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TREE SURVEY, ARBORICULTURAL IMPACT ASSESSMENT AND TREE PROTECTION PLAN

A report to accompany a planning application for the construction of a single storey extension to the rear of 6 Greenaway Gardens, London, NW3 7DJ.

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and

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On the instructions of Steve Adams, Architect

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1. Introduction

1.1 Martin Dobson Associates Ltd were instructed by Steve Adams on 17 February 2016 to carry out a survey of trees on or immediately adjacent to land at 6 Greenaway Gardens, London NW3 7DJ. The purpose of the survey was to inform architects of potential tree-related constraints on the site and to provide advice on design options for the construction of a single storey extension to the rear of the property.

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 Greenaway Gardens is within the Redington Frognal Conservation Area and this means that all trees with a trunk diameter of 75 mm or more benefit from statutory protection and no work can be carried out to trees (including cutting roots or branches or felling) without statutory notification to the local planning authority.

1.4 One tree in the neighbouring garden was surveyed and it is considered to be category B and of moderate value (Bay T1). The tree is to be retained during development. Details of tree protection are contained in this report.

2. Tree survey

2.1 The tree survey was carried out by Iain Waddell on 29 February 2016.

2.2 Appended at **MD1** is the tree survey schedule which provides details of the one tree present 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.

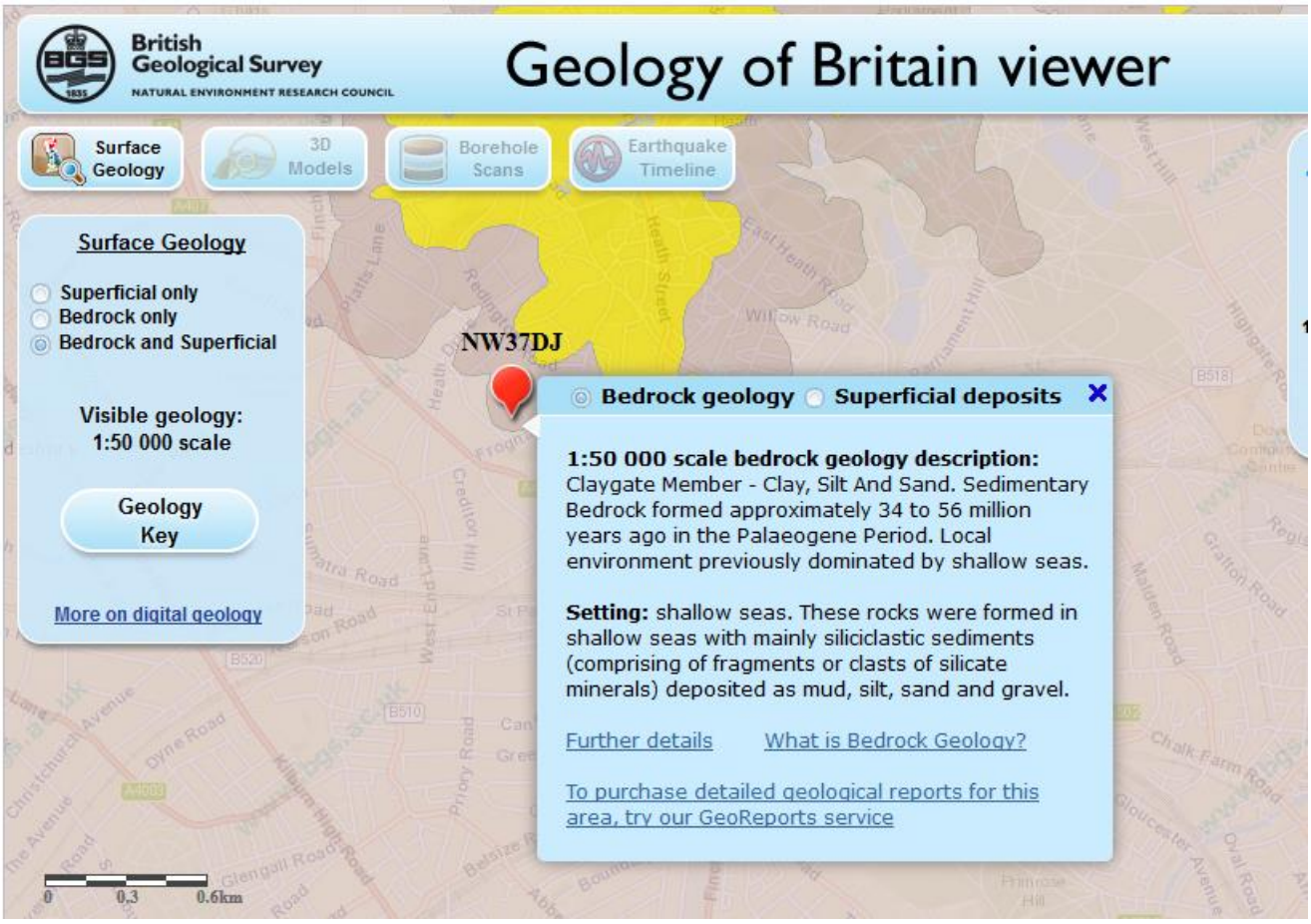
2.5 Adequate protection, both above and below ground, is essential for trees that are to be retained as part of a development. The British Standard BS5837: 2012 *Trees in Relation to Construction - Recommendations* advises that there should be a root protection area (RPA) around trees which is kept free 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 area (and radial distance from the trunk to be protected) has been calculated and is shown as a circle around the tree on the tree constraints plan at **MD2** and is tabulated at **MD3**.

