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TREE SURVEY, ARBORICULTURAL IMPACT ASSESSMENT AND TREE PROTECTION PLAN

A report to accompany a planning application for the demolition of an existing garage, relocation of site access and development of a two-storey extension and basement level at 4 Frognal Rise, London, NW3 6RD

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On the instructions of Stephen Brandes Architects

5 June 2015

MDA reference C66

Contents

1. Introduction

1.1 Martin Dobson Associates Ltd were instructed by Stephen Brandes Architects on 5 May 2015 to carry out a survey of trees at or adjacent to 4 Frognal Rise, London, NW3 6RD and prepare a report in support of an application to partially demolish an existing garage, relocate the site access and develop a two-storey extension and basement level.

1.2 The British Standard 5837: 2012 *Trees in relation to design, demolition and construction – Recommendations* provides a framework for considering trees in the planning process. It gives guidance on categorising the qualities of trees in order to enable decisions to be made as to which trees are appropriate for retention within a development. It then advises on options for protecting trees to be retained during the development (at all stages including demolition, construction and hard landscaping), and the means of incorporating trees into the developed landscape.

1.3 Twelve trees were surveyed and out of these one considered to be category A and of high value (T1 beech), four are considered to be category B and of moderate value (T2 and T10 sycamore, T5 ash and T11 holm oak). The remaining seven trees are considered to be category C and are of low value.

1.4 In general category C trees should not be considered a material constraint to development.

1.5 The proposed development requires the removal of one small category C birch (T12) which is damaging the front boundary wall. A replacement tree will be planted in a similar location.

1.6 The remainder of the trees will be retained and will be protected during development. Details of tree protection are contained in this report.

2. Tree survey

2.1 The tree survey was carried out by Dr Martin Dobson on 6 June 2013.

2.2 Appended at **MD1** is the tree survey schedule which provides details of the twelve trees with trunk diameters larger than 75 mm present within or immediately adjacent to the property.

2.3 The site survey drawing appended at **MD2** shows the positions of the trees surveyed and gives a reasonable indication of their comparative branch spreads. The drawing has been colour coded as follows:

A trees (high quality and value, minimum 40 years useful life)	LIGHT GREEN
B trees (moderate quality and value, minimum 20 years useful life)	MID BLUE
C trees (low quality and value, minimum 10 years useful life)	GREY
U trees (unsuitable or dead/dying/dangerous, less than10 years useful life)	RED

2.4 It should be understood that no individual safety inspection has been carried out on any tree. Similarly, any suggestions for tree work should not be taken as a specification for tree works.

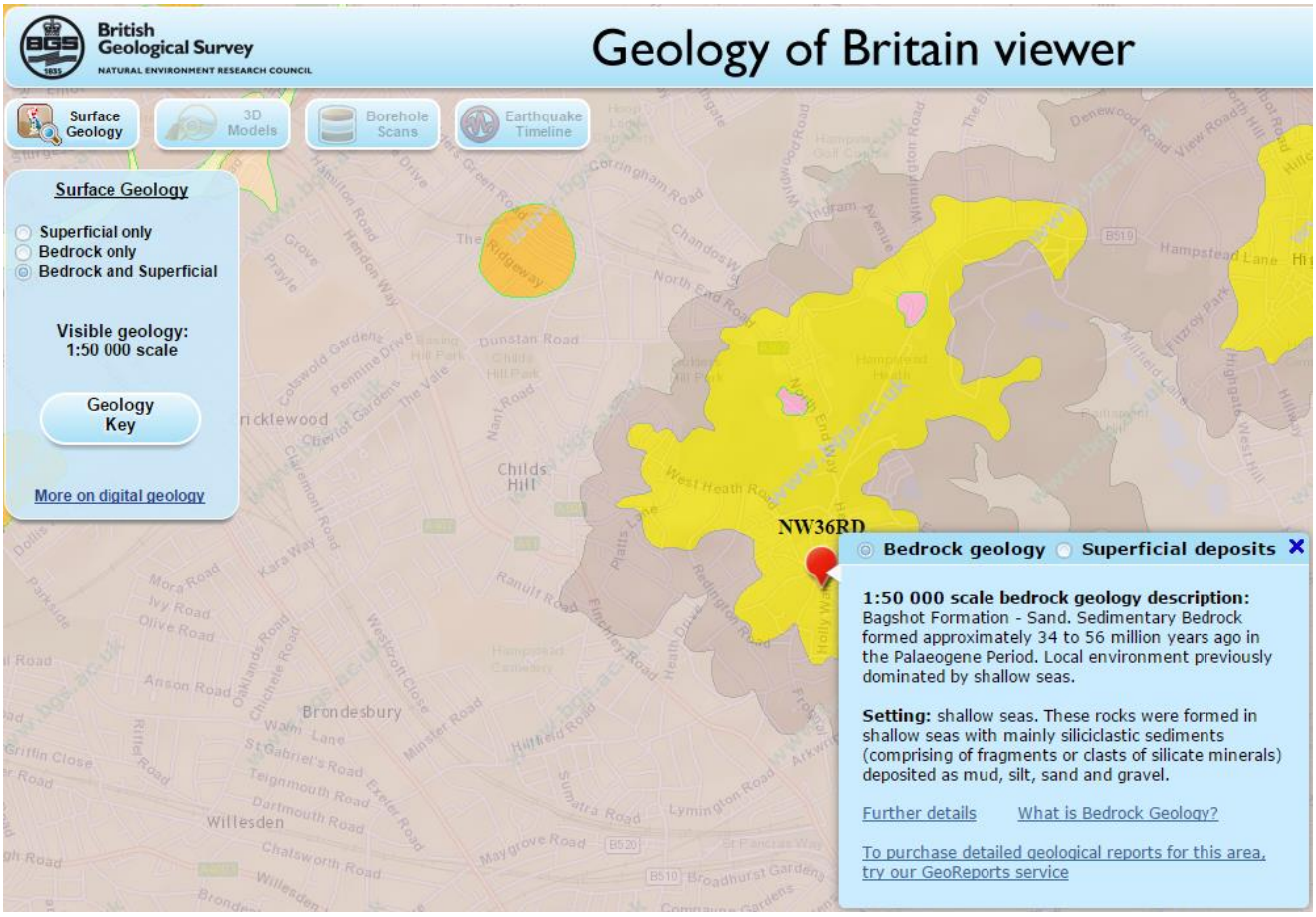
2.5 Adequate protection, both above and below ground, is essential for trees that are to be retained as part of a development. The British Standard BS5837: 2012 *Trees in Relation to Construction - Recommendations* advises that there should be a root protection area (RPA) around trees which is kept free of construction activities by means of an exclusion zone enforced by protective fencing and/or ground protection. The RPA is calculated as the area equivalent to a circle with a radius of 12 times the trunk diameter at a height of 1.5 m above ground level. Based on the tree survey data root protection areas (and radial distances from the trunk to be protected) have been calculated and these are shown as circles around the trees on the tree constraints plan at **MD2** (existing ground floor) and **MD3** (existing first floor) and are tabulated at **MD4**.

