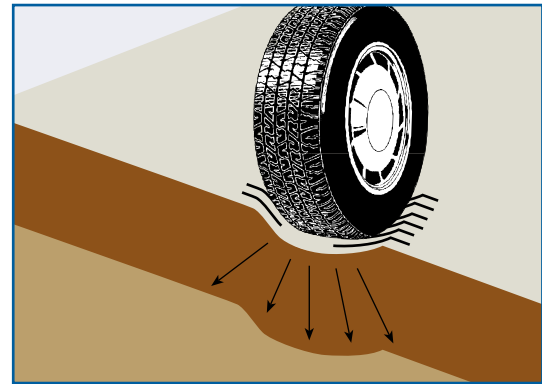
Thus, APN1 advised that driveways could be installed within the root protection zone provided that an above-ground, no-dig construction was used. This advice was incorporated into the recent British Standard which recommended that the most effective means of achieving this was through the use of a three-dimensional cellular confinement system.

## Terram Geocell ground protection

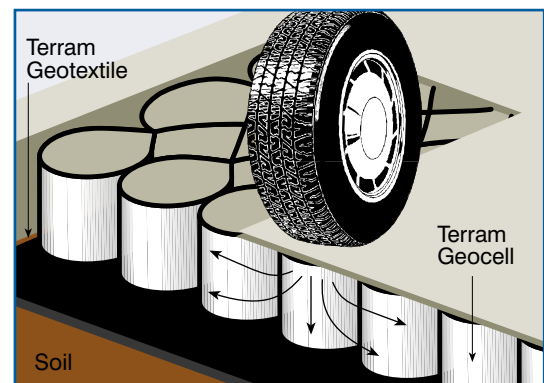
Terram Geocell is an ideal solution for providing ground reinforcement within tree protection areas. It confines fill material within its strong yet flexible cell structure in order to provide a stable base for traffic and an even load distribution (Figures 3 and 4). A big advantage of Terram Geocell over other products is that the geotextile material is permeable and allows lateral movement of air and water.

Terram Geocell is suitable for permanent woodland trails, paths, driveways, roads and parking areas.

It may also be used as temporary ground reinforcement where access to a site is limited by the presence of trees. Once operations on site are completed the temporary surface can easily be removed and the ground left undamaged.

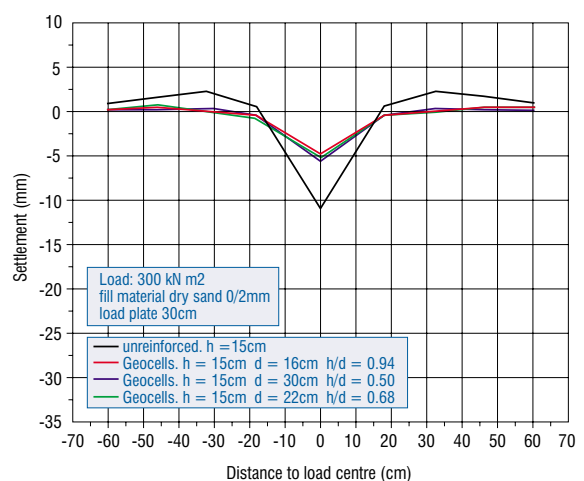


*No ground reinforcement: Unreinforced soil becomes compacted and rutted by vehicle loads*



*Geocell ground reinforcement: Forces are spread laterally reducing loads on the underlying soil*

*Figure 3. The Geocell distributes loads evenly in order to prevent rutting*



*Figure 4. Static loading tests of up to 300kN/m<sup>2</sup> revealed only minimal deflection (<5mm) of the surface of filled Geocell*



*Figure 5*

## Getting the design right

Every application will be slightly different so it is important to have the input of an engineer and arboriculturist together in order to design the right solution for an installation near to trees. The arboriculturist will be able to advise on tree protection issues and the engineer will be able to specify details such as cell depth, fill type (Figure 5) and load bearing capacity.

For example, the design of a pedestrian footpath may be less rigorous than that of an access road that may have to withstand the load of a heavy crane or a lorry.

But there are some principles that should be considered in every application (see Figure 6):

- The ground must be protected at all stages during installation - there is no point in installing a ground protection system when soil or roots have already been damaged by other site activities
- Terram Geotextile should be used underneath the Geocell to prevent fill materials penetrating the soil
- The fill material should be granular and should permit water and air flow
- Any edgings should be carefully designed to avoid excavation and root severance
- A permeable and gas-porous wearing course should be installed above the Geocell
- In most cases the driveway or parking area should not exceed 20% of the root protection area.

If correctly designed and installed the Geocell cellular confinement system should allow paths, drives and parking areas to be located within a tree's protection zone, thus enabling development that might not otherwise be permitted by local authorities.