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 Claygate Member- Clay, Silt and Sand. This typically has a high shrinkage potential, i.e. plasticity index in excess of 40. Foundations must therefore be designed by an engineer with reference to the National House Building Council's (NHBC) Standards Chapter 4.2 *Building near trees* NHBC separates trees into three water demand categories. Bay is regarded as being a "moderate" water demand species.

Figure 1. British Geological Survey 1: 50,000 scale showing that the site is underlain by the Claygate Member- Clay, Silt and Sand.



4. Arboricultural impact assessment

4.1 The purpose of an arboricultural impact assessment (AIA) is to evaluate the direct and indirect effects of proposed development on trees and, where necessary, to consider appropriate mitigation. It should set out which, if any, trees are to be removed to facilitate the development and should consider the possible effects on retained trees of potentially damaging activities on the site (for example changes in ground level and installation of below ground services). Requirements for access around trees should be considered and potential conflicts identified, for example, where branches overhang the development area and may require pruning.

4.2 Mitigation for any issues identified should be proposed and addressed in the arboricultural method statement (AMS).

Tree removals

4.3 The proposed development does not require the removal of any trees and it is considered that there is sufficient space between tree T1 and the development that it will not be harmed by the works.

Tree pruning

4.4 Branches of the bay (T1) overhang the rear garden from the neighbouring property. The proposed extension will have a finished height of 3m; the branches of the bay will therefore need to be pruned back to the boundary line and to a height of ≥3.5m to create clearance between the new building and future branch growth. Fortunately, bay is very tolerant of pruning, especially when young, and pruning would cause no undue harm to the tree nor would it reduce screening between the properties.

4.5 Piling will be required and this may necessitate the use of a hand piling rig as there is no direct access to the rear garden. The branches of the bay in its current state would therefore constitute an obstruction but the crown raising procedure described above (4.4) will create the space needed to operate the pilling machine without causing mechanical damage to the tree.

Tree protection

4.6 The footprint of the proposed extension lies within the Root Protection Area (RPA) of the Bay T1. It is therefore necessary to dig a trial pit before the commencement of any works to ascertain where the roots are, their size, and direction of growth. The trial pit will be dug to a depth of 1m and its location is shown on the plan at **MD3**. This will be carried out under arboricultural supervision to minimize any damage to the roots. Once the location of the roots has been identified the structural engineer can design the cantilevered floor slab (if required) and set the location of the piles. This will prevent severance or mechanical damage to any significant roots (diameter >25mm).

4.7 The relocation of the patio steps will be carried out using hand tools only where excavations are carried out within the RPA of T1. In the unlikely event of any significant roots being discovered, arboricultural advice will be sought.

4.8 The remainder of the patio will be protected by ground protection to reduce the possibility of soil compaction due to the construction activity and small working space.

4.9 There are trees located at the end of the rear garden which have not been included in the survey due to being deemed sufficiently far away from the development. To prevent storage of materials, machinery and any spoil in this area there will be a construction exclusion zone (CEZ) fence installed shown as a red line in **MD5**.

Working space

4.10 The proposed construction works are achievable without causing damage to trees. However, space on the site for machinery, construction materials and spoil are limited and therefore careful consideration has been given to phasing of works.

Landscaping

4.11 The final surfacing of the patio will be constructed using a porous material such as gravel or block paviours bedded on sand.

