

Tree Survey Report (BS5837:2012)



Proposed Keyline Development, Plot 2, Hermitage Park, Harts Farm Way, Havant, Hampshire, PO9 1JN

March 2017

Revision A - 6 April 2017

Prepared by



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Summary

The trees in this report have been assessed in accordance with BS 5837:2012 "Trees in relation to design, demolition and construction - Recommendations" in connection with an application for planning consent for a new Keyline development (Class B8) consisting of a Tempastore with office cabin and hardstanding for lorry movement, parking and external racking on land at Hermitage Park, Harts Farm Way, Havant, Hampshire.

There are several existing trees within the site, all located around the boundary, which have been recorded in this survey within 6 groups.

The trees are not located within a Conservation Area and none of the trees are covered by Tree Preservation Orders as confirmed by a search of Havant Borough Council's online database.

Construction of the development, including the area of hard standing to the north, does not require the removal of any trees. The concrete yard and perimeter fencing does however have the potential to impact upon the retention of the trees on the boundary as work will encroach within the Root Protection Area (RPA) and therefore requires a "no dig" construction method and should follow the Arboricultural Method Statement (AMS) to ensure the existing tree population is retained unaffected by the development.

There are no category A or B trees on site. All trees recorded are either category C2, low quality trees, albeit with some visual amenity, or category U trees that are dead or showing signs of significant and/or irreversible overall decline.

The Local Authority should rest assured that consultation with the designers has ensured that the trees along the northern boundaries can remain undisturbed and safeguarded during the construction works by following the recommended AMS, so the trees are retained unharmed to ensure the visual amenity of the shelterbelt planting is retained.

1 Introduction

1.1 The advice contained within this tree survey report has been prepared for the applicant, Travis Perkins, in respect of existing trees on land off Harts Farm Way, Hermitage Park, Havant, in proximity to the proposed redevelopment in response to correspondence from Jamie Gargett, Arboriculture, Havant Borough Council.

1.2 The report seeks to:

- Assess the quality of the trees in proximity to the proposed construction works and calculate the Root Protection Area (RPA)
- Determine if any trees are legally protected by Tree Preservation Order (TPO)
- Provide an *Arboricultural Method Statement* with regard to work within the Root Protection Area

1.3 Following the site visit, preparation of the tree survey data and discussion period with the designer, this arboricultural information is provided.

1.4 The report is based on the following drawings supplied by the client's designer:

- Topographical Survey reference 10461-1 dated 06.09.06 by Greenhatch
- Keyline Havant-Site 2-Feasibility 1.3 dated 13.10.16 by Travis Perkins
- Site visit by Encon Associates 22.03.17

2 Limitations & Methodology

2.1 The survey is concerned with the arboricultural aspects of the site only. The trees on site have been surveyed and classified in accordance with BS 5837:2012 "Trees in relation to design, demolition and construction - Recommendations".

2.2 The survey was undertaken using the Visual Tree Assessment (VTA) methodology to conduct a preliminary assessment of the above ground portion of the tree.

2.3 Trees are large dynamic organisms whose health and condition can change rapidly, therefore due to their changing nature and other site considerations, this report and

any recommendations made are valid for the 12 month period following the site survey which was conducted on 22 March 2017. After a period of 5 years, the information in this survey should not be relied upon.

- 2.4 The survey has been conducted in accordance with the Terms and Definitions contained in Section 3 of BS 5837:2012 ie carried out by an arboriculturalist or a competent person.

Third Party Liability

- 2.5 The limit of Encon Associates Limited indemnity over any matter arising out of this report extends only to the instructing client. Encon Associates Limited cannot be held liable for any third party claim that arises following this report.

Subsistence Risk

- 2.6 This report is primarily concerned with the condition of existing trees and applying current guidance for their retention. Any discussion on soil characteristics is only presented where this may have a direct effect on tree growth. This report does not seek to address the specific area of subsidence risk assessment or damage to existing buildings or structures.

Survey Methodology

- 2.7 The survey was undertaken from ground level with the aid of binoculars where necessary.
- 2.8 No aerial inspection nor invasive probing or drilling has been undertaken. No excavations were carried out nor soil or root samples taken.
- 2.9 The height of the tree was measured using digital Leica Disto surveying equipment.
- 2.10 The canopy spread of the trees were measured on four compass points using measuring tape.
- 2.11 The locations of the trees have been taken from the topographical survey information provided and verified during the site visit.

2.12 The information contained within the “Schedule of Trees” includes the following for each surveyed tree:

- 1 Tree reference number - cross referenced with the Tree Survey Plan drawing number A3118-01 and the Tree Constraints Plan A3118-02
- 2 Species - have been given their common and botanical name where specifically known
- 3 Height - measured on site
- 4 Stem diameter - calculated by measuring the circumference at a height of 1.5m from ground level to determine the diameter
- 5 Branch spread - indicated on the tree survey plan to be representation of the overall spread of the crown in each compass direction
- 6 Height of crown clearance - given in metres above adjacent ground level
- 7 Age class - young (YNG) up to 10 years, semi-mature (SM) 1/3 life expectancy, early mature (EM) 2/3 life expectancy, mature (M) over 2/3 life expectancy, over mature (OM) declining/moribund, veteran (V) exceptionally old tree at the end of its life
- 8 Condition & Comments - good (G) sound tree needing little or no attention, fair (F) minor but rectifiable defects, poor (P) major structural and/or physiological defects that would be inappropriate to retain and/or expensive, dead (D) no longer alive or those dying and unlikely to recover. General observations on ‘physiological/structural condition’ and ‘preliminary management’ is also provided
- 9 Estimated remaining contribution - in years eg less than 10, 10-20, 20-40, over 40
- 10 Category grading - given a grade to classify the quality based on the Condition Classes and subcategories given overleaf
- 11 RPA - Protective measures as per BS 5837 which states that an area based on a radius equal to 12 times the stem diameter should be protected against damage to roots known as the “Root Protection Area” (RPA) given in m²

2.13 Category grading for the assessment of tree quality (in accordance with Table 1 "Cascade chart for tree quality assessment" within BS 5837:2012) is described below:

U Trees unsuitable for retention - Those in such a condition that they cannot be realistically be retained as living trees in the context of the current land use for longer than 10 years

A Trees of high quality - With an estimated remaining life expectancy of at least 40+ years

B Trees of moderate quality - With an estimated remaining life expectancy of at least 20-40 years

C Trees of low quality - with an estimated remaining life expectancy of at least 10-20 years, or young trees with a stem diameter below 150mm

2.14 Subcategories grading for the assessment of tree quality (in accordance with Table 1 "Cascade chart for tree quality assessment" within BS 5837:2012) is described below:

1 Mainly arboricultural qualities - Trees that are a particularly good example of their species, especially if rare or unusual

2 Mainly landscape qualities - Trees, groups or woodlands of particular visual as arboricultural and/or landscape features

3 Mainly cultural values, including conservation - Trees, groups or woodlands of significant conservation, historical, commemorative or other value eg veteran trees or wood-pasture

For full description of subcategories, refer to Table 1, page 9 of BS 5837:2012

3 Project Requirements & Site Overview

The Site

- 3.1 The application site is within land between Harts Farm Way and the A27 at Hermitage Park, Havant and includes areas of existing hard standing, groups of trees and woodland block to the north adjacent to the motorway.

Proposed Development

- 3.2 The proposed works entail the construction of a new Keyline development (Class B8) consisting of a Tempastore with office cabin and hardstanding for lorry movement, parking and external racking.