3. Soil assessment

3.1 BS5837: 2012 advises that soil properties should be considered as part of a tree survey report. This is necessary because trees can cause damage to structures founded on soils that shrink and swell with changes in moisture content (principally clays). Such movement is exacerbated by the influence of trees and therefore if a shrinkable soil is suspected foundations should be deigned to extend below the likely zone of seasonal moisture change.

3.2 The British Geological Survey 1: 50,000 scale map indicates that the underlying geology of the site is non-shrinkable Bagshot Formation - Sand (Figure 1). This suggests that foundations should not need to be deepened to take account of trees. However, the geological maps indicates that highly shrinkable London clay is close by and therefore if site specific investigations detect shrinkable clay then foundations must be designed with reference to the National House Building Council's Standards Chapter 4.2 *Building near trees*. Cypress and oak are high water demand species, ash, birch and sycamore are moderate water demand species and beech is low water demand.

Figure 1. British Geological Survey 1: 50,000 scale showing that the site is underlain by the Bagshot Formation - Sand.



4. Arboricultural impact assessment

4.1 The tree survey identified three trees within the curtilage of the property, a fine category A copper beech (T1) to the rear, a small category C birch causing damage to the front boundary wall (Figure 2) and a category B holm oak in the rear left corner of the garden (Figure 3)

Figure 2. Beech T1 (left) and birch T12 (right)

Figure 3. Holm oak (T11) – in the shadow of the beech T1 and suppressed by it.

4.2 The remaining trees are to be found in a row adjacent to the boundary in the neighbouring garden to the left (Figure 4) and comprise a line of cypresses topped and maintained as a boundary screen (T3 – T4 and T6 – T9) with a young ash (T5) growing amongst the cypresses and two sycamores (T2 and T10) at either end of the cypresses. T2 is the larger of the two sycamores and was significantly crown reduced in 2012/13.

Figure 4. Photograph of trees near to the boundary taken from the rear garden of 4 Frognal Rise

4.3 In anticipation of the possibility that roots from the neighbouring trees might cross the boundary a 10 m long trench was dug adjacent to the boundary wall from the front entrance up to the garage (Figure 5) on 15 August 2013. The trench was dug to a maximum depth of 1100 mm (i.e. below the depth where larger woody roots might be expected). The brick footings of the garage extended to 800 mm below ground level and the concrete foundation must have been deeper than this, but excavations were not deep enough to reveal it. The base of the boundary wall was at 1100 mm below ground level and was on a brick rubble foundation. No roots were seen to be penetrating through the brickwork or rubble. A single woody root of about 20 mm diameter was growing along the face of the foundation at a depth of about 400 mm. It appeared to be a conifer root and had apparently grown around the end of the boundary wall, under the pavement, and turned to grow towards the garage along the drive. It is considered that the root is not significant to the overall health of the conifer it originated from.

4.4 A second, larger, root of 50 mm diameter emerged from the face of the trench (on the house side) at a depth of about 600 mm below ground level and about 2.3 m away from the garage. About 200 mm from the face of the trench the root turned at right angles because of a large piece of masonry in its way and continued in a straight line towards the front boundary for about 1 m before turning at right angles again away from the boundary wall (Figure 6). A side shoot from the root was sampled and sent to Richardson's Botanical Identifications and was identified as being Fraxinus – ash. It seems likely therefore that the root was from the young ash tree T5 in the neighbour's garden. How the root came to be in the location it was discovered in is something of a mystery. It didn't grow under the boundary wall in the excavated area and it

seems unlikely that it grew under the relatively deep foundations of the garage, the brick footings of which were in excess of 800 mm deep and there was probably a further 500 mm of concrete below the footings. A root 50 mm diameter is not, in my experience, likely to grow to a depth of 1300 mm and therefore, as improbable as it sounds, the root had probably grown around the rear end of the garage and then grown back down its right hand flank wall. Whilst the root is in close proximity to the trunk of its parent tree T5 (approximately 2 m) it may have travelled 20 m to get there.

Figure 5. Exploratory trench 1.1 m deep by 10 m long hand-dug adjacent to the boundary wall to determine whether tree roots were present.

Figure 6. Root thought to be from the neighbour's cypress growing along face of boundary wall foundations.

Figure 7. Ash root 50 mm diameter growing out of house-side of exploratory trench and back into the side wall of the trench after 1 m.

4.5 Other fine and fibrous roots were seen in the exploratory trench but these were all less than about 7 mm diameter and are considered not to be of significance.

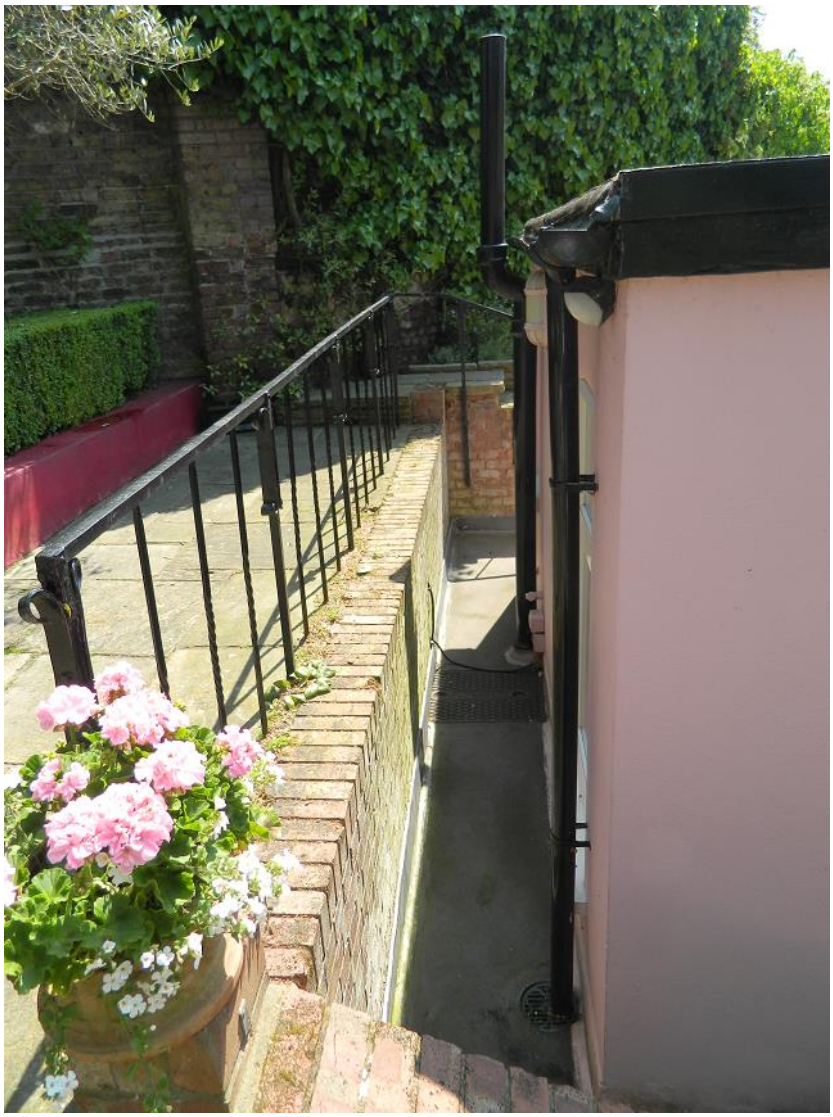
4.6 It is considered that removal of the 50 mm diameter ash root will not have any implications for the health of T5. The root, strictly speaking, is also outside the theoretical root protection area of the ash as it has travelled significantly more than 3.6 m away from the parent trunk. The young age of the ash combined with the relatively small size of the root means that, in my opinion, it may be removed without harm to T5.

