Arboricultural Development Report

The Pears Building,

Royal Free Hospital,

London,

NW3 2QG.

17 October 2014

Author: Matthew Middle Dip., (Arb.), Tech.Arbor.A.

Table of Contents

If this report has been released electronically the appendices referred to herein can be found in the annexed zip folder/s as .pdf or .dwg files. If this report has been released in hard copy the appendices will be bound into the back of this report. Plans may be annexed separately as A1 or A2 copies where a bound-in A3 copy is not appropriate.

Executive Summary

This report describes the extent and effect of the proposed development at The Pears Building, Royal Free Hospital, London, NW3 2QG ("site") on individual trees and groups of trees within and adjacent to the site.

Trees within the site were surveyed; using a methodology guided by British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations' ("BS5837").

Subsequently, this report has been produced, balancing the layout of the proposed development against the competing needs of trees. This report comprises all of the requisite elements of an arboricultural implications assessment, method statement and supporting plans.

Checklist for Submission to Local Planning Authority

Tree survey	☒
Tree constraints plan	☒
Arboricultural impact assessment	☒
Arboricultural method statement	☒
Tree protection plan	☒

This report and its appendices follow precisely the strategy for arboricultural appraisal intended to provide local planning authorities with evidence that trees have been properly considered throughout the development process.

It is the conclusion of this report that the overall quality and longevity of the amenity contribution provided for by the trees and groups of trees within and adjacent to the site will not be adversely affected as a result of the local planning authority consenting to the proposed development. It is considered that any issues raised in this report, or beyond the scope of it can be dealt with by planning conditions.

General Information

Client: The Royal Free Charity

Site: The Pears Building, Royal Free Hospital, London, NW3 2QG.

Brief proposal description: The core focus of the development is to provide world-class space, facilities and equipment for laboratory research and write-up in the field of immunity and transplantation.
The new building will provide laboratory and research space, patient hotel, Royal Free Charity office space and replacement car park together with landscaping, mechanical plant and infrastructure works.

Planning application reference: N/A

Documents referred to:

Document	Reference
Topographical survey drawing	13021-02T-E
Proposed layout drawings	Royal Free Proposed Site Base; Stage D architectural drawings
Landscape master plan drawing	N/A
LPA pre-app comments	N/A
British Standard 5837:2012	“BS5837”
Arboricultural Impact Assessment	Arbtech AIA 03
Tree Protection Plan	Arbtech TPP 03

Tree Survey

Survey: An arboricultural survey to BS5837 of all trees within impacting distance of the site was undertaken by David Garrick on 17th March 2014 with additional trees surveyed on 29 September 2014.

Limitations: The survey was made at ground level using visual observation only. Detailed examinations, such as climbing inspections and decay detection equipment were not employed, though may form part of the survey's management recommendations. Measurements were taken using specialist tapes, laser and GPS devices. Where this was not possible, measurements are estimated.

Scope: Pre-development tree surveys make arboricultural management recommendations based exclusively upon the individual tree or group of trees condition relative to their present context (*i.e. not in relation to the proposed development*).

Legal Status: No statutory protection check has been performed. BS5837 does not draw any distinction between trees subject to statutory protection, such as a Tree Preservation Order ("TPO"), and those trees without. This is principally because a detailed planning consent overrides any TPO protection. Consequently, we do not seek to offer any comparison between or infer any difference in the quality or importance of TPO trees and other trees.

* For more information on the surveyed trees please see Arbtech Consulting Ltd, Tree Survey Schedule (Appendix 1), Tree Survey Report and Tree Constraints Plan.

Arboricultural Impact Assessment

There are a number of issues that may need to be addressed in an arboricultural impact assessment between the trees and the proposed development, these are as follows –

- The effect and extent of the proposed development within the root protection areas (RPAs) of retained trees;
- The potential conflicts of the proposed development with canopies of retained trees; and
- The likelihood of any future remedial works to retained trees beyond which would have been scheduled as a part of usual management.

These impacts can be seen on the Arboricultural Impact Assessment drawing no. Arbtech AIA 03.

Trees to be removed

There are 15 individual trees (four of these trees are key components of group G3) and six groups and the partial removal of one group (G3) that will need to be removed as they are in direct conflict with the proposed development.