5. Arboricultural method statement and tree protection plan

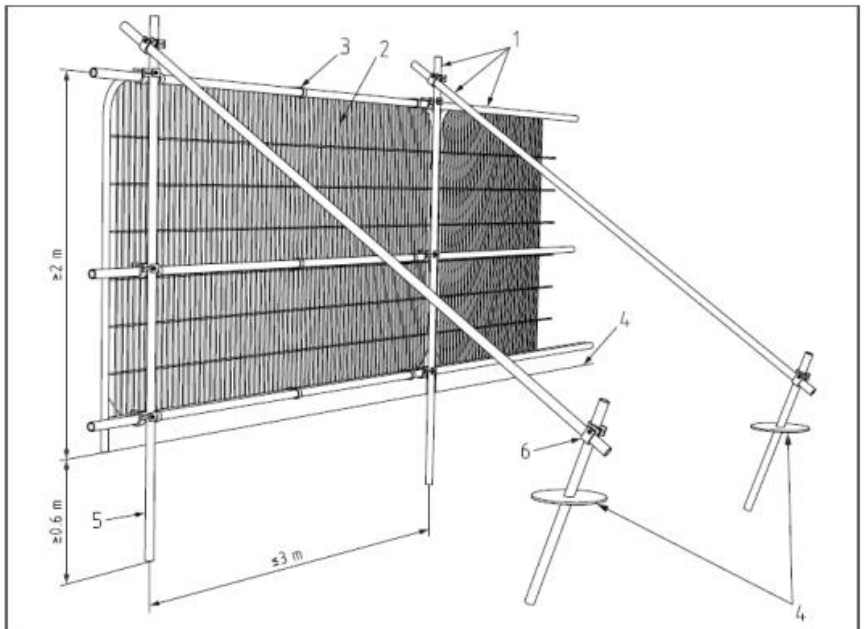
5.1 Trees can very easily be damaged during construction activities through their branches being broken by construction traffic passing close to the canopy or by root severance during the digging of foundation or service trenches. The majority of roots are to be found in the upper 600 mm of soil and so even relatively shallow trenches can sever a significant number 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 few 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. Protection of the soil around trees by means of a construction exclusion zone (CEZ) is therefore vitally important in order to preserve roots undamaged.

Fencing and ground protection

5.3 Tree protection will comprise of 2 m tall fencing installed in the positions shown at **MD5** 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 (Figure 2). 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 3.

Figure 2. 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 3. Diagram to illustrate alternative design of protective fencing

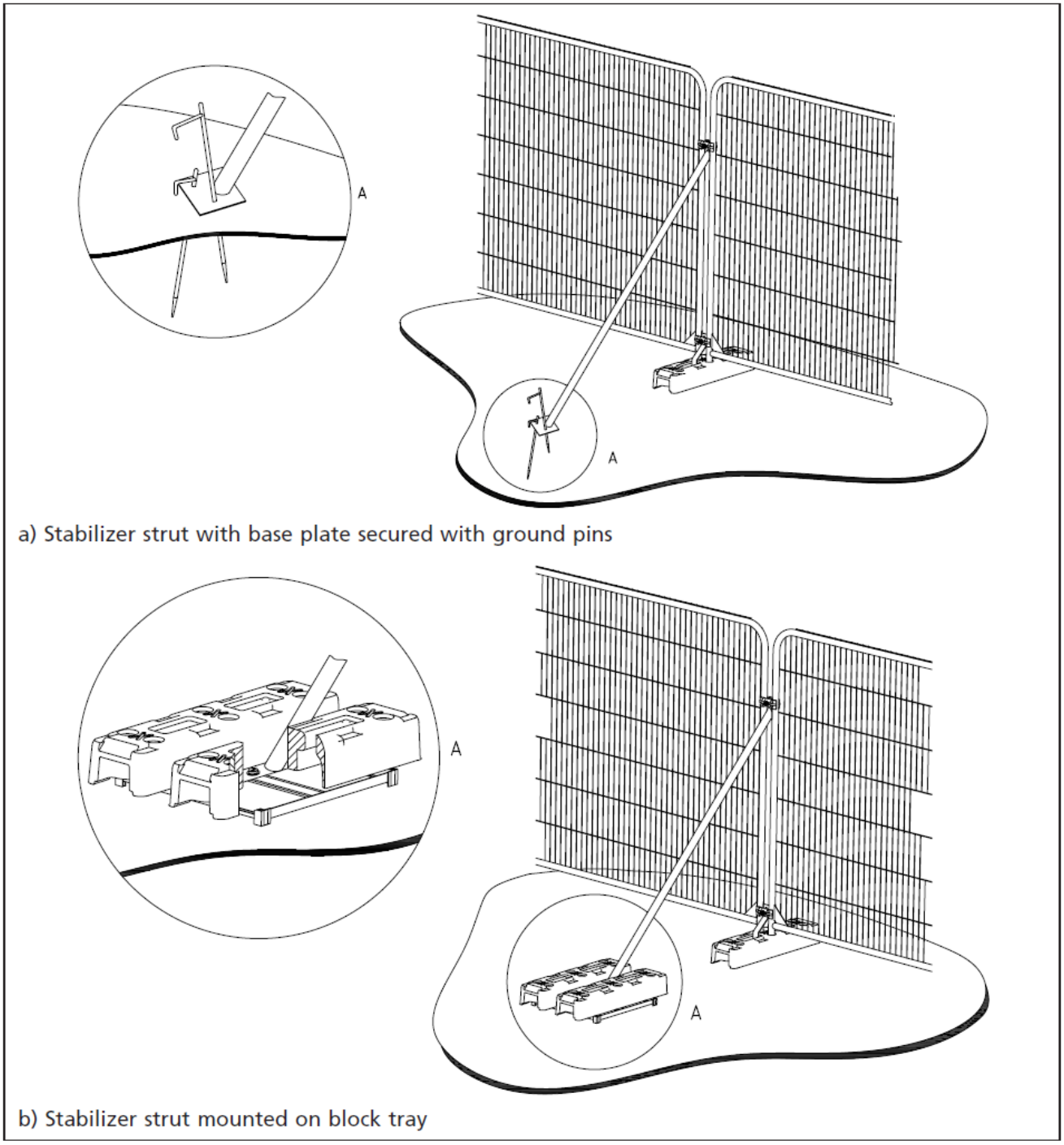


Figure 4. Photograph to illustrate installed protective fencing

5.4 High visibility all weather notices at a size no less than A3 will be securely attached to each panel of the barrier around the CEZ with wording as shown in Figure 5.