4.7 The development is theoretically within the root protection area of the beech T1 but the proposals do not extend beyond the footprint of the existing development. A retaining wall to the rear of the property (Figure 8) marks the edge of development. It is highly improbable that any roots of the beech (which tends to be shallow rooting) will grow beneath the retaining wall.

4.8 A low value category C birch (T12) is growing very close to the front boundary wall and has caused direct damage to it. The tree is not in a sustainable location and it is proposed to remove and replace it. The tree is small enough that its amenity value will easily be restored by planting a replacement tree (shown on proposed plans).

4.9 No other tree issues have been identified which may pose constraints on the proposed development.

Figure 8. Retaining wall to the rear of the property which marks the edge of proposed development which will act as a root barrier.



4.10 Trees to be retained will be protected by fencing and ground protection to create a construction exclusion zone. It is considered that implementation of tree protection measures will mean that the development will have no material deleterious effect on trees.

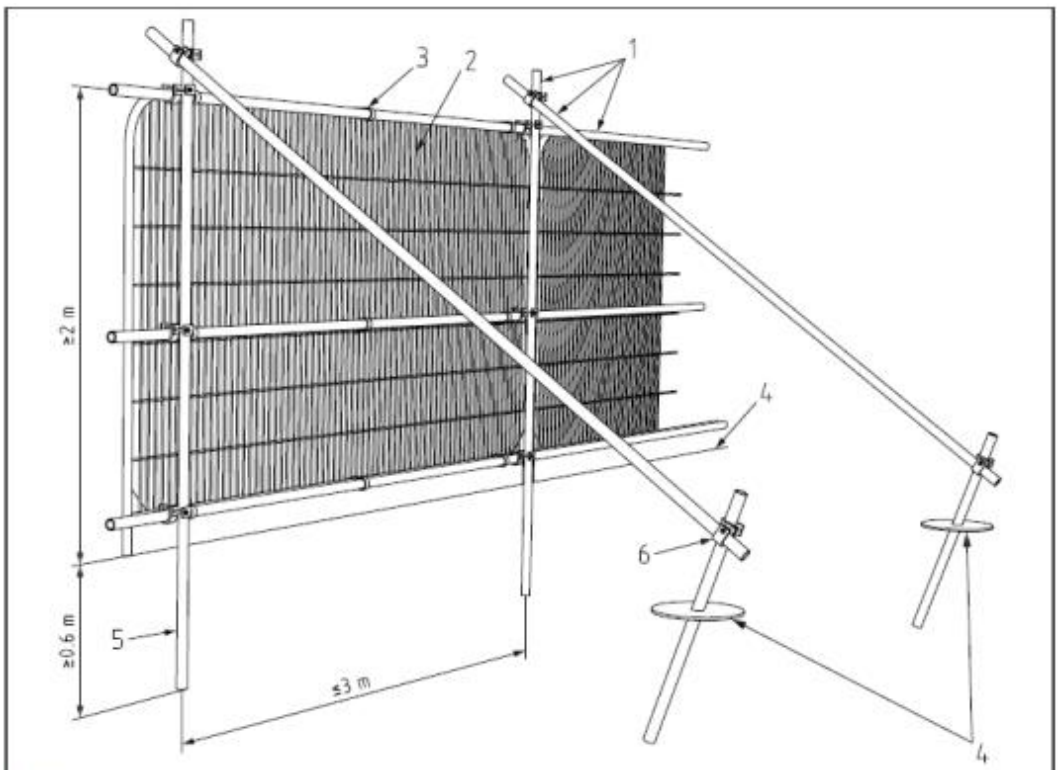
5. Tree protection plan

5.1 Trees can very easily be damaged during construction activities through their branches being broken by construction traffic passing close to the canopy or by root severance during the digging of foundation or service trenches. The majority of roots are to be found in the upper 600 mm of soil and so even relatively shallow trenches can sever the majority of roots growing across the direction of the trench. Similarly, the diameter of tree roots tapers sharply within a few metres of the trunk of a tree, so that what might seem to an uninitiated site worker to be an insignificant root (perhaps only a couple of centimetres in diameter) may actually be highly important.

5.2 Tree roots can also be damaged indirectly, often inadvertently, through soil compaction, which disrupts soil structure and can lead to root death through the development of anaerobic soil conditions. Spillage of toxic materials (e.g. oil or diesel) can also result in root damage and ultimately the death of a tree.

5.3 Tree protection will comprise of 2 m tall fencing installed in the positions shown at **MD5 – MD7** before materials are delivered to site or construction commences. The fencing will consist of a scaffold framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3 m (Figures 9 – 11). Onto this, weld mesh panels or 2 m high shuttering board will be securely fixed with wire or scaffold clamps. Weld mesh panels alone on unsecured rubber or concrete feet will <u>not</u> be used as these are not resistant to impact and are too easily removed by site operatives. An alternative system of bracing which does not require a scaffold framework is shown in Figure 10. Fencing will define a construction exclusion zone (CEZ).