Tree Removal

- 3.3 Construction of the development, including the area of extended hard standing to the north does not require removal of any trees. There are no category A or B trees on site. All are either category C2, low quality trees albeit with some visual amenity, or category U trees that are dead or showing signs of significant and/or irreversible overall decline.
- 3.4 The majority of trees along the northern boundary can remain undisturbed to ensure the visual amenity of the shelterbelt is retained, including the trees located off site adjacent to the A27 which will continue to provide screening of the site.
- 3.5 The concrete yard and perimeter fencing does however have the potential to impact upon the retention of the trees on the boundary as work will encroach within the Root Protection Area (RPA) and therefore requires a “no dig” construction method and should follow the Arboricultural Method Statement (AMS).

4 Baseline Factors

Tree Preservation Orders (TPO) or Conservation Area (CA) Designation

- 4.1 The site falls within the planning jurisdiction of the Havant Borough Council and is located adjacent to the A27 motorway, to the south west of Havant within an area of existing industrial estate.
- 4.2 The trees are not located within a Conservation and none of the trees are covered by Tree Preservation Orders as confirmed by a search of Havant Borough Council's online database (see appendix for details).

Existing Trees

- 3.6 There are several existing trees and groups of trees within the site, mainly located around the boundary within a shelterbelt on the northern boundary adjacent to the A27 motorway, which have been recorded in this survey, including 6 groups in total.
- 3.7 Most of the trees have been classified as grade C2, ie trees of low quality, present in groups, conferring on them greater collective landscape value rather than individual arboricultural merit. There are some very poor trees which have been given a U classification ie trees that are dead or showing signs of significant and/or irreversible overall decline, which are recommended for removal. Details of the Root Protection Area (RPA) is provided on the Tree Survey Plan appended to this report.
- 4.3 A tree schedule containing full details of the survey is also attached in the appendix.

Root Protection Area (RPA)

- 4.4 The Root Protection Area (RPA) of a tree is defined in BS 5837 as the area surrounding the trunk that contains sufficient rooting volume to ensure the survival of the tree and is calculated as an area based on the stem diameter of the tree.

- 4.5 Detailed analysis of the ground conditions has not been carried out, however a visual assessment concluded that the trees appear to be growing in reasonable soils and growing medium, albeit in some very restricted areas in proximity to paved surfacing which is likely to have influenced the morphology and disposition of the root system.
- 4.6 Tree root systems are typically concentrated within the uppermost 600mm of the soil, although it may be deeper within the dense mass of roots and soil closer to the base of the tree, particularly in more mature trees. The development of the roots is influenced by the availability of water, nutrients, oxygen and soil penetrability ie how compacted the ground is and therefore the root spread does not generally show the symmetry seen in the branch system. The trees in this survey are likely to have been influenced by proximity to surrounding structures and compacted ground conditions and proximity to the adjacent roads and hardstanding areas. Some of the trees have established into reasonable specimens whilst others are struggling due to the constraints of adjacent hard standing and of low arboricultural value. Whilst some of the trees have defects such as deadwood, or lower branches which would benefit from crown lifting, they do offer some visual amenity to the area.

5 Arboricultural Implications Assessment

- 5.1 This section considers the implications that the proposed development will have upon the existing trees, to provide advice and solutions to any implications to ensure those trees worth of retention are safeguarded from damage during construction and once the development is operational.
- 5.2 The proposal to construct a new Keyline development (Class B8) consisting of a Tempastore with office cabin and hardstanding for lorry movement, parking and external racking. Areas of hardstanding will encroach within the RPA of some of the trees along the northern boundary. All trees can be retained as part of the finished site and should be protected during the construction works using protective barrier

fencing, to ensure they remain part of the overall site once the construction has been completed.

- 5.3 New kerbs and paved areas are proposed within the RPA of some trees, including an hard standing area has the potential to cause damage to the existing roots if present. It is therefore recommended that a “no dig” specification is applied to the surfacing within the RPA in these areas to ensure that no roots are damaged by ground excavations. A cellular confinement system such as Terram Geocell should be used to protect the ground from excavations and compaction when constructed the new surfacing within the root protection areas of the adjacent trees.
- 5.4 Any fencing to be erected close to the trees within the RPA has the potential to cause damage to the roots and should therefore be installed in accordance with the Arboricultural Method Statement appended to this report.
- 5.5 Construction works should follow the Arboricultural Method Statement in Appendix D at the back of this report.

6 Tree Protection Measures

- 6.1 The close proximity of construction activity to the trees is such that the trees should be separated from the work by protective fencing. Heras fencing should be erected to prevent damage to the trees from the construction work on site. See AMS in Appendix D for details.

7 Mitigating Tree Loss

- 7.1 Whilst a number of existing trees will be retained and will continue to provide valuable visual amenity for the site, new tree planting should be included in appropriate areas of the site to further enhance the visual amenity of the site.

- 7.2 The trees should be of a sufficient size and maturity to provide instant impact and recommended to be no less than “Heavy Standards”, 3.5-4.25m high, 12-14cm girth with a 1.75-2.0m clear stem, located in strategic positions.

8 Conclusions

- 8.1 There are several existing trees within the site, all located around the boundary, which have been recorded in this survey within 6 groups.
- 8.2 The trees are not located within a Conservation Area and none of the trees are covered by Tree Preservation Orders as confirmed by a search of Havant Borough Council’s online database.
- 8.3 Construction of the development, including the area of hard standing to the north, does not require the removal of any trees. The concrete yard and perimeter fencing does however have the potential to impact upon the retention of the trees on the boundary as work will encroach within the Root Protection Area (RPA) and therefore requires a “no dig” construction method and should follow the Arboricultural Method Statement (AMS) to ensure the existing tree population is retained unaffected by the development.
- 8.4 There are no category A or B trees on site. All trees recorded are either category C2, low quality trees, albeit with some visual amenity, or category U trees that are dead or showing signs of significant and/or irreversible overall decline.
- 8.5 The Local Authority should rest assured that consultation with the designers has ensured that the trees along the northern boundaries can remain undisturbed and safeguarded during the construction works by following the recommended AMS, so the trees are retained unharmed to ensure the visual amenity of the shelterbelt planting is retained.