Number of individual trees to be removed:

U	A	B	C
0	0	12	3

Number of groups of tree to be removed:

U	A	B	C
0	0	1 (1)	5

Canopy cover is ecologically important and the loss of canopy cover by these trees will be mitigated with planting within the development.

Arboricultural Method Statement

Details of key site personnel, including site / project manager will be submitted to the Council's Tree Officer prior to the commencement of site works.

This method statement is to be approved and agreed to in writing by all key personnel prior to the commencement of site works.

No site personnel are to be present and no demolition, site clearance, building work or delivery of materials is to occur until the protective measures are in accordance with this method statement and the Tree Protection Plan drawing no. Arbtech TPP 03.

Protective measures should be in accordance with this method statement and the Tree Protection Plan; drawing no. Arbtech TPP 03 will remain unaltered and in situ, unless otherwise specified, for the entire duration of the construction.

Accidents and emergencies involving trees

Any accidents and emergencies involving trees shall be immediately reported to Arbtech and their advice sought and agreed to by the council.

Phasing of tree protection measures

The tree protection measures shall be phased as follows.

a) Undertake tree works
b) Install the protective measures in accordance with the approved protection plans and this method statement
c) Undertaken demolition works
d) Undertake and complete construction works
e) Undertake external landscape works to areas outside of construction exclusion zones
f) Remove protective measures
g) Undertake external landscaping works within the construction exclusion zones
h) Sign off from the company as no further involvement required

Tree Works

For reasons of public safety, all tree works referred to herein must be carried out prior to any site personnel commencing works or any building materials being delivered.

Summary of Tree Works

No.	Species	Works	Category
10	Yew	Fell to ground level; grind out stump.	B_1
11	Elder	Fell to ground level; grind out stump.	C_1
12 (G3)	Sycamore	Fell to ground level; grind out stump.	B_2
13 (G3)	Sycamore	Fell to ground level; grind out stump.	
14 (G3)	Sycamore	Fell to ground level; grind out stump.	
36	Prunus *Sp.*	Fell to ground level; grind out stump.	C_1
37	Prunus *Sp.*	Fell to ground level; grind out stump.	B_1
38	Swedish whitebeam	Fell to ground level; grind out stump.	B_1
39	Prunus *Sp.*	Fell to ground level; grind out stump.	C_1
40	Norway maple	Fell to ground level; grind out stump.	B_1
41	Norway maple	Fell to ground level; grind out stump.	B_1
42	Norway maple	Fell to ground level; grind out stump.	B_1
43	Norway maple	Fell to ground level; grind out stump.	B_1
45	Lime	Fell to ground level; grind out stump.	B_1
46	Lime	Fell to ground level; grind out stump.	B_1
G3	Sycamore	Partial removal - Fell to ground level; grind out stumps.	B_2
G2	Sycamore	Fell to ground level; grind out stumps.	C_2
G6	Various	Fell to ground level; grind out stumps.	C_2
G7	Various	Fell to ground level; grind out stumps.	C_2
G8	Silver birch	Fell to ground level; grind out stumps.	B_1

No.	Species	Works	Category
G9	Various	Fell to ground level; grind out stumps.	C_2
G10	Various	Fell to ground level; grind out stumps.	C_2

Notes

All tree work is to be undertaken in accordance with British Standard BS 3998:2010, Recommendations for tree work. All arising's are to be removed and the site is to be left as found. Care is to be taken of the ground around retained trees to make sure that it does not become compacted as a result of tree surgery operations. No equipment or vehicles such as timber Lorries, tractors, excavators or cranes shall be parked or driven beneath the crowns of any retained trees, to prevent subsequent compaction and root death.

Tree removal

A tree should be felled in one piece only when there is no significant risk of damage to people, property or protected species (see Annex A).

Where restrictions (e.g. lack of space, buildings, other features, land ownership or use, or other trees which are to be retained) cannot be overcome, trees should be dismantled in sections.

This also applies where a tall stump is being retained but where branches are to be removed/pruned.

Extensively decayed trees can be unpredictable when they are being felled, and special precautions should therefore be taken, such as the use of a winch to guide the direction of fall.