Figure 9. Diagram to illustrate design of protective fencing with scaffolding anchored into the ground



Key
1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

Figure 10. Diagram to illustrate alternative design of protective fencing

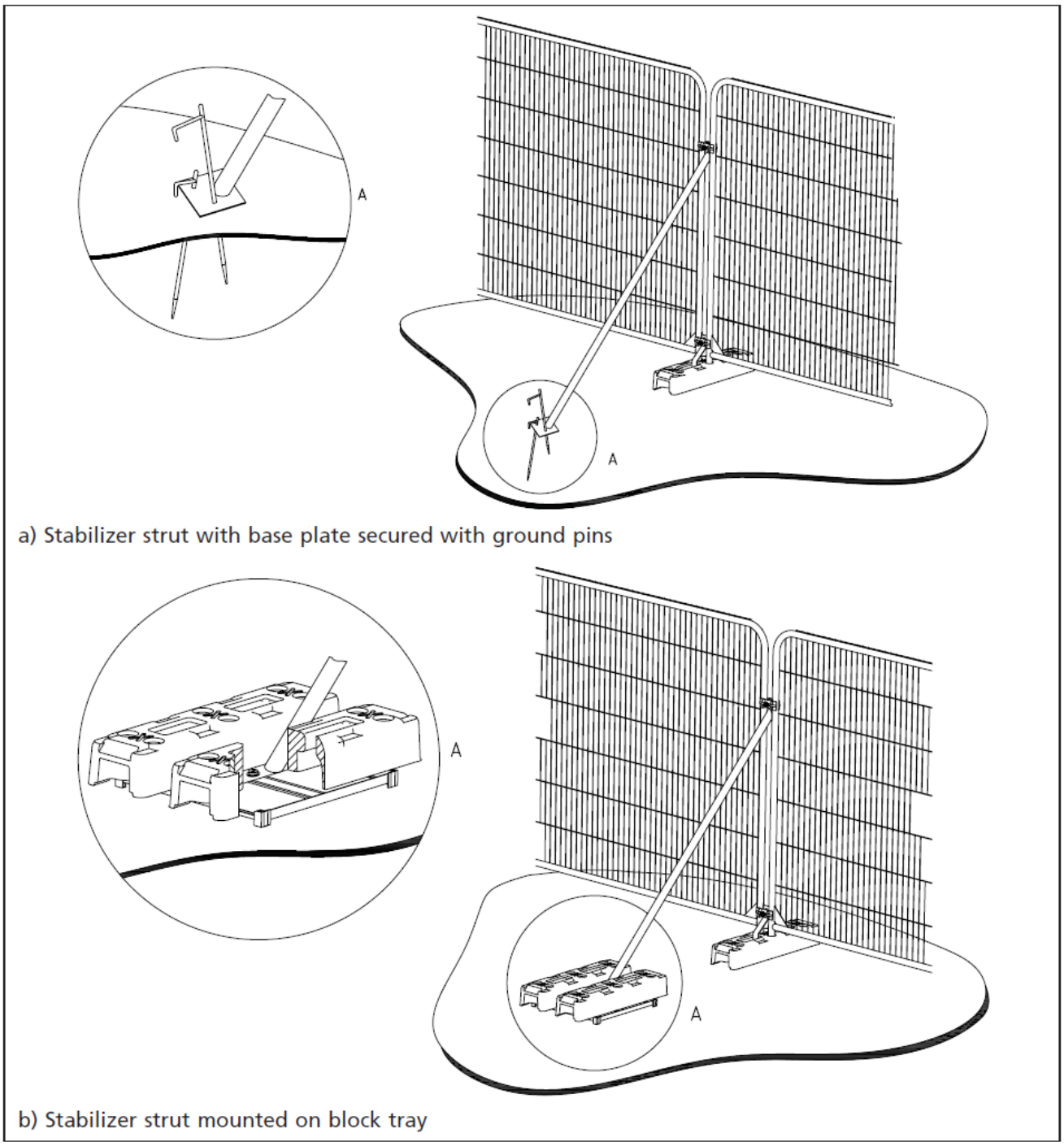


Figure 11. Photograph to illustrate installed protective fencing

5.4 High visibility all weather notices will be securely attached to the barrier around each protection zone with wording as shown in Figure 12. Where long lengths of barrier are erected a sign will be attached at intervals of no less than 6 m.

Figure 12. Wording to be included in high visibility all-weather sign attached to protective fencing

5.5 In order to allow access for construction workers and piling rig around the perimeter of the development it is proposed that part of the RPA will be protected by ground protection. The area hatched purple on the tree protection plan (**MD5 – MD7**) will be covered by heavy duty plywood boards (Figure 13) laid over the existing paving slabs. Once laid the plywood sheeting will be secured in place by wooden battens screwed into adjacent sheets. The existing paving will provide a platform from which the piling rig and site workers can operate without causing compaction of the underlying soil.

Figure 13. Illustration of ground protection using plywood over existing paving slabs

5.6 A project arboricultural consultant will be appointed to oversee tree protection for the duration of the construction/ landscaping contract(s). The project arboriculturist will be consulted on any issues that may arise concerning trees and will visit the site as often as necessary to ensure that trees are protected and/or at the following key stages:

- Prior to contractors commencing works on site in order to meet with the supervising architect and/or the contractor's nominated site manager to ensure that the principles of tree protection are understood and the procedure, timescale and materials for installation of tree protection are agreed;
- Following installation of tree protection but prior to any works commencing on site to confirm that it is fit for purpose;
- During installation of piles;
- At any time that there are potential conflicts with tree protection and/or at monthly intervals;
- At the completion of construction works to confirm that tree protection may be removed to enable final landscaping;

5.7 A pre-start meeting will be held on site with the project arboriculturist and the contractor's representative(s) so that the precise details of the schedule of works together with details of installation of tree protection can be agreed.

5.8 No enabling works will take place until after the meeting has been held and tree protection has been installed, inspected and approved as fit for purpose.

5.9 Fencing and ground protection will not be removed under any circumstances during construction unless with the express approval of the local authority. If in any doubt the site manager must contact the nominated arboricultural consultant.

Burning of waste

5.10 No fires will be lit on site within 3 m of root protection due to the danger of scorching of leaves and branches of overhanging trees.

Space for machinery, parking of vehicles, storage of materials and site huts

5.11 All machinery required on site will operate outside of root protection areas or from the ground protection. Site huts will be located outside root protection areas.

5.12 Delivery vehicles will park in the drive or off site and storage of materials will be outside root protection areas.

Services

5.13 New services and drainage runs will be installed outside root protection areas. The project arboriculturist will be advised of the proposed locations and will approve them.

Tree works

5.14 One category C birch tree is to be removed as part of these proposals. The tree will be removed as part of preliminary works. This will be carried out by suitably qualified arboriculturists to the standards set out in BS3998: 2010 *Tree works – recommendations*.

Landscaping

5.15 Once construction has demonstrably finished (to the satisfaction of the project arboriculturist) fencing may be removed in order to allow final landscaping to be undertaken. Landscaping will not involve any changes in soil levels, digging of any trenches or construction of masonry or retaining walls within root protection areas.