Appendix A - Schedule of Trees

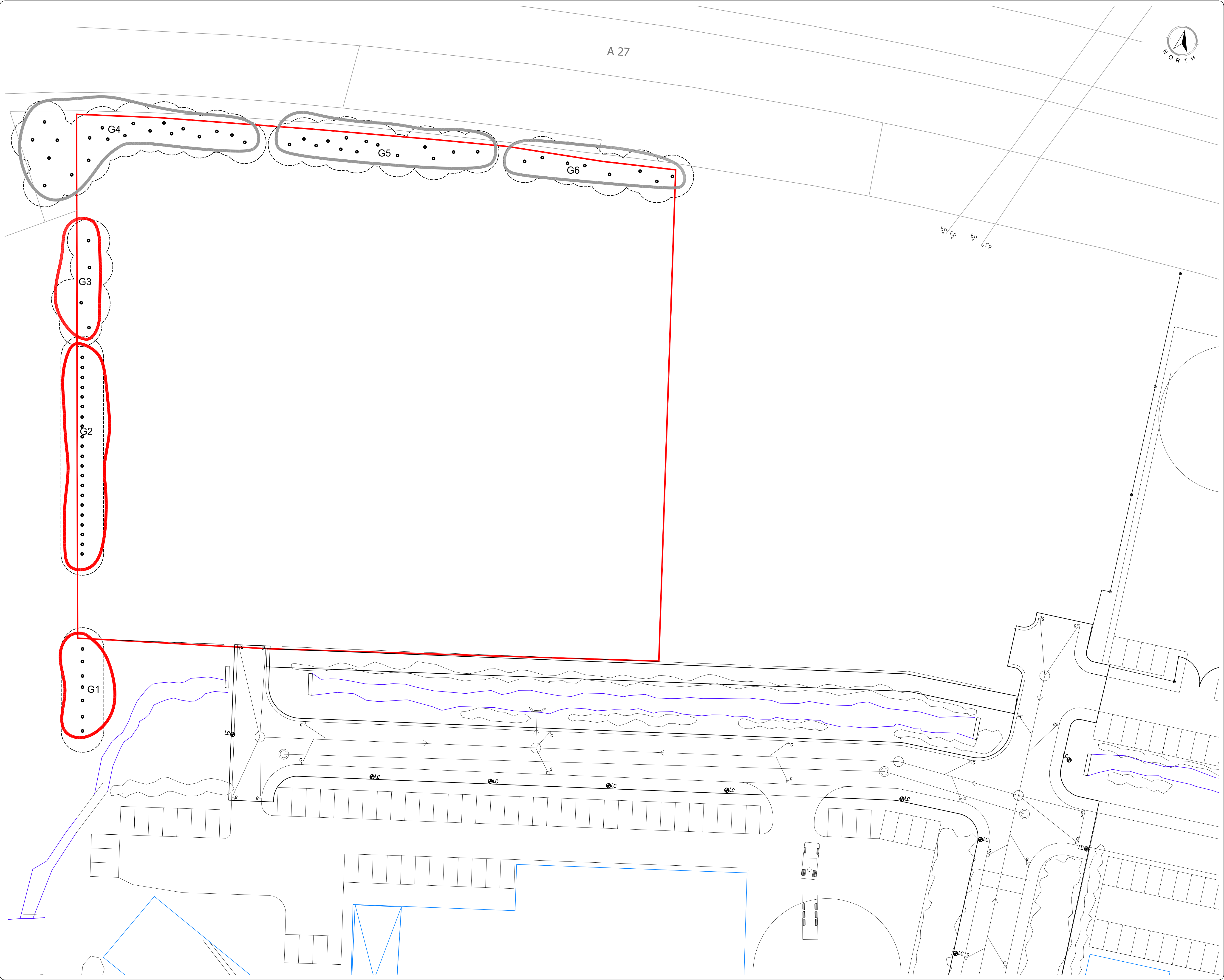
Site: Harts Farm Way, Havant

Date: 22-Mar-17

Weather: Bright

Ref	Species	Height (m)	Stem Diameter (mm)	Branch spread (m)				Height crown clearance (m)	Age class	Condition & Comments	Years left	Category grading	RPA (m²)	RPA radius
				N	E	S	W							
G1	Leylandii (Leyland cyprus)	12	300	5	5	5	5	0.5	OM	Poor. Group of 7, multi stem conifers left un-maintained for several years.	0	U		
G2	Leylandii (Leyland cyprus)	15	300	8	8	8	8	1.5	OM	Poor. Group of 29 multi stemmed conifers left un-maintained for several years. Poor form and structure.	0	U		
G3	Alnus glutinosa (Alder)	14	300	4	4	4	4	5	M	Poor. Group of 4 Alder trees with Cherry interspersed. 2 Alder dead or dying. Mature Ivy growth.	0	U		
G4	Mixed deciduous woodland	12	250	3	3	3	3	6	M	Fair. Mix of several Ash, Lime and Sycamore.	20	C2	28	3.00
G5	Mixed deciduous woodland	12	200	2	2	2	2	6	M	Fair. Mix of several Ash, Lime and Sycamore with some poor Oak and Conifers	20	C2	18	2.40
G6	Mixed deciduous woodland	12	200	2	2	2	2	6	M	Fair. Mix of several Ash, Lime and Sycamore with some poor Conifers present.	20	C2	18	2.40

Appendix B - Tree Survey Plan & Tree Constraints Plan



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Notes:

Key to Tree Survey Plan

The RPA (Root Protection Area) is the zone in which the root system is believed to be concentrated, has been calculated for each tree within the site boundary. The results can be found with the Tree Report.

The branch spread of each tree is indicated by the size of the circle representing the tree.

- This drawing is based on:
- Topographical Survey reference 10461-1 dated 06.09.06 by Greenhatch
 - Site visit by Encon Associates 22.03.17

RPA shown as a dashed circle around each tree with the Reference Number

T1

Class A

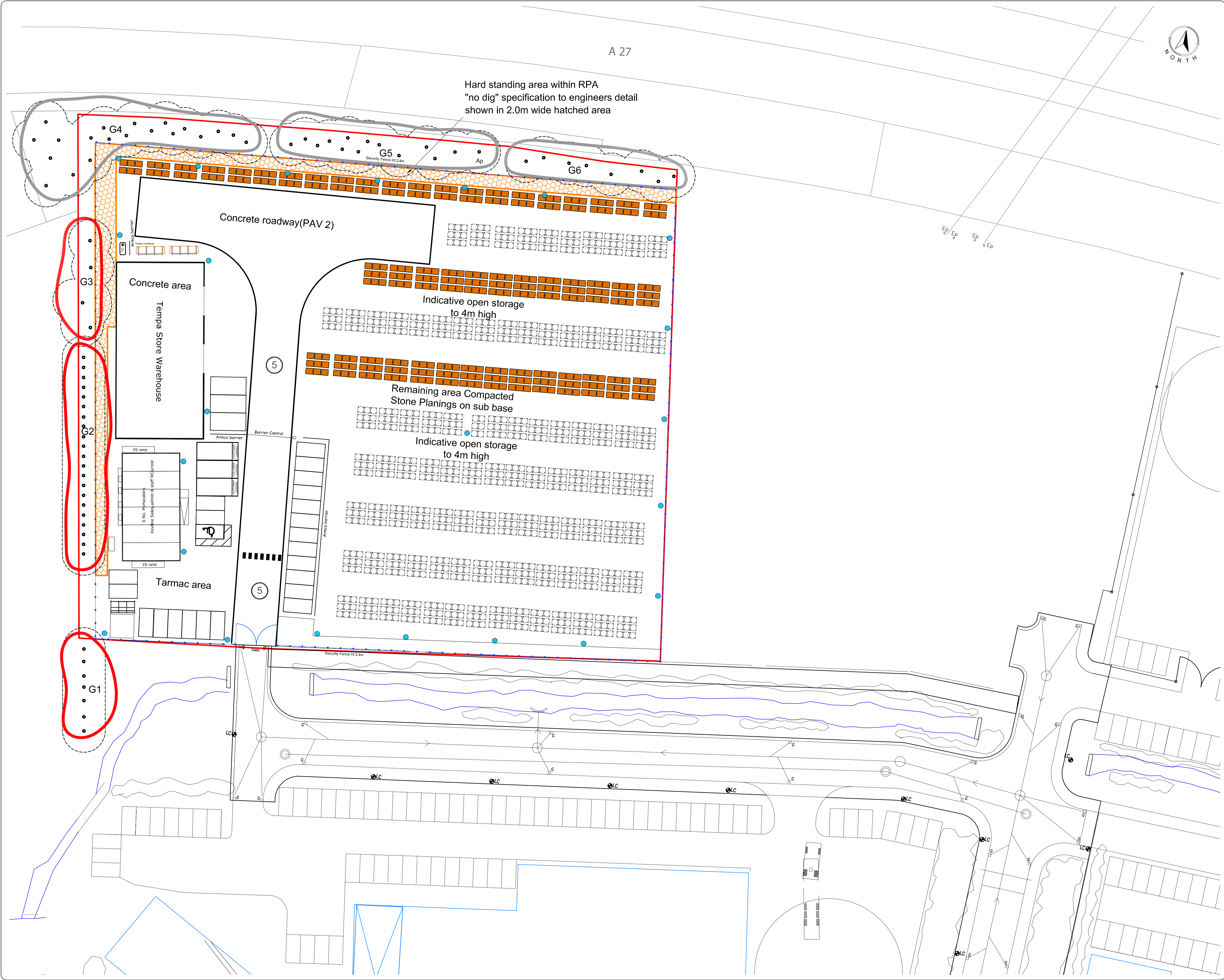
Class B

Class C

Class U

For full details of the tree classifications, refer to the Tree Report.

