elliottconsultancyltd.
arboricultural consultants

Project:
'The Treehouse'

Location:
Hesleyside Huts
Northumberland

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

Ref:
ARB/AE/2185b

Date:
July 2019

Contents

1 Introduction

2 Site Information

3 Tree Quality Assessment

4 Design Proposals and Arboricultural Impact Assessment

5 Arboricultural Method Statement - Pre-construction & Site Preparation Works

6 Arboricultural Method Statement - Tree Protection measures During Construction

7 Arboricultural Method Statement - Post-construction Considerations

Appendices

1 Tree Details

Tree Group Details

2 Arboricultural Tasks Sequence Table

3 Construction Exclusion Zone Notice

4 Protective Fencing Specification

5 Ground Protection Guidelines

6 'Terram' No Dig Construction Note

7 Tree Constraints Plan

8 Tree Impact Plan

9 Tree Protection Plan

1 Introduction

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 5th July 2019.

1.3 **Scope of the report:**

- This report provides arboricultural information and advice in relation to the proposed construction of a 'Treehouse' holiday residence adjacent to woodland at Hesleyside – as shown within Appendix 8.
- 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.
- Within the Arboricultural Tasks Sequence Table (Appendix 2), is a timescale for implementation of any tree works and protective measures in reference to the construction period.

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 3-9.**

2 Site Information

2.1 The site is located to the northwest of Bellingham, to the west of the River North Tyne in Northumberland, and is within the grounds of Hesleyside Hall. Figure 1 shows the approximate location of the 'Treehouse'.

Figure 1: Approximate location of 'Larch Tower' in red.

2.2 Tree cover pertinent to the proposals includes two mature parkland trees within the field and an adjacent woodland block plantation of mixed species.

2.3 Any visibility constraints encountered are noted within the survey data (Appendix 1).

3 Tree Quality Assessment

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.

3.2.4 **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. The proposals include the construction of a new holiday residence located within the north-eastern corner of the field as shown in Appendix 8.

4.2 **Potential Conflict 1: Loss of trees to allow construction.**
No trees require removal to allow construction.
Mitigation / Countermeasure: No mitigation or countermeasures are required.

4.3 **Potential Conflict 2: Damage to surrounding trees during construction.**
Damage could be caused to trees during the construction phase due to impact or root damage.
Mitigation / Countermeasure: The proposals allow the positioning of the new structure to be generally free from root protection areas (RPA's). Where it does enter the RPA's of Trees 1 & 2 the design proposes to use screw pile foundations with a clear gap being maintained underneath the structure to the ground level. As such it is not expected that any significant damage or impact will be caused. A working zone is shown around the structure within which ground protection can be installed prior to construction which will remove the potential for significant compaction damage occurring to the ground during construction This ground protection can be installed prior to construction and demarcated by immoveable fencing in accordance with **BS5837:2012** '*Trees in relation to design, demolition and construction – Recommendations*'.

4.4 **Potential Conflict 3: Location of utility runs within Root Protection Areas.**
Damage can be caused to roots during the installation of utilities runs.
Mitigation / Countermeasure: Where waste water is taken from the structure it is proposed to be taken to the northeast into the woodland before entering into a septic tank with two chambers. Where installing the piping and septic tanks in the woodland the work will be almost perpetually within adjacent tree RPA's and as such could result in root damage. With no obvious preferential or advantageous route being visible, it is recommended to generally locate the piping equidistant between tree stems to minimise root disturbance. In the woodland all work will be undertaken by hand without necessity for larger machinery, placing the piping at 300mm depth.

Short lengths of drainage pipe can be installed in short-trench sections, allowing for all larger tree roots (40mm plus) to be retained where encountered. Backfilling the trench will be undertaken immediately following installation to limit any potential root damage due to desiccation or drying out of subsoils.

4.5 **Potential Conflict 4: Location of car park bays within Root Protection Areas of Trees CP1 & CP2.**

It is proposed that a new two car parking area will be located on the southern access road that could cause damage to the roots of the two adjacent trees during the installation of the parking bays.