6. Conclusions

6.1 A BS5837: 2012 tree survey has been carried out at or immediately adjacent to 4 Frognal Rise, London, NW3 6RD.

6.2 Twelve trees were surveyed and out of these one considered to be category A and of high value (T1 beech), four are considered to be category B and of moderate value (T2 and T10 sycamore, T5 ash and T11 holm oak). The remaining seven trees are considered to be category C and are of low value.

6.3 An exploratory trench was dug adjacent to the left boundary wall and no roots were found growing under or through the wall. Two roots were identified, one 20 mm in diameter and one 50 mm in diameter. The larger root was from the ash (T5) but had followed a circuitous route and was, in fact, remote from the parent tree. Removal of both roots is considered to be acceptable and will not cause undue harm to the parent trees.

6.4 The proposed development requires the removal of one small category C birch (T12) which is damaging the front boundary wall. A replacement tree will be planted in a similar location.

6.5 The remainder of the trees will be retained and will be protected during development. Details of tree protection are contained in this report

6.6 It is considered that the proposed development will pose no threat to trees to be retained and is sympathetic leafy character of the area.

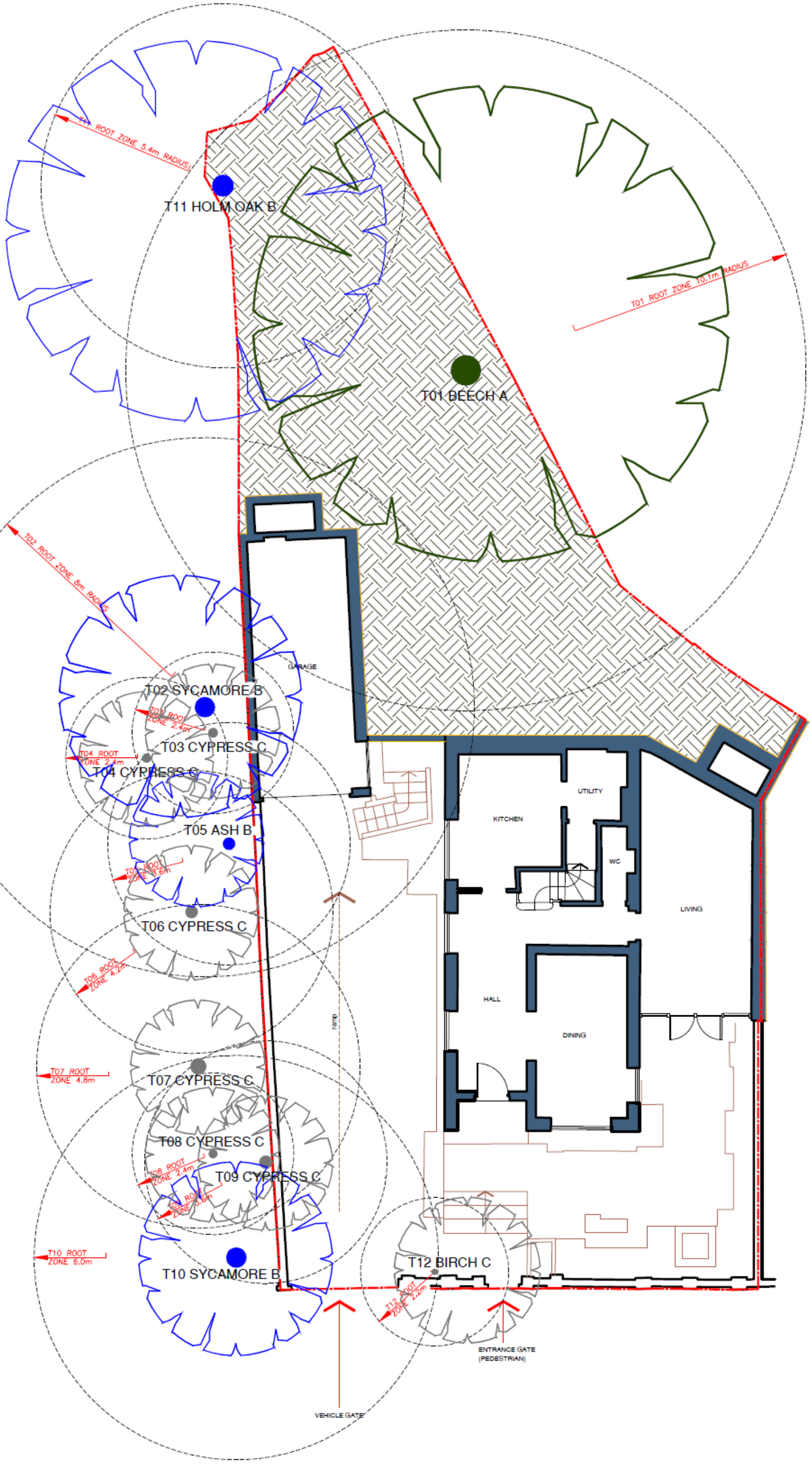
APPENDIX MD1
Tree survey schedule (BS5837: 2012)

Tree No.	Species	Height (m)	Trunk diameter (mm)	N (m)	S (m)	E (m)	W (m)	Height of crown clearance (m)	Age class	Physiological condition	Structural condition	Useful life	BS5867 Grade	Comments
T1	Beech	20	840	8	5	8	7	10	MA	Good	Good	40+	A	Lower branches removed to effect crown lifting
T2	Sycamore*	16	670	5	4	3	4	8	MA	Good	Good	40+	B	Crown reduced 30 - 40% winter 2012/3. Lower branches shortened.
T3	Cypress	8	200	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T4	Cypress	8	200	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T5	Ash	17	300	4	4	1	3	8	Y	Fair	Good	40+	B	
T6	Cypress	8	350	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T7	Cypress	8	400	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T8	Cypress	8	200	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T9	Cypress	8	300	2	2	2	2	2	MA	Good	Fair	20-40	C	Part of boundary screen - topped winter 2012/3
T10	Sycamore	16	500	3	3	3	3	8	MA	Good	Good	40+	B	
T11	Holm oak	16	450	4	8	4	6	4	MA	Good	Good	40+	B	Very close to boundary retaining wall.
T12	Birch	4	180	2	2	3	1	2	Y	Good	Good	<10	C	Too close to boundary wall. Damage occurring already and will worsen

* multi stem. ^ trunk measured at ground level. Age class: OM – over mature; M – mature; MA – mid-aged; Y - young