Rev	Date	Description	Drawn	Checked
Client				
Travis Perkins				
Project				
Keyline, Plot 2 Hermitage Park, Harts Farm Way Havant, PO9 1JN				
Title				
Tree Location Plan				
Drawing Status				
FOR PLANNING APPROVAL				
Drawn	MJB	Checked	GM	
Date	22.03.17	Scale (A1)	1:250	
 Head Office 10 Chapel Lane Nottingham NG5 7DR ■ T: 0115 987 55 99 ■ E: enquiries@enconassociates.co.uk ■ W: www.enconassociates.co.uk				
Environmental Consultants to the Construction Industry				
■ BREEM ■ Code for Sustainable Homes Assessors ■ Landscape Architecture ■ Highway Engineers ■ Life Cycle Costing ■ Energy Assessment ■ SAP ■ EPC ■ BREEAM ■ Daylight Calculations				
Job Number	Drawing Number	Rev		
A3118	01	A		



A 27

Hard standing area within RPA
"no dig" specification to engineers detail
shown in 2.0m wide hatched area



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Notes:

Key to Tree Survey Plan

The RPA (Root Protection Area) is the zone in which the root system is believed to be concentrated, has been calculated for each tree within the site boundary. The results can be found with the Tree Report.

The branch spread of each tree is indicated by the size of the circle representing the tree.

This drawing is based on:

- Topographical Survey reference 10461-1 dated 06.09.06 by Greenhatch
- Site visit by Encon Associates 22.03.17
- Keyline Havant-1.8.dwg

○ T1
RPA shown as a dashed circle around each tree with the Reference Number

○ Class A

○ Class B

○ Class C

○ Class U

○ No dig cellular confinement system within RPA

For full details of the tree classifications, refer to the Tree Report.

B 06.04.17 Revised in line with latest site plan MJB GLM

Rev	Date	Description	Drawn	Checked
-----	------	-------------	-------	---------

Client
Travis Perkins

Project
Keyline, Plot 2
Hermitage Park, Harts Farm Way
Havant, PO9 1JN

Title
Tree Constraints Plan

Drawing Status
FOR PLANNING APPROVAL

Drawn	MJB	Checked	GM
Date	22.03.17	Scale (A1)	1:250

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■ Life Cycle Costing ■ Energy Assessment ■ SAP ■ EPC ■ BREEAM ■ Daylight Calculations

Job Number	Drawing Number	Rev
A3118	02	B

Appendix C - Photographic Record



Photo 1 – View of the poor leylandii on the western boundary (G1)



Photo 2 - View of poor leylandii (G2) in a large block along the western boundary



Photo 3 - View of the group of alder (G3) including the dead tree seen leaning to the wet



Photo 4 - View of the group of alder and cherry (G4) in along the northern boundary corner of the site with the mixed woodland (G4) and the A27 beyond



Photo 5 – View of the tree mix along the northern boundary (G5)



Photo 6 - View of the tree mix along the northern boundary (G6), tall, poorly formed

Appendix D - Arboricultural Method Statement (AMS) & Tree Protection Details

The following Arboricultural Method Statement to be read in conjunction with the Tree Constraints Plan (TCP) which identifies:

- Trees to be retained
- Trees to be protected

1.1 Root Protection Area (RPA)

The Root Protection Area (RPA) required by the current edition of BS 5837:2012 relates to the stem diameter of each tree when measured at a height of 1.5m from ground level, adjusted where necessary to account for actual rooting patterns on site. The RPAs are to be afforded protection at all times and will be protected by fencing barriers. No works will be undertaken within any RPA that causes compaction to the soil or severance of tree roots.

1.2 There is no planned construction of any building foundations within any RPA around the existing trees to be retained.

1.3 The construction proposals include construction of new kerbs, surfacing and fencing within the RPA of some existing trees on site. A “no-dig” specification should be used to install the new surfacing and careful hand digging should be carried out to install the new fencing.

2.0 Protective Fencing

A protective fence should be erected prior to the commencement of any site works e.g. before any materials or machinery are brought on site, any construction work starts or any stripping of soil commences. The barrier needs to have signs attached stating that this is a Tree Protection Area and that no works are permitted within the barrier. The barrier may only be removed following completion of all construction works.

2.1 The fence is required to be sited in accordance with the TPC. The fence must ideally be constructed as per figure 2 in BS 5837:2012 (see detail at the end of this section) and be fit for the purpose of excluding any construction activity. The construction on site should be excluded from the RPA with 'Heras' type Fencing construction, along with a formal briefing of any work person by the site manager with regards to the contents of this method statement.

3.0 Precautions in respect of Temporary Works

If temporary access is required to an RPA then access may only be gained following placement of materials such as concrete slabs or geo-textile fabrics that will spread the

weight of any vehicular load and prevent compaction to the soil. For pedestrian movements within any RPA then a single thickness scaffold board on top of a compressible layer laid onto a geotextile fabric may be acceptable.

4.0 Access Details

There is no requirement for any special measures related to the retained trees if access for all construction vehicles is kept away from the trees to be retained and stay outside of the RPA.

5.0 Contractors Car Parking

This is likely to be within an existing hard standing area onsite. The area designated for parking needs to be away from the area around the trees to be retained.

6.0 Site Huts and Toilets

The area designated for site accommodation needs to be away from the area around the trees to be retained.

7.0 Storage Space

The storage of materials should ideally be on existing hard standing away from existing trees. The contractor should not store any materials on site within the RPA of an existing tree.

8.0 Additional Precautions

No storage of materials or lighting of fires should take place within the RPA. No mixing or storage of materials should take place up a slope where they may leak into a RPA.

8.1 No fires to be lit within 20 metres of any tree stem and the fire size and wind direction should be taken into account so that, no flames come within 5.0m of any foliage.

8.2 No high-sided vehicles or cranes should access the site close to any trees to be retained and should not come into contact with any branches or travel within the RPA

8.3 No notice boards, cables or other services to be attached to any tree.

8.4 Materials which may contaminate the soil should not be discharged within 10m of any tree stem. When undertaking the mixing of materials It is essential that any slope of the ground does not allow contaminants to run towards a tree root area.

9.0 Site Gradients

No alterations of soil levels to take place within the RPA of the protected trees

10.0 Demolition Works

No demolition works to take place with the RPA of the protected trees

12.0 Soft landscaping

Any new planting scheduled to be carried out within any RPA needs to be done so with consideration of the existing trees roots. Planting pits need to be hand dug, and extreme caution exercised to ensure no roots are severed during digging.

12.1 The planting scheme should select suitable species to enhance the area and consider the available rooting space, soil type, hydrology and availability of sunlight.