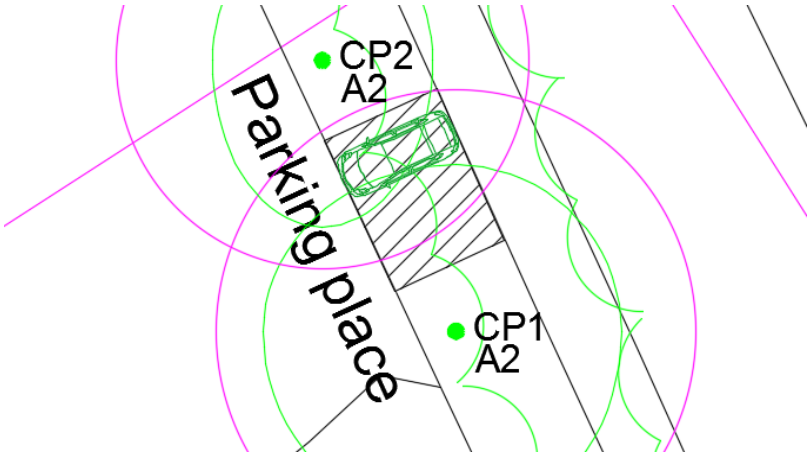


Figure 2: Parking area hatched at the side of the southern access road.

Mitigation / Countermeasure: A conventional constructed parking area would damage surface roots, however if the parking bays are constructed using a low impact and limited excavation specification (such as the above ground Terram type method shown in Appendix 6) any significant impact can be avoided. All ground preparation prior to instalment must be undertaken by hand and without necessity for larger machinery that may cause root damage and compaction.

Figure 2: Area for parking

4.6 **Potential Conflict 5: Damage to trees to construct footpaths.**

Footpath links between the car parking area and the new structure could cause damage to trees.

Mitigation / Countermeasure: Where footpath links are required, as noted in other locations on site, they will be informal and lightweight in construction. Generally this will not require excavation but will use lightweight and permeable wearing layers being placed onto ground cleared of vegetation and with a pinned board edge used to retain the covering as necessary. All installation will be undertaken by hand and without necessity to use machinery.

5 Pre-construction and Site Preparation Works

5.1 Refer to Appendix 2 for stage specific tasks.

5.2 Place tree protection barriers according to the locations found on the Tree Protection Plan (Appendix 9). The fence should conform to the specification within Appendix 4. All weather notices should be attached to the fencing marked with the following: '*Construction Exclusion Zone - Keep Out'* (a notice is provided within Appendix 3).

5.3 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 construction

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 Building material storage and operations that can contaminate soil, such as cement mixing, must be confined to areas outside the construction exclusion zone.

6.4 Fires should not be lit.

6.5 The trees should not be used to attach notices, cables or other services.

6.6 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).

6.7 When constructing parking areas on southern access road a ‘non-dig’ cellular construction specification will be used. All preparation work will be undertaken by hand.

7 Post-construction Considerations

7.1 Refer to Appendix 2 for stage specific tasks.

7.2 Only once all construction works have been completed can the protective fencing be removed.

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-catagories1, 2, & 3 – details of which are shown in appendices.

Tree Survey Data

No.	Species	Age	DBH	Stems	Height	Crown Spread				CH	EstD	General Observations	EstCont	BS Cat	Recommendation
						N	S	E	W						
1	Scots Pine	M	140	1	17	6	9	8	8	1	N	Co-dominant stems at 1.8m with tight fork - union appears ok. Large spreading form. Minor deadwood in crown.	40+	A1	No work required
2	Sycamore	M	73	1	14	6	7	7	6	2	N		40+	A1	No work required
CP1	Sycamore	M	73	1	20	6	7	6	7	10	N		40+	A2	No work required
CP2	Sycamore	M	63	1	20	5	6	4	4	6	N		40+	A2	No work required