Stump removal – stump grinding

Stump grinding should be to a minimum of 300mm deep or to extend through the base of the stump leaving the major roots disconnected if the intention is to reduce the potential for the spread of Honey fungus.

The grinding residue should be treated as arising's and removed from site.

NOTE Mechanical destruction of a stump by stump grinding is less disruptive to the site than digging out.

The hole left by stump removal, should be filled with soil or other material. The filling should be appropriate for future site usage, and for any surface treatment that is to be installed.

Where future plant growth is desired, the backfill material should be firmed in 150 mm layers by treading, avoiding excessive compaction and destruction of the soil structure.

After stump removal

The hole left by stump removal, whether by digging out or grinding, should be filled with soil or other material. The filling should be appropriate for future site usage and for any surface treatment that is to be installed.

Where future plant growth is desired, the back fill material should be firmed in 150mm layers by treading, avoiding excessive compaction and destruction of the soil structure.

Common Birds

All common wild birds are protected under The Wildlife and Countryside Act 1981.

This legislation makes it an offence to:

- Kill, injure or take wild birds.
- Take damage or destroy the nest of wild birds while it is in use or being built.
- Take or destroy the eggs of wild birds.

Certain rare breeding birds are listed on Schedule I of The Wildlife and Countryside Act 1981. Under this legislation they are afforded the same protection as common wild birds and are also protected against disturbance whilst building a nest or on or near a nest containing eggs and or unfledged young e.g. Barn Owl Tyto alba.

Bats

Bats species are afforded further protection by the Countryside and Rights of Way Act 2000; and the Natural Environment and Rural Communities Act 2006.

This legislation makes it an offence to:

- Intentionally or deliberately kill, injure or capture bats.
- Deliberately disturb bats, whether at roost or not.
- Damage, destroy or obstruct access to bat roosts.
- Possess or transport bats, unless acquired legally.
- Sell, barter or exchange bats.

A bat roost is defined by the Bat Conservation Trust publication Bat Surveys—Good Practice Guidelines as “the resting place of a bat” (BCT 2007). Generally however, the word roost is interpreted as “any structure or place, which any wild bat uses for shelter or protection.”

Bats tend to re-use the same roosts; therefore legal opinion is guided by recent case law precedents, that a roost is protected whether or not the bats are present at the time. This can include for summer roosts, used for breeding; or winter roosts, used for hibernating.

Protective Measures

Protective measures are to be installed immediately following the completion of the tree works, and are to be sited and aligned in accordance with the tree protection plan (Arbtech TPP03).

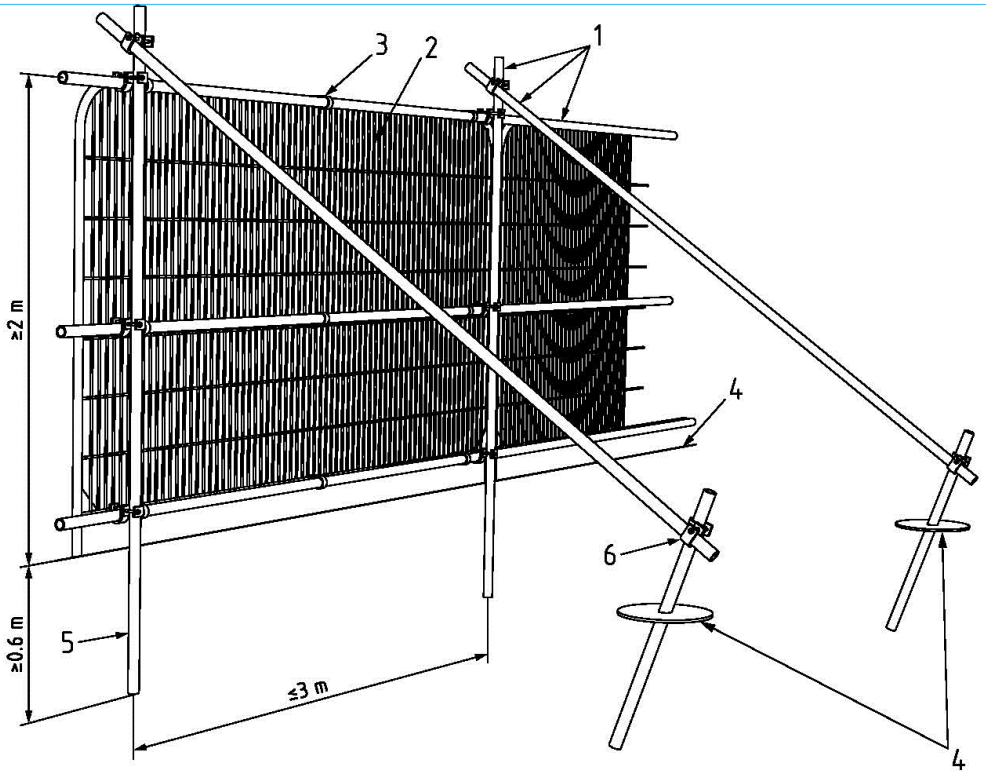
The existing site boundary measures are to be retained for the duration of the development. If for any reason the existing boundary measures are not to be used protective barrier fencing is to be installed along the line of the boundaries and is only to be removed upon the written permission of the project arborist or LPA tree officer upon the completion of the development or immediately prior to the installation of the permanent boundary measures.