Figure 5. Wording to be included in high visibility all-weather sign attached to protective fencing

5.5 In order to allow for construction workers at the rear of the house it is proposed that part of the RPA and patio will be protected by ground protection. This area, located inside of the purple lines on the tree protection plans (**MD5**), will be covered by heavy duty plywood boards laid over a 100 mm thickness of a compressible material such as woodchips laid onto the existing surface or, if bare earth, onto a geotextile such as Terram (Figures 6 and 7). Once laid the plywood sheeting will be secured in place by wooden battens screwed into adjacent sheets.

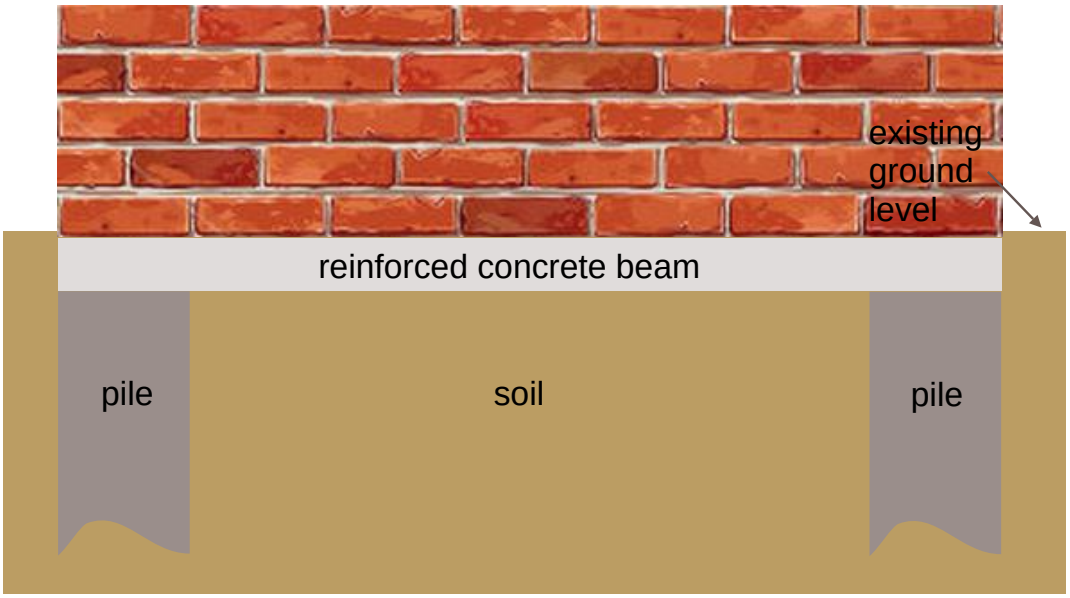
Figure 6. Specification for ground protection

Figure 7. Plywood sheeting used as ground protection.

Pile and beam foundations

5.6 Pile and beam foundations will be designed by a structural engineer but are intended to minimise ground disturbance and root severance by avoiding excavating a continuous trench (Figure 8). Piles will be installed by a piling rig and will not exceed 500 mm diameter. Concrete beams will be installed at depths of no more than 200 mm below existing ground level. The specific position of the piles will be determined by hand digging in the proposed pile location. If roots larger than 25 mm diameter are encountered the position of the pile will be moved.

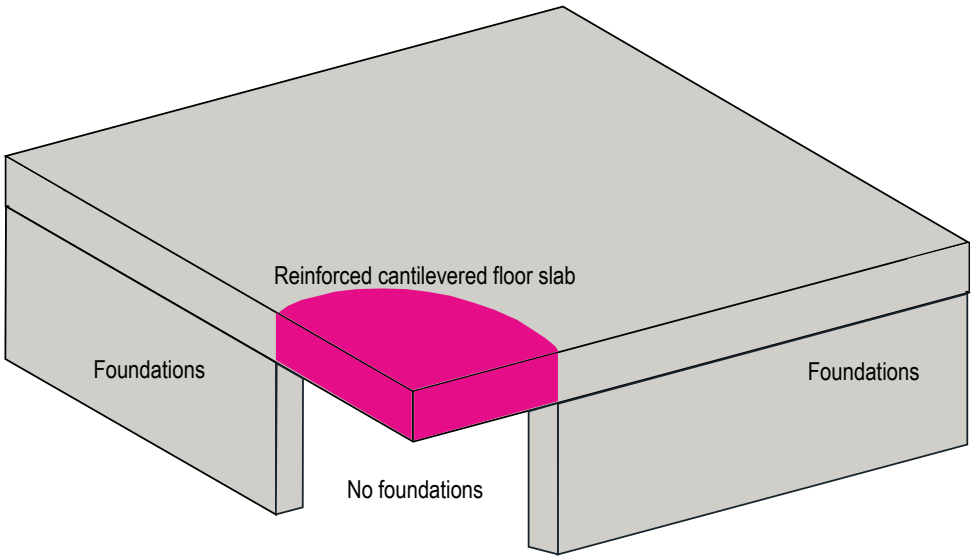
Figure 8. Illustrative diagram to show pile and beam foundation construction.