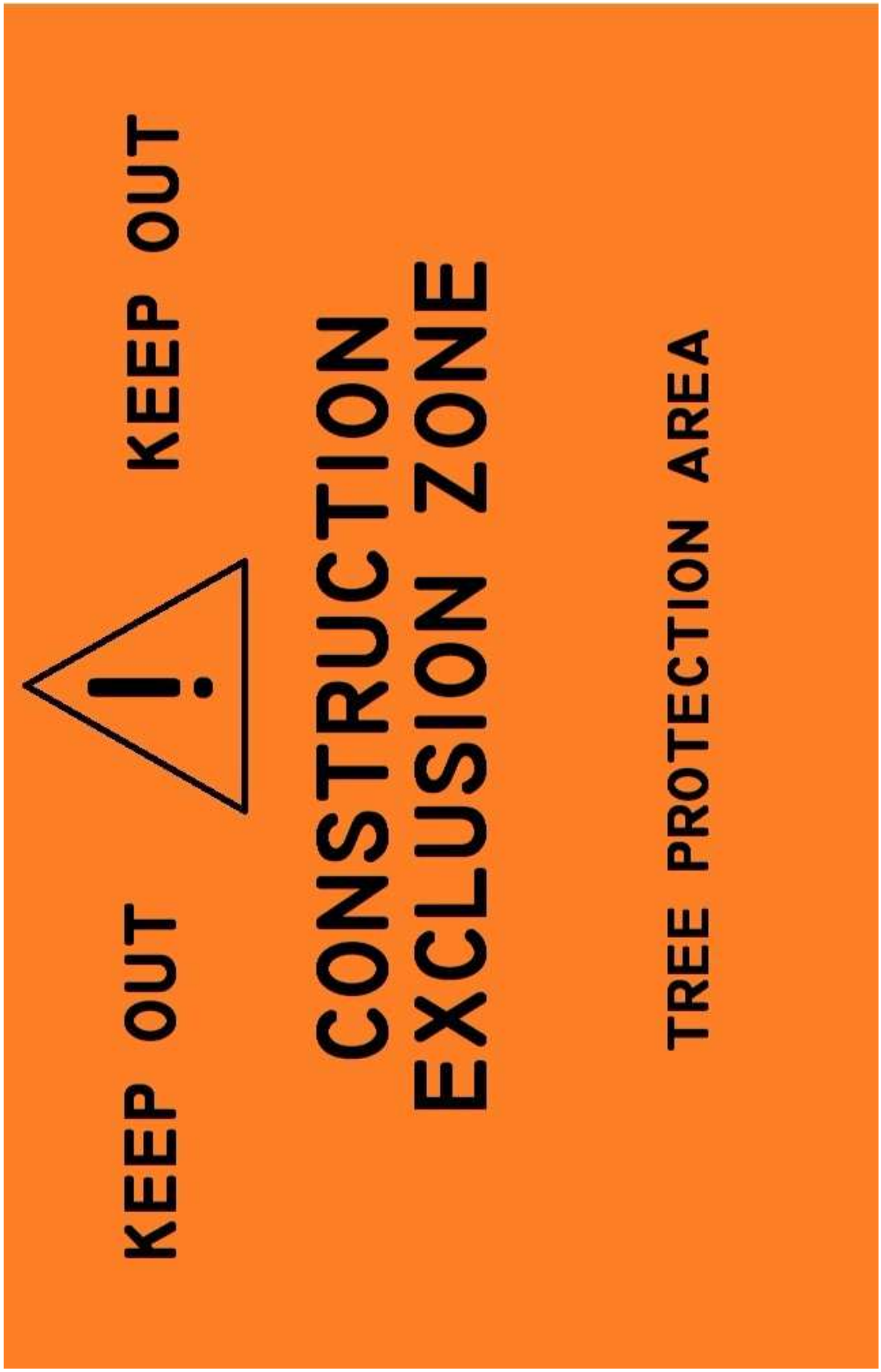
Group Data

Group Number	Dominant Species	Lesser Species	DBH	Average Height	Age	Average Spread	Condition/Comments	Recommendations	EstCont	BS Cat
1	Scots Pine Larch spp Spruce spp Birch spp	Beech	40	20	SM	4	Mixed plantation. 3-5m spacings.	No work required	40+	A2

Appendix 2: Arboricultural Tasks Sequence Tables

Tree or Group Number	Pre-Construction Stage	Construction Stage	Post Construction Stage
All trees.	Adhere to Section 5. Set out and erect protective fencing as per Appendices 4 & 9. Attach notice in Appendix 3.	Adhere to specification within Section 6. Monitor integrity of fencing and tree protection area.	Adhere to specification within Section 7. Remove tree protection measures.