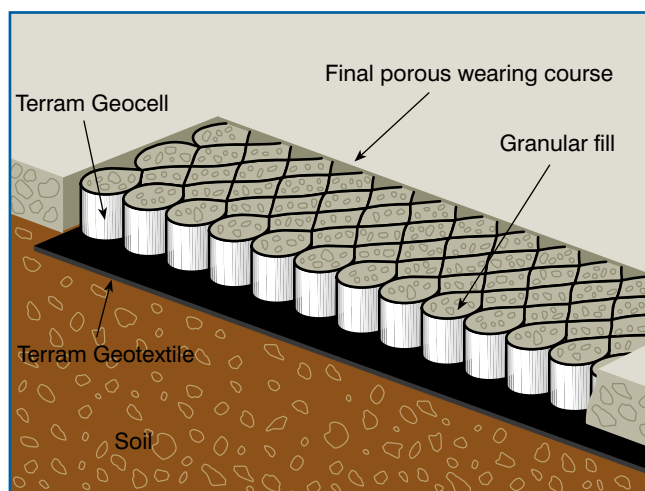


Figure 6. Components of an above-ground load-bearing platform suitable for vehicles

## Example installation

### Driveway construction

- 1 Remove grass and other vegetation and the upper organic layer of soil by hand digging. Arisings should be wheel-barrowed out of the tree protection area. Machinery (even low ground pressure tracked vehicles) should not be used due to the danger of soil compaction
- 2 Small depressions may be filled with sharp sand
- 3 Lay out Terram Geotextile over the driveway area
- 4 Lay out Terram GeoCell and carefully peg in place
- 5 Fill the cells working from the area furthest from the tree first. Further filling should be carried out using the filled Geocell as a platform
- 6 Install a permeable wearing course, e.g. porous tarmac, block pavements on a sharp sand base (a further layer of Terram above the filled Geocell will be needed in this case to prevent the sand mixing with the granular fill below).

## Conclusion

BS5837 Trees in Relation to Construction and APN 1 allow the careful development of paths, drives and roads within the root protection area of trees provided an above-ground, no-dig construction is used.

The use of Terram Geocell as a ground reinforcement platform is therefore an ideal solution that can facilitate such development near to trees which might not otherwise be permitted due to fears of damage to soil structure and tree roots.

## Further reading

*BS 5837: 2005 Trees in Relation to Construction - Recommendations.* British Standards Institution

*Dobson, M. (1995): Tree Root Systems. Arboriculture Research and Information Note 130/ARB/95. Arboricultural Advisory and Information Service, Farnham.*

*Patch, D. and Dobson, M. (1996). Driveways Close to Trees. Arboricultural Practice Note 1. Arboricultural Advisory and Information Service, Farnham.*

*Nicholson, R. (2001). APN1, BS5837 & PPG 3, Guidance for Trees: Conflict or Complement? Arboricultural Journal 25, 361 - 376.*

Products Available	Panel size	Depth	Cell Diameter
Erocell 22/20	5.0m x 10.1m	200mm	220mm
Erocell 25/15	7.0m x 10.0m	150mm	250mm
Erocell 25/10	7.0m x 10.0m	100mm	250mm

The cell depth and diameter is dependent upon specific site conditions

Cellular Confinement Systems | June 2006

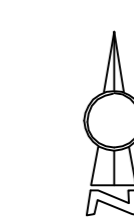
Terram Ltd, Mamhilad, Pontypool, Gwent NP4 0YR, United Kingdom

Tel: +44 (0) 1495 757 722 Fax: +44 (0) 1495 762 393

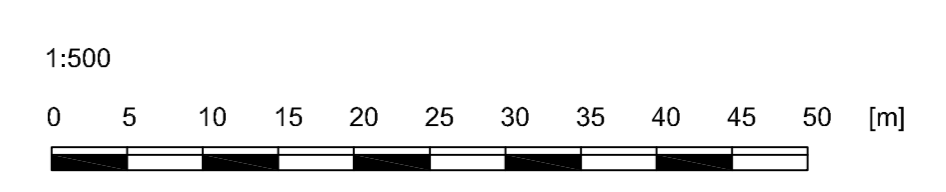
Email: [info@terram.co.uk](mailto:info@terram.co.uk) Web: [www.terram.com](http://www.terram.com)

*Recommendations for use are a guide and purchasers must determine the suitability of the product for their intended use. Terram Ltd assumes no liability for claims beyond the replacement value of our product.*

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- Tree Position Showing Crown Extents and BS5837 Category A
- Tree Position Showing Crown Extents and BS5837 Category B
- Tree Position Showing Crown Extents and BS5837 Category C
- Tree Position Showing Crown Extents and BS5837 Category U
- Root Protection Area - to remain free from disturbance (merged where over-lapping)
- Group of Trees
- 1/G1/H1 Tree/Group/Hedgerow Number
- A1/B1/C1/U BS5837 Retention Category
- Photo Number, Position and Aspect
- Tree or Shrub not inspected as too small or discrete from proposals