13.0 Use of Herbicides

No herbicide use is predicted, however if used, it should be done so in strict accordance with the manufacturer's instructions and contact with any tree foliage should be avoided.

14.0 On Site Monitoring Regime

All operations to be monitored by the main contractor. The site manager shall contact the appointed specialist if there is a breach of the RPA and tree protection measures. The appointed specialist shall recommend an action plan to incorporate mitigation measures where necessary.

15.0 Use of Sub-Contractors

The main-contractor will be responsible for ensuring sub-contractors do not carry out any process or operation that is likely to adversely impact upon any tree on site.

16.0 Contingency Plan

Water should be readily available on site to be used to flush split materials through the soil and avoid contamination to tree roots. At the time of any spillage the main contractor needs to contact an appointed specialist for advice.

17.0 Remedial Tree Works

Any remedial tree works should be undertaken prior to the commencement of construction activities. Trees on site identified to have their crowns lifted and/or formative pruning, must be carried in accordance with BS 3998 British Standard Tree Work - Recommendations 2010 by a competent tree surgeon to the following specification:

Crown Lifting & Formative Pruning:

- Where practicable, pruning should be restricted to healthy, small diameter parts of the tree to minimise the size of resultant wounds and enable these to be occluded.
- Crownlift to achieve a clearance of 6m above ground level to include complete removal of the lowest primary branches and thereafter secondary and tertiary branches, not exceeding 100mm diameter cuts. When pruning branches back to the main stem or fork, the branch will be removed in small sections using the step cut method leaving a small stub before carrying out the final cut.
- Formative pruning to growth less than 20mm in diameter to be pruned cleanly back to its point of origin, avoiding damaging the bark of the tree. Growth greater than 20mm is to be cut back to avoid damage to the branch bark ridge and collar if applicable. All pruning carried out using a sharp handsaw or secateurs. On no account will a chainsaw be used in this operation. All shoots will be removed back to, but not into the branch collar leaving no projections or exaggerating the size of the wound.
- Selective pruning to be carried out to remove any inner crown deadwood or to preserve the shape and habit of the tree.

18.0 Installation of Fencing within Root Protection Area

The following Arboricultural Method Statement is to be followed when installing any fencing, including any proposed boundary fencing, close to existing trees to prevent damage to roots, trunk and branches:

- Heras type protective fencing to be installed to fence off the trees from the construction activities. All fencing to be pegged and braced to resist impact and/or reinforced using horizontal rails - to resist accidental impact and make the whole fencing more inconvenient to be moved and therefore more likely to be respected by contractors during works.
- No excavations using machinery is to take place within the RPA exclusion zones. All works to be carried out in accordance with the NJUG Chapter 4 - Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees.

- Holes for fence posts to be carefully dug by hand avoiding damage to roots, particularly those of 10mm diameter and above or significant clumps of smaller roots, which may be encountered. Post hole positions must be adjusted where significant roots are encountered and/or to minimise harm to adjacent trees.
- No storage of materials or mixing of cement to take place within the RPA or at a separation of less than 10m and/or locating downhill or use of bunding so that run off cannot encroach the RPA.
- No machinery or vehicles to travel within the RPA of any tree by ensuring the protective fencing remains in place at all times during the construction works. Any plant must only operate from the site side of the pits.
- Holes dug for fence posts to be lined with polythene prior to pouring concrete to prevent cement coming into contact with tree roots to avoid contamination.
- Extreme care to be taken when installing fencing posts and panels to prevent damage to trunk or branches of the trees. The works are to be appropriately supervised at all times. The work supervisor/contracts manager is to relay the information in this report in “tool box talks” including a pre start briefing.
- No fence posts to be located within 1m of the tree trunks.
- No fence panel should be closer than 1m from the trunk to allow for future expansion of the trunks girth.
- Burying of the gravel board may cause root severance, therefore soil levels to be artificially raised to give the necessary seal between the board and the ground without excavations to prevent damage to tree roots

19.0 Responsibilities

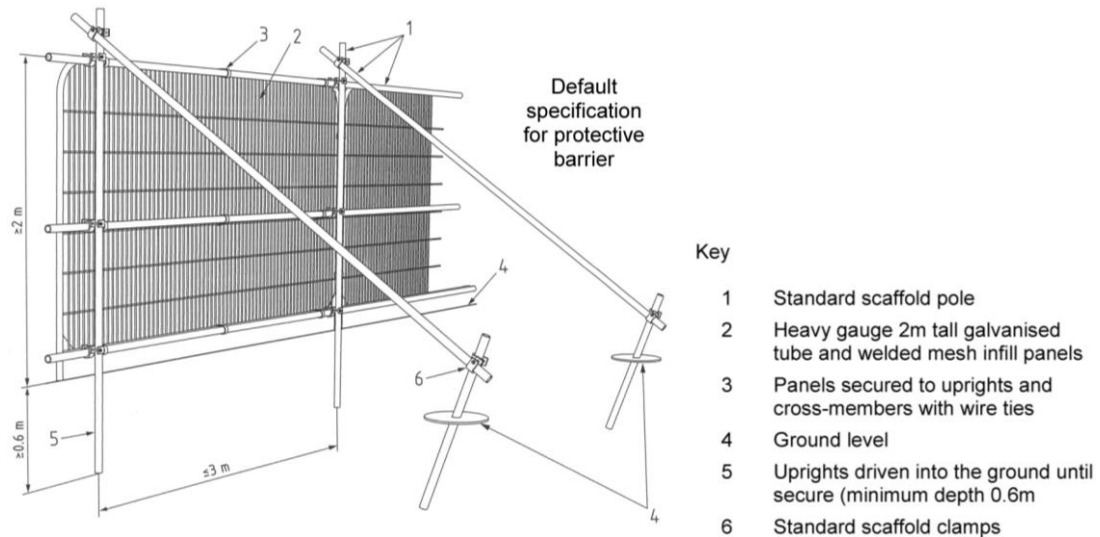
It will be the responsibility of the main contractor to ensure that the planning conditions are adhered to at all times and that a monitoring regime in regards to tree protection is adopted on site.

19.1 The main contractor will be responsible for contacting the Local Planning Authority at any time issues are raised related to the trees on site.

19.2 If at any time pruning works are required permission must be sought from the Local Planning Authority first and then carried out in accordance with BS 3998.

19.3 The main contractor will ensure the build sequence is appropriate to ensure that no damage occurs to the trees during the construction processes. Protective fences will remain in position until completion of ALL construction works on the site.

19.4 Protective fencing should be erected around all trees to be retained as per the following:



19.5 Signs, in accordance with the following example, should be displayed to inform all personnel where the tree protection zones are and to warn them not to enter, as per this example:



20.0 Construction of Hard Standing within RPA using Cellular Confinement System for Tree Root Protection

A “no dig” specification to be used to form areas of new hard surfacing to ensure the root systems of the retained trees are not damaged as a result. Terram Geocell (or similar approved) should be used in construction of new surfacing with the RPA of any trees.