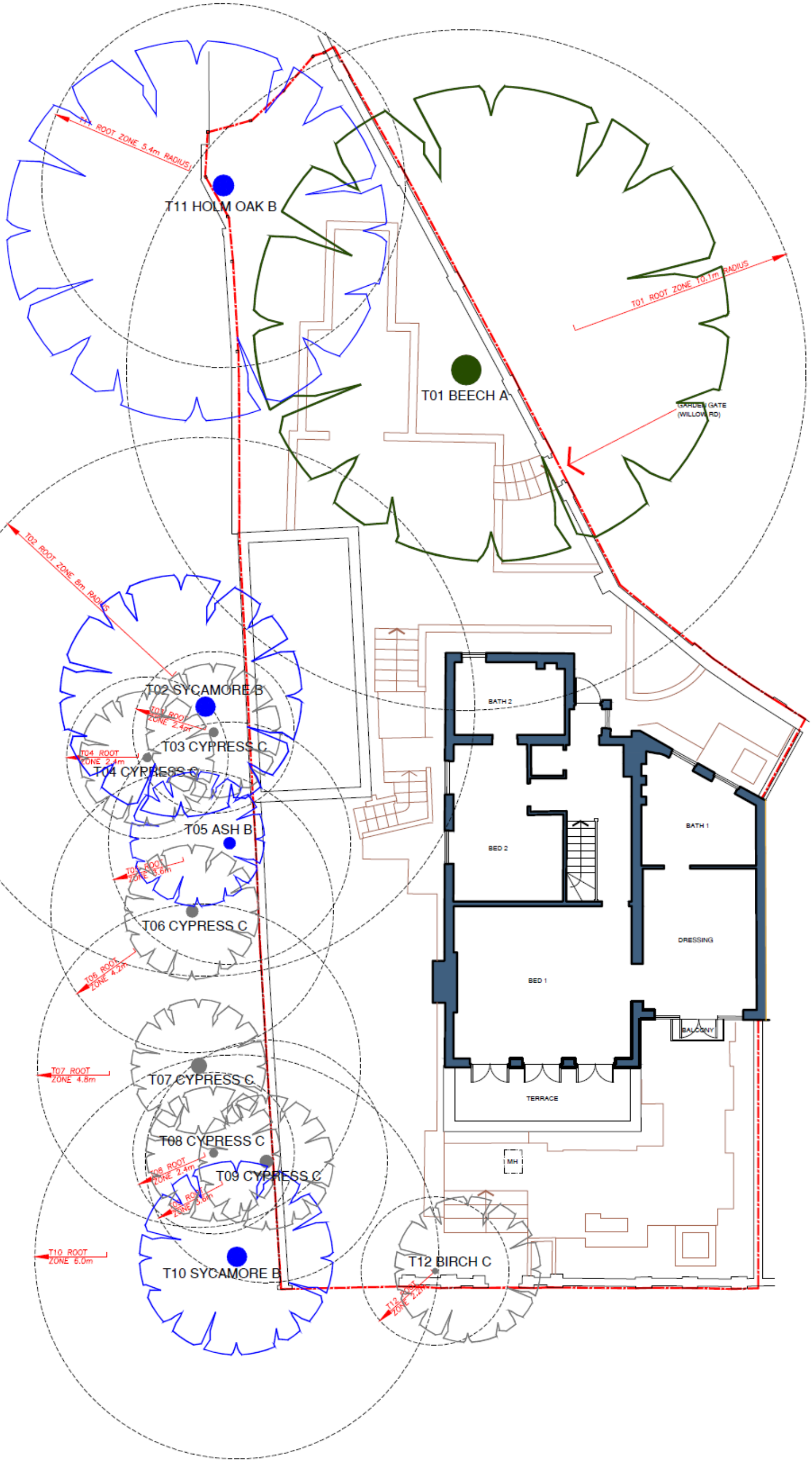
APPENDIX MD2

Tree constraints plan (ground floor) showing existing plot layout with tree numbers, BS5837: 2012 colour codes (A – Green, B – Blue, C – Grey, U - Red) and root protection areas (dashed circles)



APPENDIX MD3

Tree constraints plan (first floor) showing existing plot layout with tree numbers, BS5837: 2012 colour codes (A – Green, B – Blue, C – Grey, U - Red) and root protection areas (dashed circles)