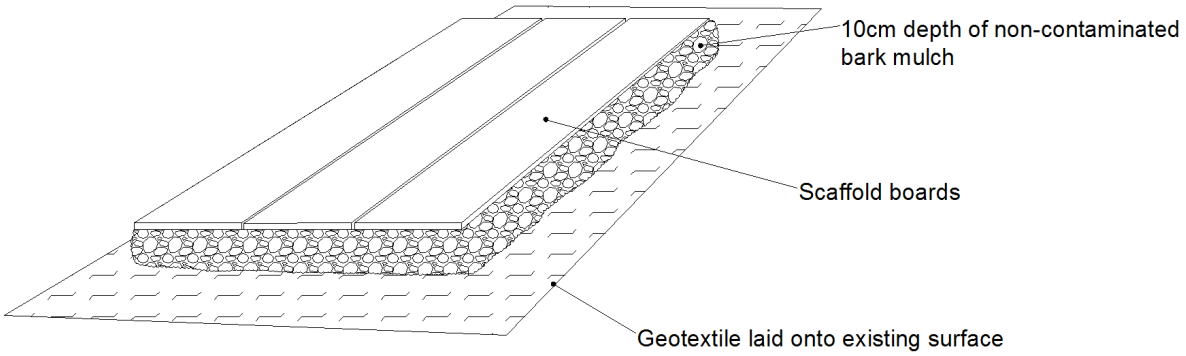
Appendix 3: Construction Exclusion Zone Notice



Appendix 4: Protective Fencing Specification

Appendix 5: Ground Protection Guidelines

Ground Protection to Enable Access for Pedestrians within Root Protection Areas



For pedestrian operated machinery with a maximum gross weight of 2 tonnes, 15cm of bark mulch on top of a geotextile topped with interlocking ground reinforcement boards would be suitable. For vehicles exceeding 2 tonnes gross weight, suitable ground protection to enable access within a root protection area would need to be designed by an engineer in conjunction with an arboriculturalist. Scaffold can be placed over this ground protection with the lowest level being placed above the ground protection boards.

Examples of interlocking ground protection mats such as the *Trakmat* of *Euromat* would be the recommended final layer.

Figure: Trakmat

Figure: Euromat

TERRAM

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.

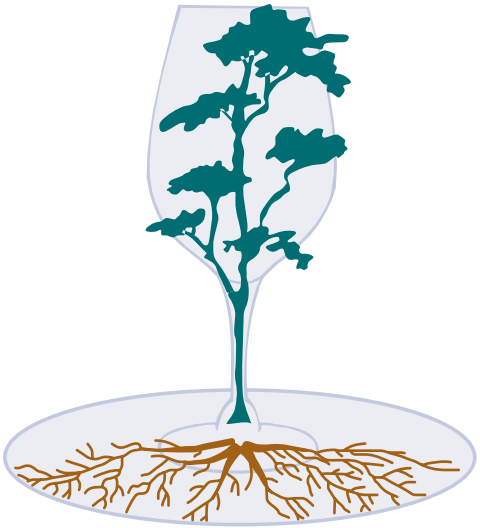


Figure 1

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.

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**

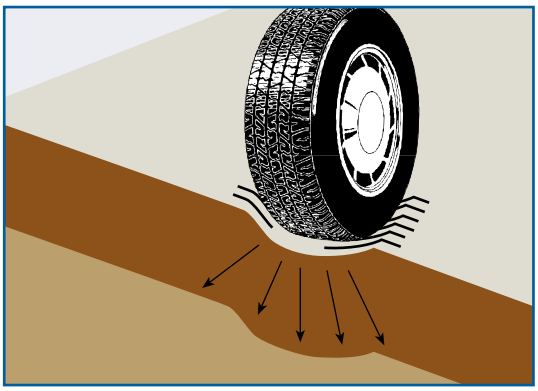
Thus, APN1 advised that driveways could be installed within the root protection zone provided that an above-ground, no-dig construction was used. This advice was incorporated into the recent British Standard which recommended that the most effective means of achieving this was through the use of a three-dimensional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