SPECIFICATION & INSTALLATION GUIDANCE



TERRAM GEOCELL CONFINEMENT SYSTEM FOR TREE ROOT PROTECTION

Terram Geocell is a geocellular sub-base confinement system designed for the protection of tree roots where the construction of roads, car parks and access routes are required in the vicinity of trees and where Tree Preservation Orders (TPO) may be enforced. The structure confines and stabilises the sub-base stone ensuring that vehicle loads are dissipated, rutting and soil compaction is prevented and damage to tree roots is avoided. When installed as advised, Terram Geocell will also allow the continued passage and circulation of air, water and nutrients to tree roots to sustain a healthy growing environment as recommended by the following 2 documents:

- British Standard BS5837: 'Trees in Relation to Construction' (2005).
- Arboricultural Advisory and Information Service: Practice Note 1 – 'Driveways Close to Trees' (APN1)

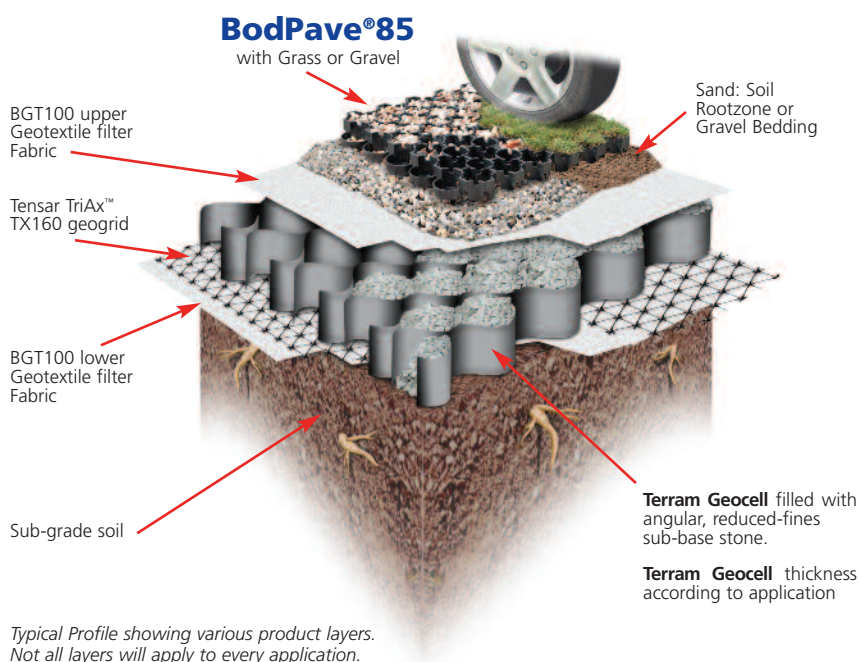
Tree Root Protection is supplied flat packed and opens to form a strong geocellular structure. It is simply pinned in place using metal fixing pins as described.

In this type of 'Reduced-Dig' or 'No-Dig' Tree Route Protection application, Terram Geocell is intended for use in conjunction with a water and gas permeable SuDS (Sustainable Drainage System) compliant pavement surface product such as BodPave[®]85 cellular plastic paving, Concrete Porous Block Paving or Porous Asphalt surfaces. Although Terram Geocell can be used by traffic in isolation for a very limited period when filled; it is not advised that Terram Geocell is used as the permanent surface finish for vehicle access routes. Exceptions may arise where Terram Geocell is installed as a temporary haul road for example as a site access route and may be removed and disposed of or fully re-surfaced after use. Refer to installation method details for further information.

GENERAL INSTALLATION ADVICE FOR ALL APPLICATIONS

Prior to commencing works it is advisable to seek the professional opinion and approval of the Local Planning Department and Arboriculture Officer. Specific design limitations may be determined by Tree Officers, Engineers or Planners and must be closely adhered to. All applications will vary according to the site conditions and specific tree species involved. The ground and tree roots within the tree root protection zone must be protected from compaction and damage at all stages of the construction works. Works may involve varying degrees of excavation or build-up where edge retention is required, which must avoid root damage and soil compaction. The use of mechanical equipment or even low ground pressure machinery in the tree root protection zone must be avoided and hand tools may be the only method of excavation close to the root system.

Typical Profile



SPECIFICATIONS

PRODUCT	PANEL SIZE	CELL DIAMETER & DEPTH	PANEL WEIGHT	MATERIAL	LOADING APPLICATION	PART No.
Geocell [™] 250/100	5m x 7m	250mm x 100mm	18kg	Non-woven Polypropylene	Pedestrians	051397
Geocell [™] 250/150	5m x 7m	250mm x 150mm	25kg	Non-woven Polypropylene	Cars/Light vehicles	051403
Geocell [™] 220/200	6m x 3m	220mm x 200mm	20kg	Non-woven Polypropylene	HGV's	051380

PRODUCT	MATERIAL	SIZE	UNIT	PART No.
Fixing U-Pin	Steel rod	550mm long x 8mm dia	Each	082834

INSTALLATION METHOD FOR PERMANENT ACCESS ROUTES AND CAR PARKS

1. Obtain the approval of the Local Planning Department and Arboriculture Officer that this method of construction is appropriate and acceptable for the application and to determine the limits of construction and proximity to the tree.
2. Prepare the site by carefully removing all debris and reducing surface levels to the allowable reduced dig as appropriate to the specification, whilst strictly avoiding soil compaction and tree root damage. Build-up directly on the existing surface levels may be necessary.
3. Ensure that the prepared surface is reasonably even and fill any localised depressions with sharp sand to achieve an even surface profile. Do not roll or consolidate the area.
4. Install tanalised timber edging boards or other approved edge retention to the perimeter of the construction zone as appropriate to the total layer profile thickness. Avoid damage to tree roots when placing fixing posts and pegs. Concrete kerbs are unlikely to be appropriate or allowed.
5. Install a layer of BGT100 Geotextile Fabric across the site, overlapping adjacent rolls by a minimum of 150mm. It may be necessary to lightly pin the Geotextile in place until the overlying layers are installed.
6. An optional layer of Tensar TX160 TriAx™ Geogrid may be required at this stage, possibly determined by the site soil strengths (i.e. weak CBR% strength*), the proposed application and applied load such as HGV's. In some cases the TX160 layer may also aid the reduction of the required layer thickness of Terram Geocell where an extremely limited allowable excavation or build-up has been applied. Place the Geogrid layer over the Geotextile Fabric layer and fix down using steel pins to hold flat. Overlap adjacent rolls by minimum 150mm. Avoid tree root damage and soil compaction.
7. Open out and lay the specified layer thickness of Terram Geocell (100mm/150mm/200mm deep) and pin in place between the edging boards. It may be necessary to cut the Terram Geocell to size using a sharp knife or it can be left uncut and folded up against the edgings if preferred.
8. Pin the Terram Geocell in place using Steel Fixing Pins or similar approved. The pins are generally used to maintain the cells in an open and fully expanded position whilst the cells are being filled and also to stop the structure from being pushed up by migrating aggregate during the filling process. Pin spacing will vary according to the site conditions, but will generally be required at 1m – 2m centres on flat surfaces, mainly placed around the perimeter of the area and where adjacent sections of Terram Geocell abut each other, with less in the middle of the area. Drive the pins in so that they are just touching the top of the cells but do not compress the fabric. Avoid tree root damage during the pinning process.
9. Fill the Terram Geocell, working toward the tree from the furthest point away and using the filled Terram Geocell as a platform. The cells must be filled with clean, open graded angular aggregate, normally in the particle size range of 5mm - 45mm. Not single sized or rounded aggregate. The project engineer may determine alternative fill materials such as clean 4/20 or 4/40 stone or a reduced-fines DoT Type 1X sub-base. It is not acceptable to use a standard DoT Type 1 Sub-base within the cells for tree root protection. Do not roll the surface, a light vibratory compaction plate (whacker) may be permitted to settle the stone into the cells, seek advice from the specifier or Tree Officer on this detail. Do not contaminate the filled cells with site debris, soil or mud.
10. Install the permeable pavement layer/wearing course i.e. BodPave®85, Block Paving, Porous Asphalt, on top of the Terram Geocell according to the manufacturers recommendations. Each porous pavement layer will have a specific design layer requirement; therefore for example, where a sand or sand:soil bedding layer is specified or a contaminant filtration layer is required, then a layer of BGT100 Geotextile Fabric shall be placed above the Terram Geocell prior to the pavement bedding layer being installed and finished according to manufacturers instructions. The Geotextile will stop the pavement bedding layer from migrating down into the aggregate voids within the Terram Geocell.