Cantilevered floor slab

5.7 No foundations for the extension will be installed in the area of encroachment into the RPA of T1. Instead a reinforced cantilevered floor slab will be constructed (Figure 9) which will prevent severance of roots. The floor slab, including insulation, must be no more than 300 mm below existing ground level to avoid woody roots (likely to be at a depth of 300 – 600 mm).

Figure 9. Illustrative diagram to show cantilevered floor slab construction in area within the yellow lines on tree protection plan (**MD5**).



Arboricultural supervision

5.8 Subject to contractual arrangements being in place Martin Dobson Associates Ltd. will be the project arboricultural consultants overseeing tree protection for the duration of the construction/ landscaping contract(s). The appointed project arboriculturists 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 trial pit digging;
- 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;

5.9 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 and personnel induction carried out. The site manager/foreman will be fully briefed on tree protection measures and procedures before any workers or sub-contractors are permitted onto the site. Following induction, a copy of the Induction Sheet (**MD6**) will be provided to and be signed by the site manager/foreman in recognition of acceptance of their role in enforcing day to day tree protection.

5.10 Martin Dobson Associates will be notified at least five days in advance of any change of site manager and will arrange for induction to take place together with signing of the Induction Sheet.

5.11 All contractors involved in the project have a duty to comply with all the specified tree protection measures and all workers will be provided with induction by the site manager/foreman and be required to sign an Induction Sheet confirming they have understood the protection measures. Signed sheets will be kept on site for inspection.

5.12 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.

5.13 Fencing 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

5.14 No fires will be lit on site within 3 m of root protection areas 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

5.15 All machinery required on site will operate outside of root protection areas or from the ground protection.

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

Services

5.17 Existing services and drainage runs will be used. If new connections are required, the project arboriculturist must be consulted in order to approve them and supervise any digging that may be required to ensure that woody roots are not harmed.

Tree works

5.18 Any tree works and clearance of the site will be undertaken as preliminary works. This will be carried out by suitably qualified arboriculturists to the standards set out in BS3998: 2010 *Tree works – recommendations*. Heavy machinery must not be used on unprotected ground.

Landscaping

5.19 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 survey of one tree has been carried out on land adjacent t 6 Greenaway Gardens London, NW3 7DJ.

6.2 The tree is considered to be category B and of moderate value (Bay T1).

6.3 The bay tree T1 is to be retained and will be protected during development and methods for ensuring its protection have been described.

6.4 It is considered that the proposed development will pose no threat to tree to be retained and is sympathetic to the leafy character of the Redington Frognal Conservation Area.