Terram Geocell ground protection

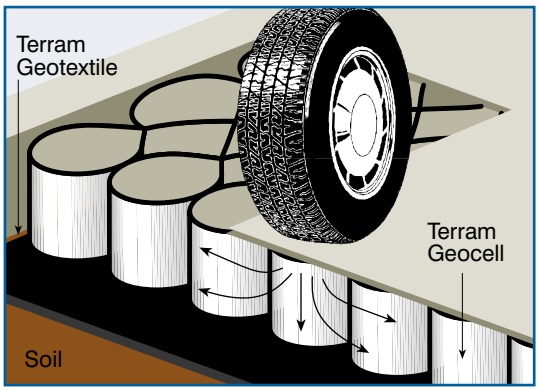
Terram Geocell is an ideal solution for providing ground reinforcement within tree protection areas. It confines fill material within its strong yet flexible cell structure in order to provide a stable base for traffic and an even load distribution (Figures 3 and 4). A big advantage of Terram Geocell 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

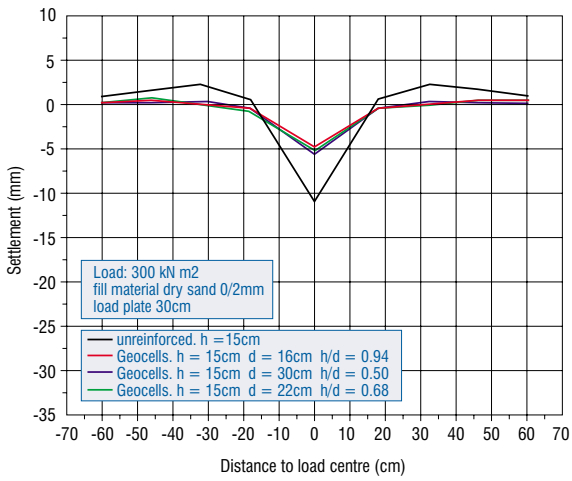


Figure 4. Static loading tests of up to 300kN/m2 revealed only minimal deflection (<5mm) of the surface of filled Geocell

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.

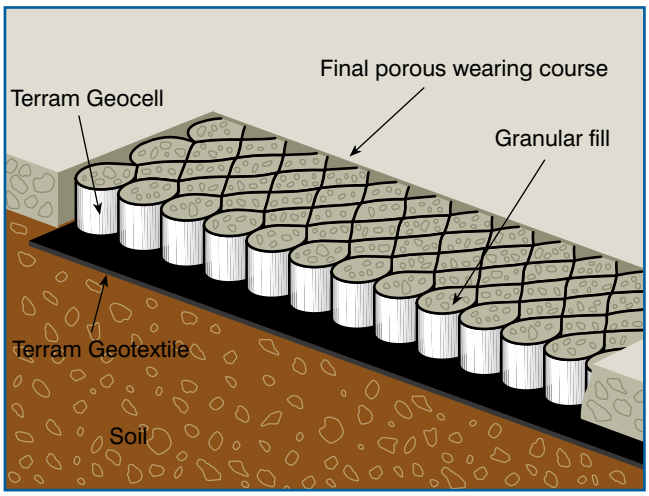


Figure 6. Components of an above-ground load-bearing platform suitable for vehicles

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 paviours 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

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 Web: 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.

130m

131m

132m

133m

134m

2
A1

1
A1

Tree Group 1
A2

1

2

3

4

elliottconsultancyltd.
arboricultural consultants

Wrens Nest, Underhill, Glaisdale
North Yorkshire YO21 2PF
01947 897001
enquiries@elliottconsultancy.com