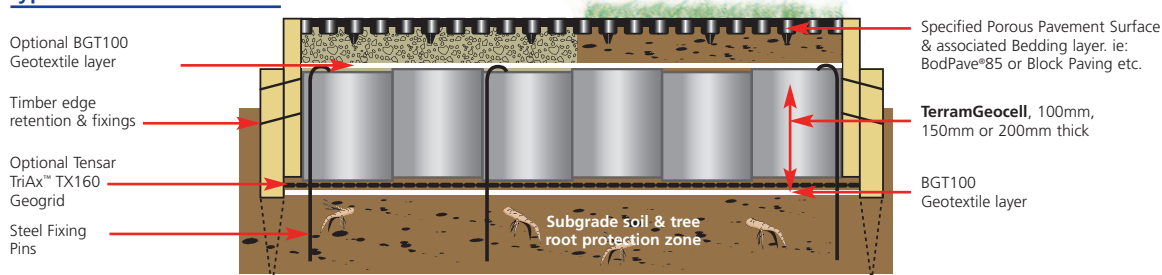
For installation recommendations for BodPave®85 cellular paving for Grass & Gravel, refer to BodPave®85 Specification and Installation Guidance Notes. For all other pavement layer products, refer to the specific manufacturers' guidance.

INSTALLATION METHOD FOR TEMPORARY ROADS AND SACRIFICIAL PAVEMENT LAYERS IN HAUL ROADS

In some applications Terram Geocell may be installed as a temporary haul road base and completely removed after use. Alternatively it may have a sacrificial stone layer placed over it which is removed and replaced with a permanent permeable pavement solution when use of the haul road is complete.

1. Obtain the approval of the Local Planning Department and Arboriculture Officer that this method of construction is appropriate and acceptable for the temporary access and to determine the limits of construction and proximity to the tree.
2. Apply all construction detail as for items 2 to 9 above for 'Permanent Access Routes'.
3. Place a layer of BGT100 Geotextile or greater strength Geotextile (i.e. Terram 2000) onto the Terram Geocell surface. The geotextile grade will be determined by the specific site design criteria and degree of haul road traffic proposed. This layer will be removed and replaced later if a porous pavement surface is being installed on the Terram Geocell.
4. Place a minimum 100mm thick layer of either clean graded stone or DoT Type 1 sub-base stone onto the surface. This will be the sacrificial pavement layer to be removed later. Aggregate specification will be determined by the project manager.
5. During use of the access route, routinely check for erosion of the surface and repair with stone as required to avoid exposure of the geotextile.
6. After the haul road use is completed, remove the sacrificial layer of stone and geotextile and replace with the preferred permeable pavement layer in accordance with manufacturers recommendations. Alternatively remove the entire construction profile to return the site to its original status. It is critically important to avoid contamination of the remaining layer of open-graded stone within the Terram Geocell where partial removal is carried out and at all times to avoid damage to tree roots and soil compaction during removal and disposal of the construction layers.
7. Where complete removal of Terram Geocell is required, seek the specifiers' advice on renovation and restoration of the landscaped surfaces within the tree protection zone.

Typical Profile Construction



Other useful notes on Tree Root Protection

- In most applications the total porous pavement area should not exceed 20% of the tree root protection area.
- It is advisable to seek an Engineers advice on the required Terram Geocell layer thickness related to local soil strengths and proposed traffic loadings.
- Soil compaction will severely affect the trees ability to take up water and oxygen; similarly, raising soil levels around trees will deprive roots of oxygen and cause stress and dieback.
- In most cases 80% - 90% of a trees root system are in the upper 1m of soil and the small fibrous tree roots are the most important to a trees health. The fine roots enable transport of oxygen, water and nutrient to the tree via the larger roots which also anchor the tree and provide stability. Severing only a small proportion of the fine surface root structure can severely affect the tree, causing stress, dieback and loss of stability.

* CBR% Strength = California Bearing Ratio – a measure of subgrade soil strength.

Further Reading

- British Standard: BS5837 1991 / 2005 – Trees in Relation to Construction - Recommendations.
- Arboricultural Advisory and Information Service: Practice Note 1 – 'Driveways Close to Trees' (APN1).
- 'Tree Root Systems'. (M. Dobson 1995) – Arboricultural Research Information Note 130/ARB/95.
- 'Driveways Close to Trees' (M. Dobson / D. Patch 1996). Arboricultural Practice Note 1.
- 'Guidance for Trees: Conflict or Compliment?'. (R. Nicholson 2001). Arboricultural Journal No. 25.

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GEOCELL Tree Root Protection



Permanent protection of tree roots where a road, access route or driveway is required when existing trees are to remain undamaged by the excavation and finished trafficked surface.



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Terram GEOCELL tree-root protection is a cellular-confinement system fabricated from a permeable geotextile and is designed as an acceptable solution for tree-root protection where a road, access route or driveway is required. See Arboricultural Advisory and Information Services APN12: Driveways close to trees.

The system confines the sub-base, stabilises the ground and ensures that the roots beneath are protected from vehicle loads whilst still being able to breathe and obtain moisture and nutrients.

A Terram GEOCELL is supplied as flat packed panels which are opened to form the characteristic honeycomb structure. These are positioned and pinned to the ground using J shaped metal pins and filled with a suitable, permeable fill. The geocell confines the fill and ensures that downward forces are spread laterally reducing loads on the underlying soils. Without the cellular system, the surface would become rutted and compacted with the traffic loads damaging the tree roots and potentially resulting in the death of the tree.

Once filled, the geocell can be trafficked but it is not intended to be a permanent surface solution unless it is paved e.g. with BODPAVE 85 pavers.

A Terram GEOCELL may be used as a temporary expediency e.g. when access to a site is limited by the presence of tree roots. On completion, the geocell can be removed, with the ground left undamaged, or paved with an appropriate surfacing.

A geocell is the ideal solution for tree-protection areas. The tough permeable fabric allows water and oxygen to penetrate through to the roots.