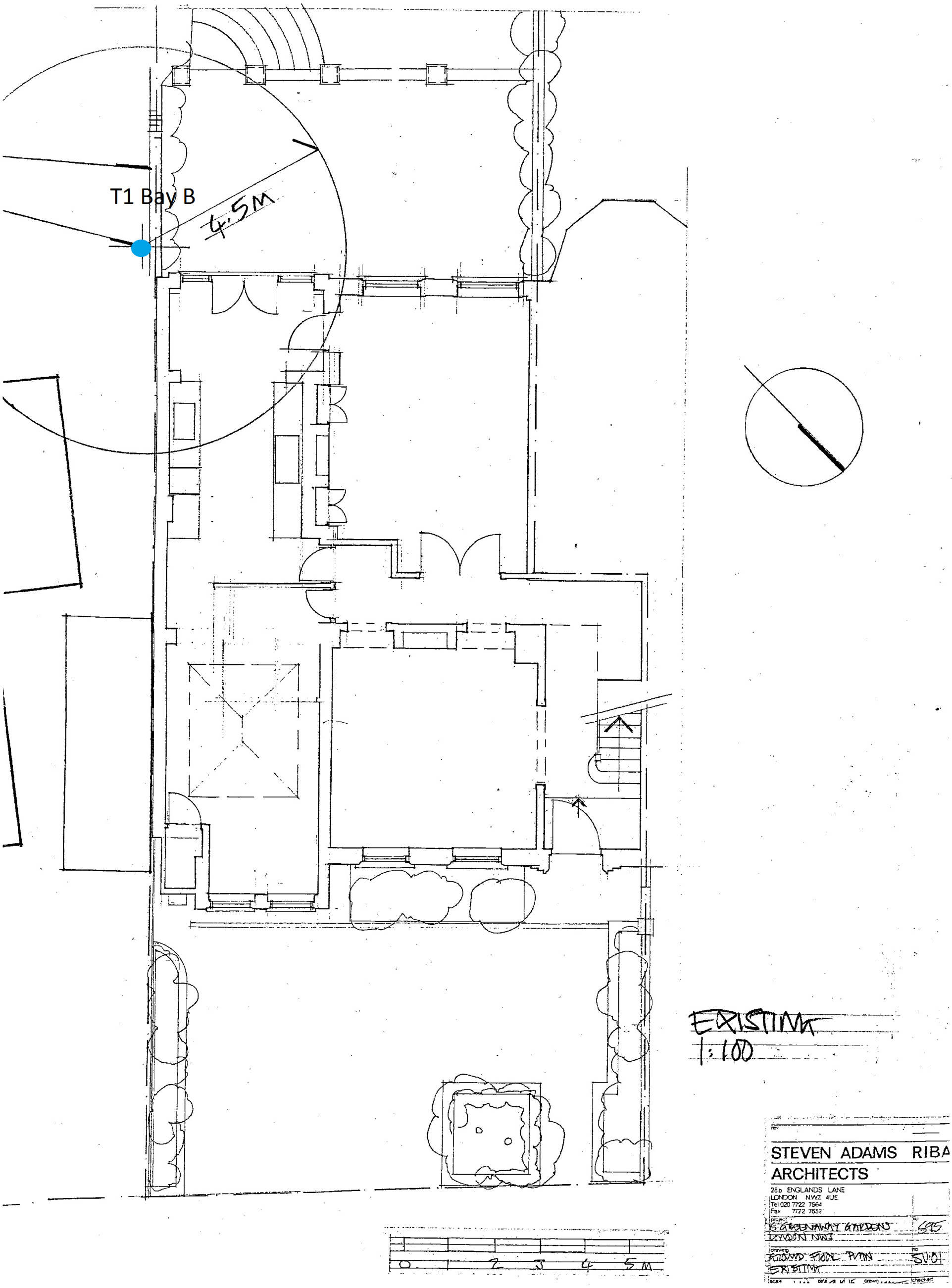
APPENDIX MD1
Tree survey schedule (BS5837: 2012)

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	Bay	6	378	1	1	1	1	0.5	M	Good	Good	10-20	B	Multi stemmed. Located 60cm to the south west of the rear corner of the building, Has been topped in the past, Crack in small boundary wall adjacent to the stem, Ivy clad. Fence panel has collapsed on to stem