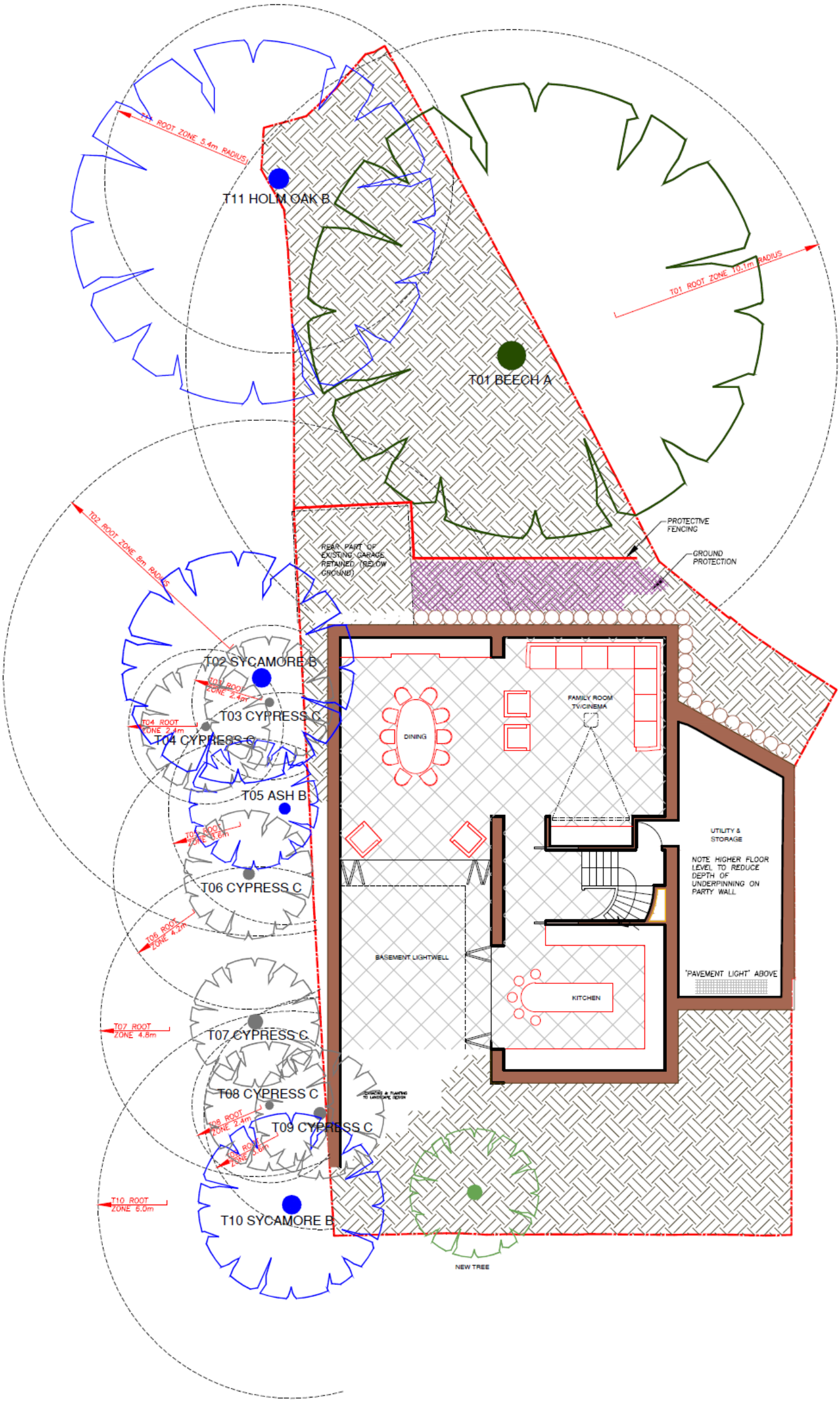


APPENDIX MD4
BS5837 schedule of protection areas

Tree No.	Species	Trunk diameter (mm)	BS5837: 2012 Root protection area, RPA, (m^2)	BS5837: 2012 Radial protection distance (m)
T1	Beech	840	319.2	10.1
T2	Sycamore*	670	203.1	8.0
T3	Cypress	200	18.1	2.4
T4	Cypress	200	18.1	2.4
T5	Ash	300	40.7	3.6
T6	Cypress	350	55.4	4.2
T7	Cypress	400	72.4	4.8
T8	Cypress	200	18.1	2.4
T9	Cypress	300	40.7	3.6
T10	Sycamore	500	113.1	6.0
T11	Holm oak	450	91.6	5.4
T12	Birch	180	14.7	2.2

APPENDIX MD5

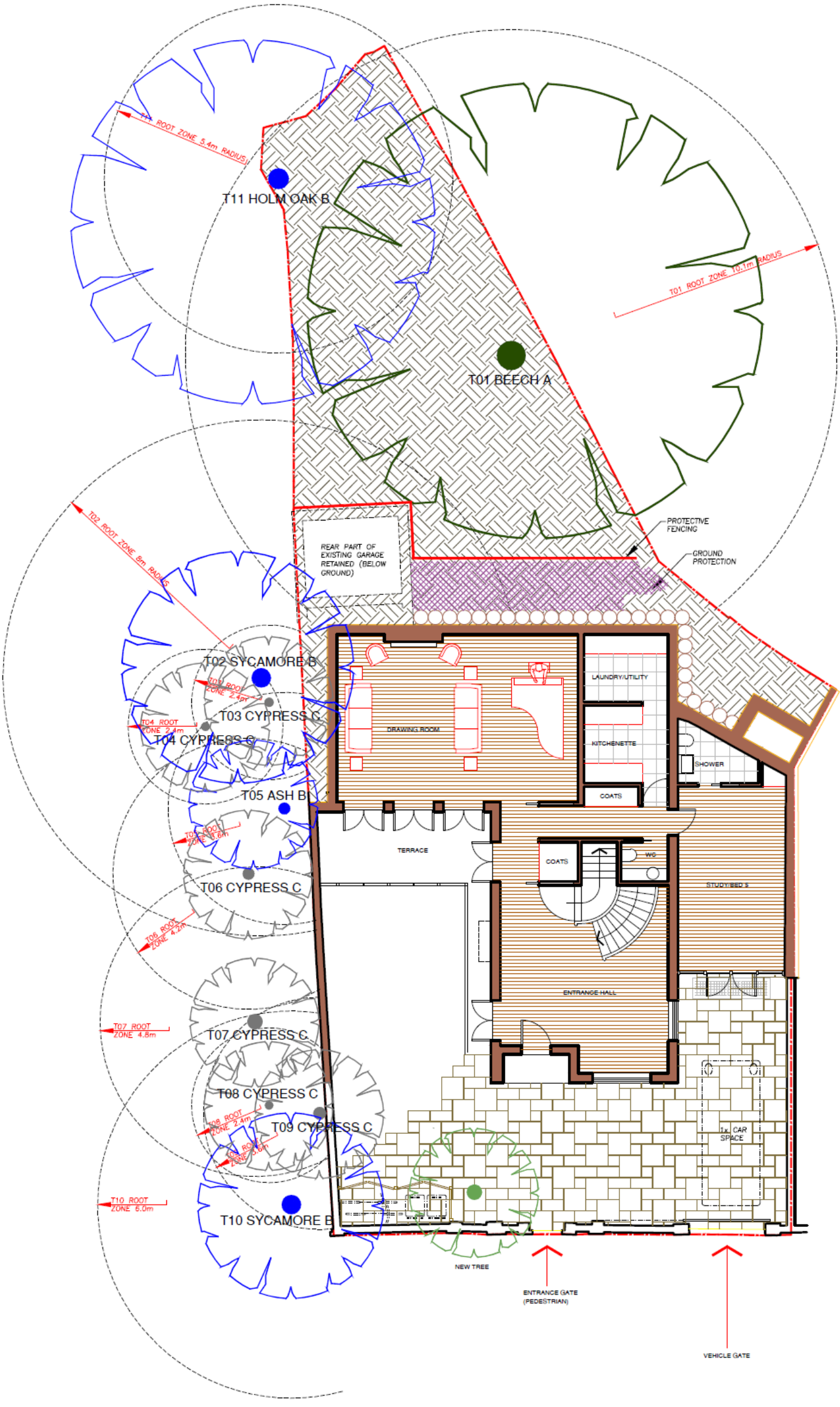
Tree protection plan (basement floor) showing retained trees, tree numbers and root protection areas (dashed circles). The location of protective fencing is shown as red lines, ground protection as blue hatching and above-ground no-dig driveway as purple hatching.



TREE PROTECTION
PROPOSED BASEMENT PLAN
FROGNAL RISE
MAY 2015
550 T-P.1

APPENDIX MD6

Tree protection plan (ground floor) showing retained trees, tree numbers and root protection areas (dashed circles). The location of protective fencing is shown as red lines, ground protection as blue hatching and above-ground no-dig driveway as purple hatching.