No equipment, vehicles or plant shall operate beyond the tree protection fencing. Booms, hoists and rigs should be kept as far away from the canopies of retained trees at all times. Where it is necessary to operate within 5m of a tree canopy, it will be done with the utmost caution and under the control of a banks man. Damage to trees will be considered a breach of this tree protection plan, which in turn could be a breach of planning permission.

Protective Barrier Fencing

Protective barrier fencing should be appropriate for the intensity and proximity of the development to protect trees where development activity is in close proximity.

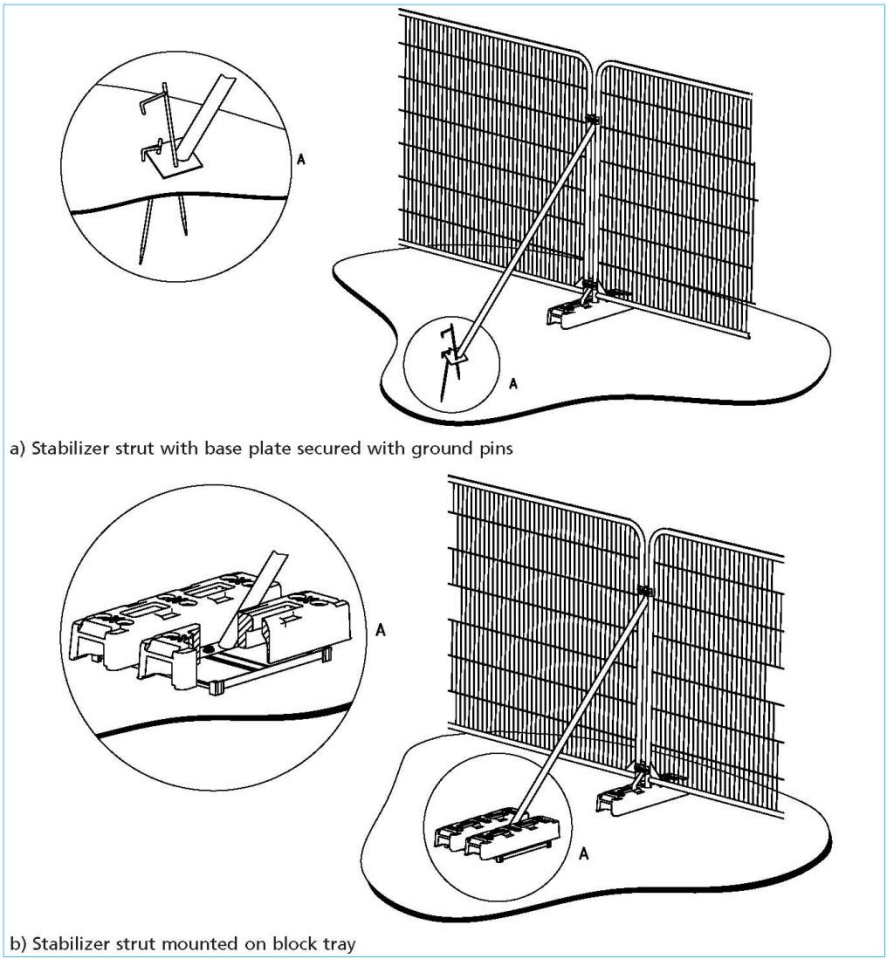
Default specification: To comprise either 2.4m wooden site hoarding; or a 2.3m high scaffold framework, well braced to resist impacts, with uprights to be spaced at a maximum of 3.0m intervals and driven into the ground by a minimum of 600mm. On o this, standard anti-climb welded mesh panels are to be securely fixed to each other with at least two scaffold clamps and to the scaffold frame work with wire.