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

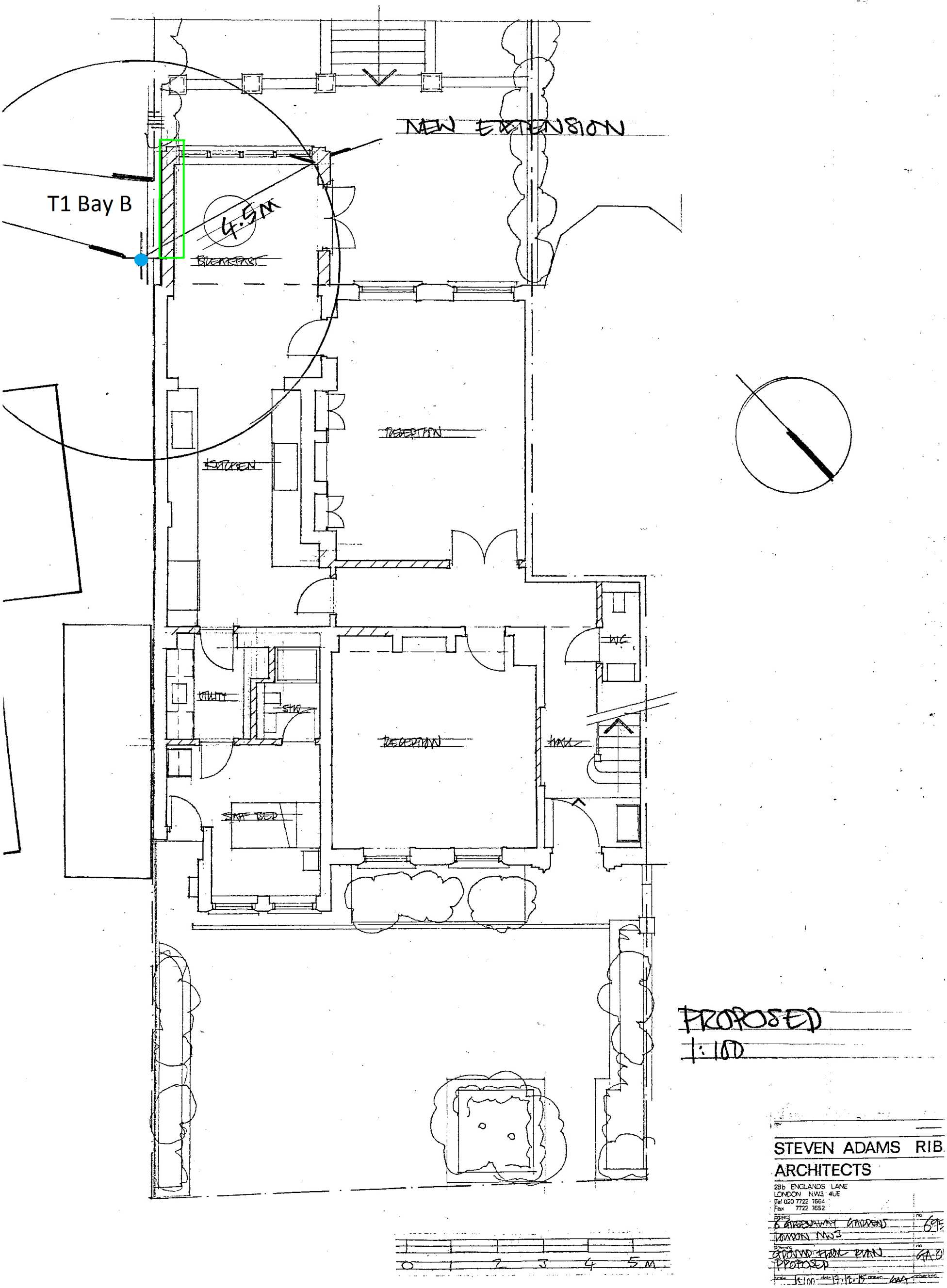
APPENDIX MD2

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



APPENDIX MD3

Trial pit location (area enclosed by green lines) 30cm wide by 1m deep.