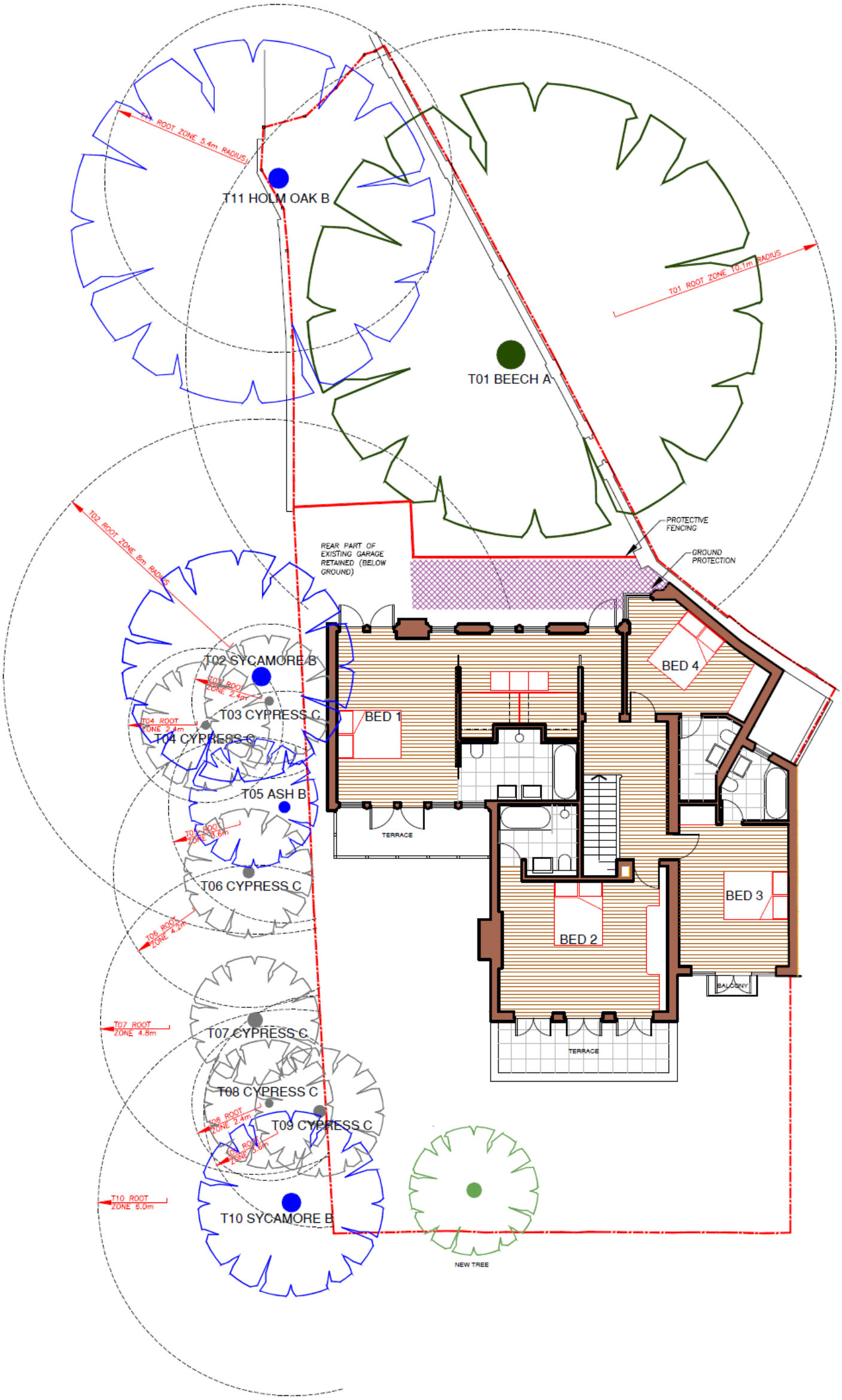


TREE PROTECTION
PROPOSED GROUND FLOOR PLAN
FROGNAL RISE
MAY 2015
550 T-P.2

0 1 2 3 5m 10m

APPENDIX MD7

Tree protection plan (first floor) showing retained trees, tree numbers and root protection areas (dashed circles). The location of protective fencing is shown as red lines, ground protection as blue hatching and above-ground no-dig driveway as purple hatching.



TREE PROTECTION
PROPOSED FIRST FLOOR PLAN
FROGNAL RISE
MAY 2015
550 T-P.3

APPENDIX MD8
Qualifications and Experience

Dr Martin Dobson has been engaged in research and advisory work on trees since graduating in 1986 with a BSc (Hons) Degree in Biology. Subsequent postgraduate research led to the award of a Doctor of Philosophy (DPhil) Degree in Tree Physiology in 1990.

Postgraduate studies began in 1986 at the University of Ulster and continued in 1987 at the Forestry Commission's Research Station in Hampshire and focussed on the influence of air pollution on trees. Upon completion of this research in 1989 Dr Dobson was employed by the Forestry Commission and worked in both the Tree Pathology and Environmental Research Branches. During the next six years he was responsible for Department of Environment research contracts focussing on air pollution, climate change, de-icing salt damage to trees, woodland establishment on landfills and tree root research. He has authored two books: *De-icing Salt Damage to Trees and Shrubs* and *The Potential for Woodland Establishment on Landfill Sites.* He concluded his time at the Forestry Commission as Project Manager for research into the interaction between trees, roots and clay soils which included laboratory investigations, testing of root barriers and a three-year field-scale monitoring programme investigating the influence of woodland and grassland on the moisture status of clay soils.

In 1995 Martin joined the Arboricultural Advisory and Information Service as a senior Arboricultural Advisor. The AAIS advised the (then) Department of the Environment on matters concerning amenity trees and was the principal source of technical advice and information to the arboricultural profession as well as landscape architects, engineers, the horticultural industry and private individuals. A large proportion of advisory work focussed on issues relating to tree diseases and interactions between trees and buildings.

In 1997 Martin started an arboricultural consultancy practice specialising in subsidence and tree root claims, planning and development, tree safety and disease diagnosis. He was a local authority retained consultant providing expertise on tree protection practice and legislation from 1999 - 2006 and has dealt with several thousand Tree Preservation Order and Conservation Area applications.

He has extensive experience as an Expert Witness in the High Court, County Court and Magistrates Court. Notable recent cases he has been involved in include Robbins v London Borough of Bexley and Khan v London Borough of Harrow and Kane.

From 1995 to 2011 he was an examiner for the Professional Diploma in Arboriculture for the Royal Forestry Society/ABC Awards and he is currently an assessor for the Arboricultural Association Registered Consultant scheme. He has been a guest lecturer for the Middlesex University Countryside Management MSc course and for Portsmouth University. Together with Dr Giles Biddle he has devised and teaches introductory and advanced courses on trees and subsidence and co-presents seminars on trees and climate change with Professor Andy Moffat for the Arboricultural Association.

In addition to over 30 publications in scientific and technical journals he is the author of Arboriculture Research and Information Note 130/95/ARB *Tree Root Systems*, and leading author of:

Driveways Close to Trees. Arboricultural Practice Note 1. AAIS, Farnham.
Trees in Dispute. Arboricultural Practice Note 3. AAIS, Farnham.
Root Barriers and Building Subsidence. Arboricultural Practice Note 4. AAIS, Farnham.

He is a Fellow and Registered Consultant of the Arboricultural Association and is a Member by examination of the Expert Witness Institute.