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

Secondary specification: To comprise of 2m tall welded mesh panels on rubber or concrete feet. Panels are to be joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence. The panels should be supported on the inner side by stabiliser struts, which should be attached to a base plate and secured with ground pins.



a) Stabilizer strut with base plate secured with ground pins

b) Stabilizer strut mounted on block tray

Signage denoting the words "*tree protection area*" at 5.0m intervals should be fixed to the protective barrier fencing (See Appendix 2).

Protective fencing is to be removed ONLY with the written permission of the arboricultural consultant and approval of the local planning authority (LPA).

Trunk Protection

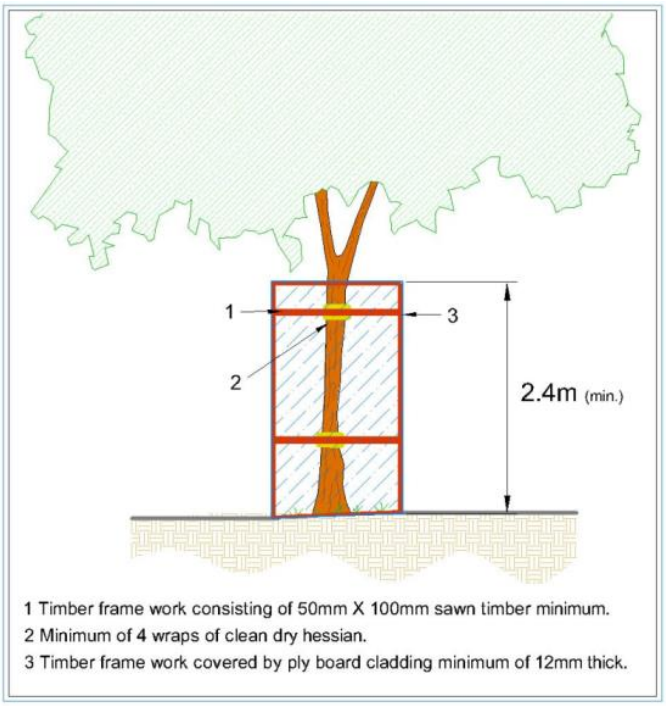
Protective trunk wrapping:

Protective trunk wrapping is to comprise of a minimum of three wrappings of clean dry hessian around the trunk from ground level up to 2.4m high and held in place with sisal. Onto the hessian there is to be a minimum of three wraps of chestnut paling around the trunk; the chestnut paling is to be held in place by 2.50mm galvanized mild steel wire at the top, middle and bottom of each wrap of chestnut paling. The wire is to be secured to the chestnut paling by fencing staples; Or

Protective barrier hoarding:

Protective barrier hoarding should be appropriate for the intensity and proximity of the development to protect trees where development activity is in close proximity. To comprise of 2.4m high wooden site hoarding constructed upon a timber frame work situated around the outside of the planting pit. Where the timber frame is constructed around the tree trunk a minimum of four layers of clean dry hessian is to be wrapped around the trunk to protect the bark.

Trunk protection is to be removed ONLY with the written permission of the arboricultural consultant and approval of the local planning authority (LPA).



Protective barrier hoarding

Ground boarding

New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

Note The ground protection might comprise of one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100mm depth of woodchip), laid onto a geotextile membrane;
b) for pedestrian-operated plant up to a gross weight of 2t, proprietary inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150mm depth of woodchip), laid onto a geotextile membrane;
c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary system or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

Where it is determined by the project engineer that the existing and or proposed hard surfacing is not adequate protection from any expected loading, ground boarding is to be installed to the engineer's specification on top of the hard surfacing within the root protection areas of retained trees.