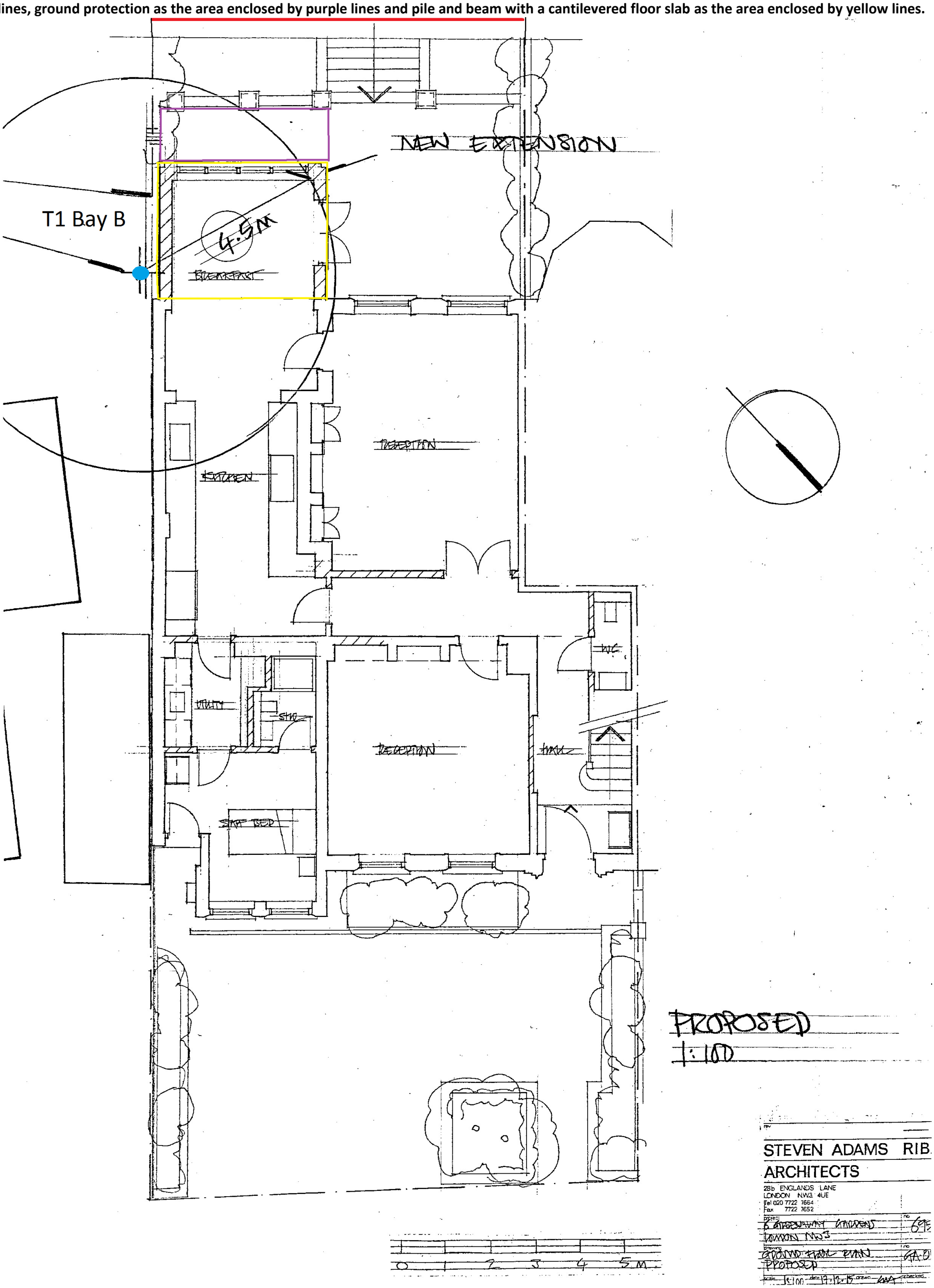


APPENDIX MD4
BS5837 schedule of protection areas

Tree No.	Species	Trunk diameter (mm)	BS5837: 2012 Root protection area, RPA, (m^2)	BS5837: 2012 Radial protection distance (m)
T1	Bay	378	64.6	4.5

APPENDIX MD5

Tree protection plan showing retained tree, tree numbers and root protection areas (black circle). The location of protective fencing is shown as red lines, ground protection as the area enclosed by purple lines and pile and beam with a cantilevered floor slab as the area enclosed by yellow lines.



APPENDIX MD6

TREE AWARENESS – SITE INDUCTION SHEET

SITE NAME: 6 Greenaway Gardens, London NW3 7DJ

Trees are an important part of this development and all trees noted on the Tree Protection Plan are protected by planning conditions and by virtue of being in a Conservation Area. Trees must not be damaged in any way, including indirectly through compaction/contamination of soil, so that they can fully integrate into the finished project and stay healthy well into the future. All persons working on this site have a responsibility to be aware of trees and to abide by tree protection procedures.

How can trees can be damaged?

Above the ground – contacts and impacts with branches and trunk (for example by machine operations: piling rigs, high-sided vehicles, crane use, fixings to trunk, unauthorised cutting back of branches). Make sure there is adequate clearance under the tree canopy and don't stray close to the trunk. Damage to bark allows infections to enter the tree.

Below the ground – roots spread out from the trunk horizontally at shallow depth and are therefore easily damaged. Vehicle and pedestrian movements and storage of materials on unprotected ground causes compaction, especially in wet weather, and must be avoided. Soil stripping during site clearance or landscaping is prohibited in root protection areas. The effects of root damage may take some time to become obvious, but can result in disfiguring dieback of leaves and branches, or even death.

Tree protection procedures

Provided that the simple steps below are followed most tree protection is straightforward:

- Stay out of tree Construction Exclusion Zones (CEZs). These are the areas of ground surrounding retained trees that are protected by barriers and/or ground protection. If you need to go into a CEZ, you must first gain authorisation from the Site Manager.
- No construction activity of any description within CEZs, e.g. soil stripping, cement mixing, services installation, storage of materials etc.
- No fires within 20m of trunk of any retained tree.
- If authorised to work within a CEZ, for example, for installation of an above-ground no-dig driveway you must follow the procedures set out in the **Arboricultural Method Statement.**
- If damage occurs, you must inform the Site Manager who must, in turn, inform the project arboriculturist.

Planning Authority enforcement action needs to be avoided:

- 'Breach of Conditions' notices can prevent a site from being signed-off.
- 'Temporary Stop Notices' halt site operations and result in associated high costs.
- Wilful damage/destruction of TPO/Conservation Area trees can result in company and/or individual prosecutions - fines can me anything up to £20,000 (County Court fines are unlimited). Remember that fines may apply to the person committing the offence as well as the site owner and main contractors!

I have received site induction in tree awareness and tree protection procedures

PRINT NAME

SIGN

DATE

APPENDIX MD7

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.

Qualifications and Experience

Iain Waddell

Iain Waddell has been working with trees since 2010 when he retired from a career of professional Ski Coaching in Canada and New Zealand.

He began his studies at Sparsholt College in Winchester where he gained a Level Three extended Diploma in Arboriculture. During his studies he worked for a Petersfield based firm – Sequoia Tree Services, starting as a groundsman but rapidly developing his skills to become a lead climber. After 4 years Iain became a Company Director and began to expand the business.

Whilst carrying out tree works at Sequoia Iain developed not only his skills with a chainsaw but also his interest in the legal side of tree management. This prompted him to attend an Arboricultural Consultancy course through Tree Life Training AC Ltd based at Westonbirt Arboretum which resulted in the attainment of a Level 6 Diploma in Arboriculture. His choice of subject of specialist research was the management of veteran trees.

Iain is a member of the Arboricultural Association and is enjoying working as an Associate Consultant with Martin Dobson Associates.