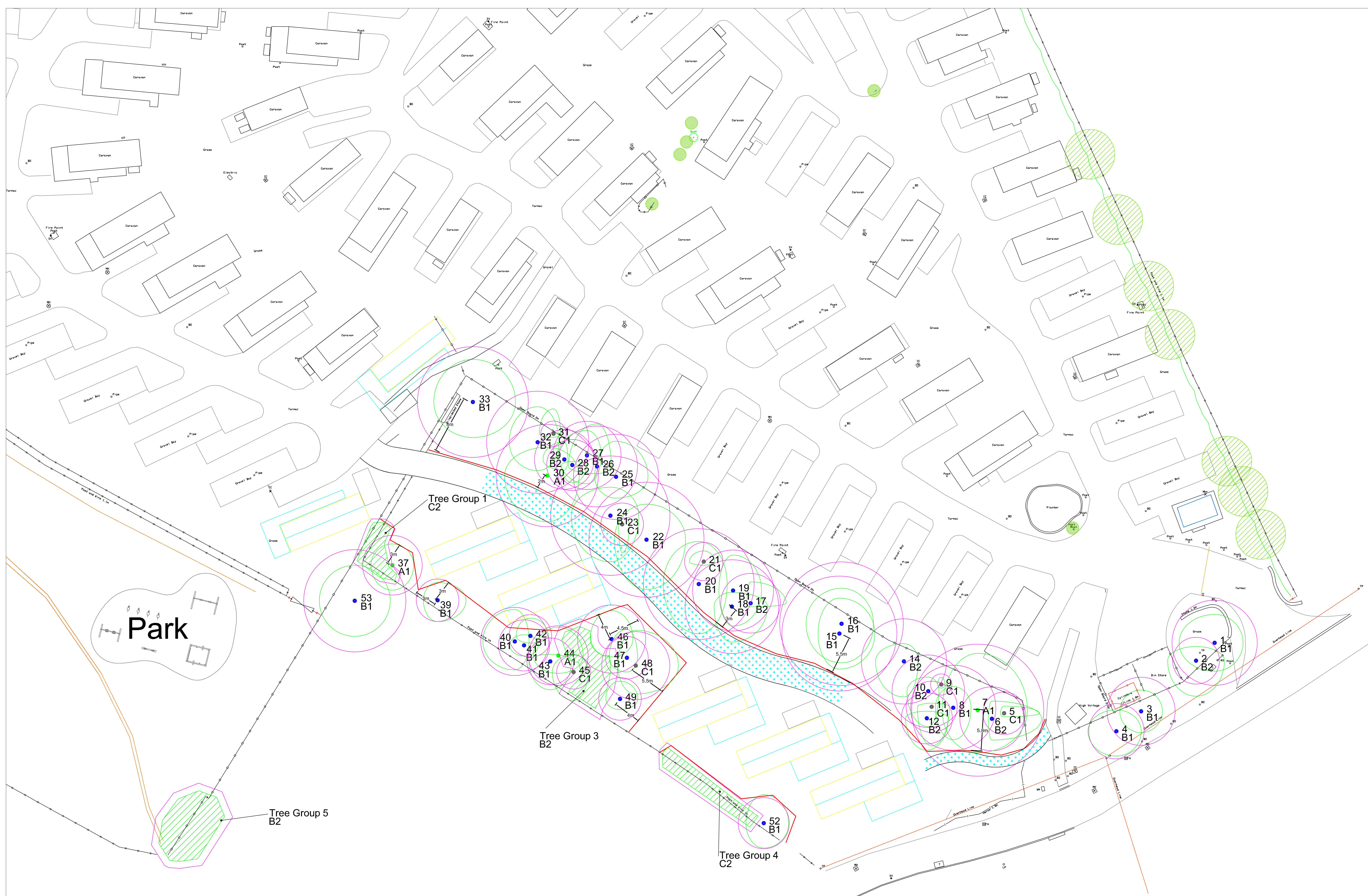
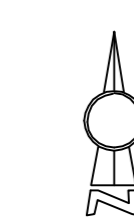



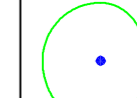

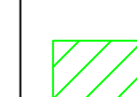

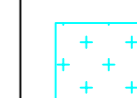


- Tree Position Showing Crown Extents and BS5837 Category A
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- Tree Position Showing Crown Extents and BS5837 Category C
- Root Protection Area - to remain free from disturbance (merged where over-lapping)
- Group of Trees
- 1/G1/H1 Tree/Group/Hedgerow Number
- A1/B1/  
C1/U BS5837 Retention Category
- Tree or Shrub not inspected as too small or discrete from proposals
- Tree Requiring Removal For Design
- Group of Trees requiring Removal for Design

**APPENDIX 6**

Drawing Title:	Tree Impact Plan
Project:	Hareshaw Linn Caravan Park
Drawing Number:	ARB/AE/1944/TIP
Date:	July 2019
Scale:	1:200 @ A0



-  Tree Position Showing Crown Extents and BS5837 Category A
-  Tree Position Showing Crown Extents and BS5837 Category B
-  Tree Position Showing Crown Extents and BS5837 Category C
-  Group of Trees
- 1/G1/H1 Tree/Group/Hedgerow Number
- A1/B1/  
C1/U BS5837 Retention Category
-  Tree Protection Fence Line
-  Special Construction Required for Tree Protection

**APPENDIX 7**

Drawing Title:	Tree Protection Plan
Project:	Hareshaw Linn Caravan Park
Drawing Number:	ARB/AE/1944/piP
Date:	July 2019
Scale:	1:200 @ A0