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

Root Protection Area - to remain free from disturbance

Group of Trees

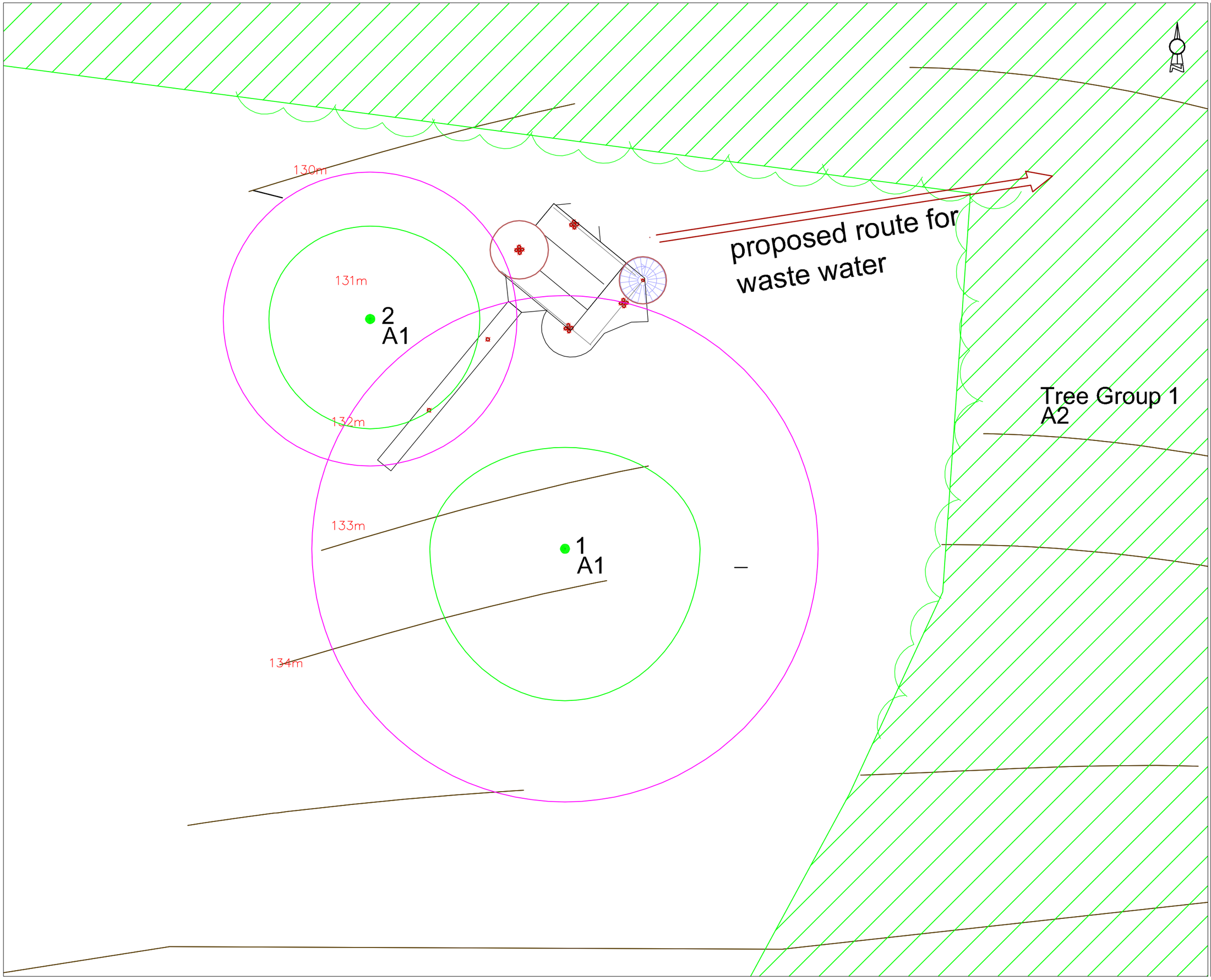
Photo Number, Position and Aspect

1/G1 Tree/Group

A1/B1/C1/U BS5837 Retention Category

APPENDIX 7

Drawing Title:	Tree Constraints Plan
Project:	Hesleyside Huts - Treehouse
Drawing Number:	ARB/AE/2185b/TCP
Date:	July 2019
Scale:	1:200 @ A3



elliottconsultancyltd.
arboricultural consultants

Wrens Nest, Underhill, Glaisdale
North Yorkshire YO21 2PF
01947 897001
enquiries@elliottconsultancy.com