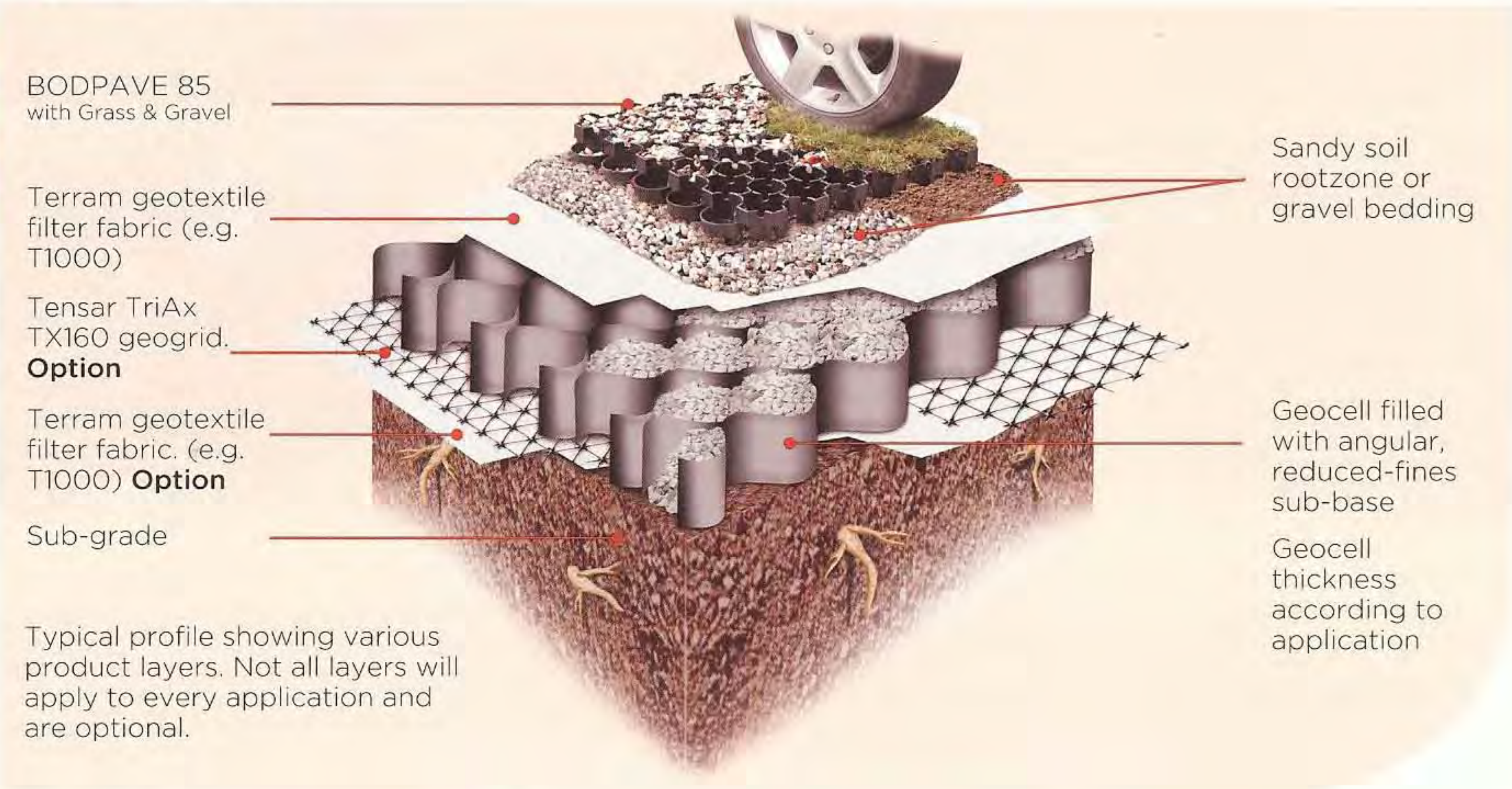
APPLICATIONS

- Permanent woodland trails
- Paths
- Driveways
- Roads
- Access routes
- Parking areas





TYPICAL PROFILE



Metal Fixing Pins

Metal fixing pins can be used to fix the cells to the ground.

PRODUCT	SIZE (mm)	MATERIAL	PART No.
J-pins	550 long x 8 dia.	Steel rod	051038

GEOCELL PRODUCT DETAILS

PRODUCT	PANEL SIZE (m)	CELL Dia & DEPTH (mm)	PANEL WEIGHT	GROUND REINFORCEMENT LOAD CAPACITY	MATERIAL	PART No.
GEOCELL 25/15	5 x 7	250 dia. x 150	25kg	Light Vehicles	Non-woven PP/PE	082148
GEOCELL 22/20	6 x 3	220 dia. x 200	20kg	Heavy Vehicles	Non-woven PP/PEæ	082056

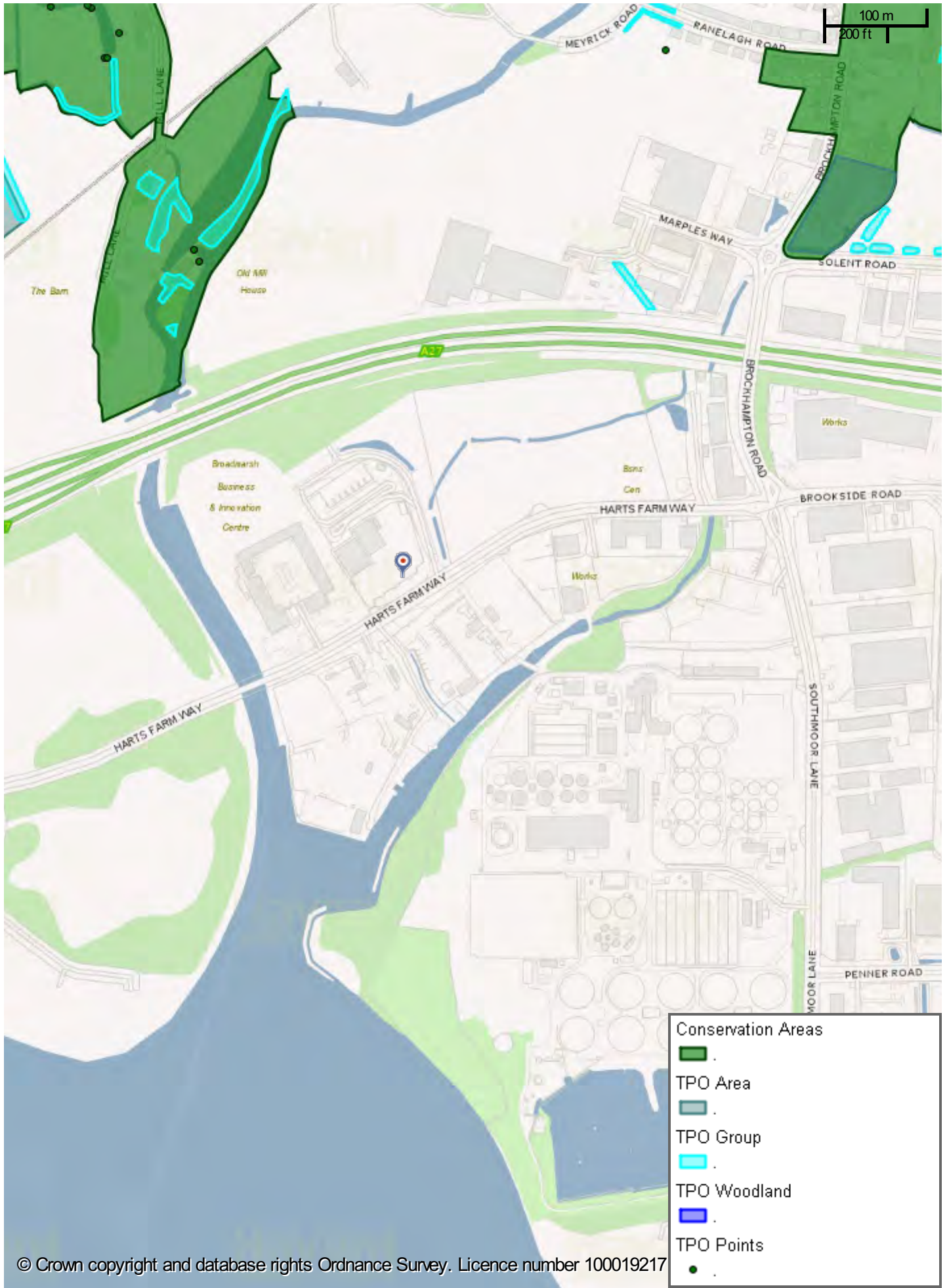


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Appendix E - Tree Preservation Orders



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