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

Root Protection Area - to remain free from disturbance

Group of Trees

1/G1 Tree/Group

A1/B1/ C1/U BS5837 Retention Category

APPENDIX 8

Drawing Title: Tree Impact Plan

Project: Hesleyside Huts - Treehouse

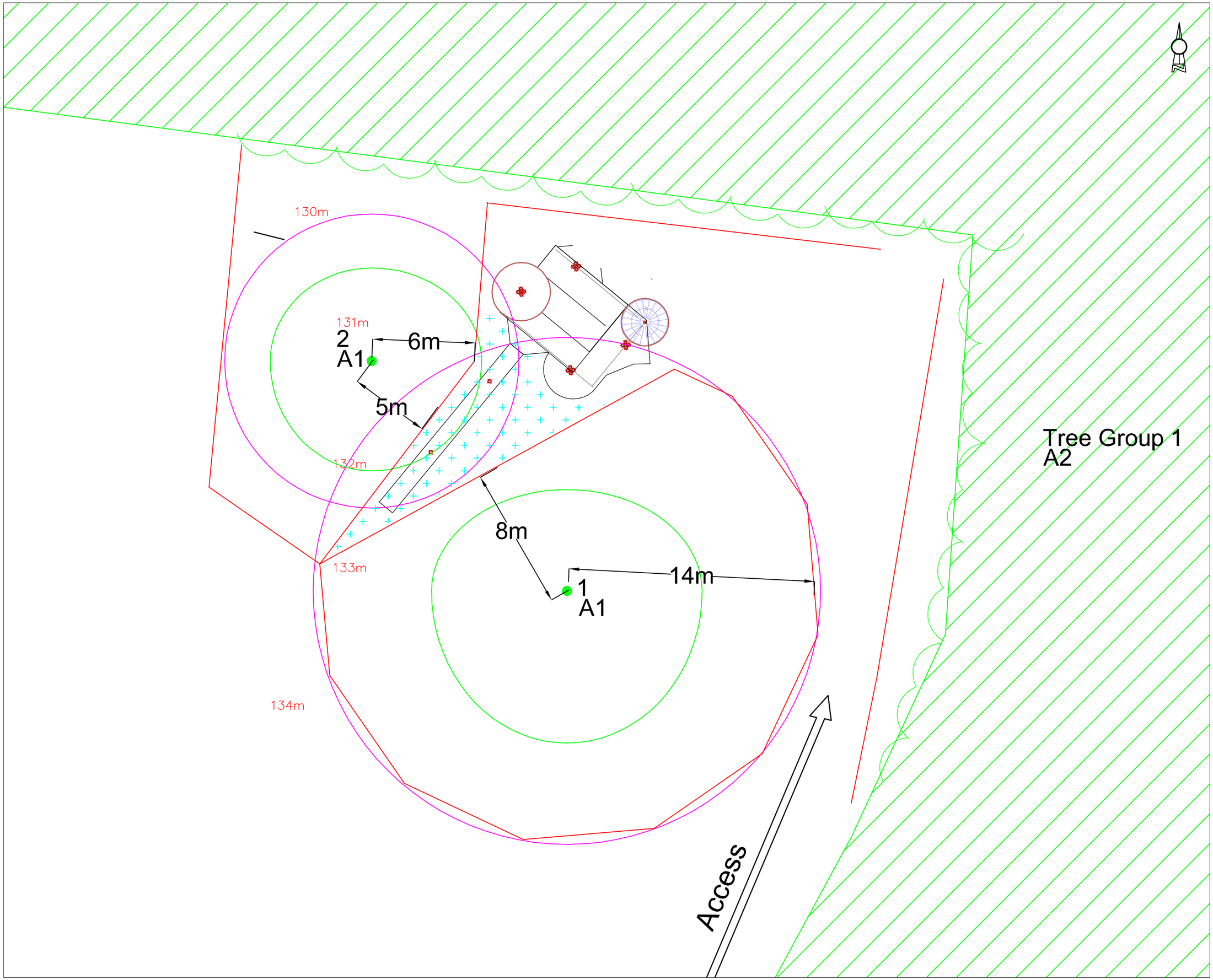
Drawing Number: ARB/AE/2185b/TiP

Date: July 2019

Scale: 1:200 @ A3

elliottconsultancyltd.
arboricultural consultants

Wrens Nest, Underhill, Glaisdale
North Yorkshire YO21 2PF
01947 897001
enquiries@elliottconsultancy.com



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

Root Protection Area - to remain free from disturbance

Group of Trees

1/G1 Tree/Group

A1/B1/C1/U BS5837 Retention Category

Ground Protection Zone

Tree Protection Fence

APPENDIX 8

Drawing Title:	Tree Protection Plan
Project:	Hesleyside Huts - Treehouse
Drawing Number:	ARB/AE/2185b/TpP
Date:	July 2019
Scale:	1:200 @ A3