Site management

The site manager will be responsible for briefing / inducting all personnel who will be working on any stage of this development and especially those who will be working within or adjacent to canopies or RPAs of retained trees; and will make them aware of, and provide a copy of this this method statement and tree protection plan drawing no. Arbtech TPP 03; this is to include but not exclusively of the movement / operation of plant, excavations, unloading deliveries, mixing / pouring cement and concrete.

The site manager will be responsible for the day to day running and protection of all retained trees and for leasing with the project arborist about any tree related matters and prior to any works that may or will affect the RPAs or canopies of retained trees; this is to include but not exclusively of the movement / operation of plant, excavations, unloading deliveries, mixing, pouring and storage of all caustic materials that may cause harm to retained trees.

Any incidents of damage to retained trees or of tree protection measures will be documented by the site manager who will then report these incidents to the project arborist immediately and make sure that works within this area cease until the project arborist has had an opportunity to inspect the damage and where appropriate, agree a mitigation plan with the local planning authority tree officer.

The site manager may designate another person to take charge of briefing / inducting new site personnel or visitors in his absence.

If the site manager is replaced or is absent from site for more than five working days the project arborist will be informed and a pre start meeting will be held with the new / acting site manager.

It is the responsibility of the site manager to ensure that the planning conditions attached to the planning consent are adhered to at all times and that a monitoring regime and supervision of any works within or adjacent to the RPAs are adopted.

If at any time pruning works are required other than those previously approved, permission must be sought from the LPA tree officer and once permission is granted they are to be carried out by a suitably qualified person in accordance with BS3998:2010 Tree work – Recommendations.

Prohibition

- Mechanical digging or scraping is not permitted within a defined root protection area or within areas cordoned off by protective barrier fencing.
- No access will be permitted within the protected areas;
- No materials, equipment or debris will be stored within any of the fenced areas, or against the fencing;
- Fires are not permitted within 5.0m of any vegetation.
- Leaning objects against or attaching of objects to a tree is not permitted.
- Machinery, plant and vehicles are not permitted to be washed down within 10.0m of vegetation.
- Chemicals and materials are not to be transported, stored, used or mixed within a root protection area or within areas cordoned off by protective barrier fencing.
- Cement silos, mixing site to be situated within a bunded area to prevent pillage/leaking of chemicals harmful to trees. These areas are to be sited well clear of protected trees.
- Refuelling of plant or machinery is prohibited within 10m of the construction exclusion zones.
- It is essential that allowance should be made for the slope of the ground so that damaging materials such as concrete washings, mortar or diesel oil cannot run towards trees.
- Where machinery is to be used within 5m of retained tree canopies a banks man will be required at all times whilst setting up, moving or operating within this distance of retained trees canopies.

Demolition

Prior to any demolition of the existing site features, all tree works are to have been completed, tree protection measures are to be in place as per Arbtech Consulting Ltd. tree protection plan document no. Arbtech TPP 03 and have been signed off and a copy of the demolition method statement has been submitted and approved by the project arboriculturist and LPA tree officer, to ensure that there is no conflict with this method statement.

All demolition work within or immediately adjacent to RPAs or canopies of retained trees is to be undertaken under the direct on-site supervision of an arboriculturist.

Structures

Demolition of the existing walls, buildings or structures beneath the canopies and or within the RPAs retained trees are to be undertaken carefully under arboricultural supervision.

The structures are to be taken down so that all debris and materials are to fall outside of the RPAs and away from the canopies of all retained trees.

Foundations within and adjacent to the RPAs of retained trees are to be left in situ where ever possible. Where this is not possible demolition of the existing foundations are to be undertaken to the minimum depth required to allow for the installation of the new soft and hard landscaping.

The removal of the existing foundations within the RPA of retained trees are to be undertaken using a hand held pneumatic breaker, hand tools and wheel barrows to break up and remove the debris out of the RPA. In some situations and only at the discretion of the arborist it may be possibly to use an excavator using a hydraulic breaker and a suitably sized toothless grading bucket.

It may be permitted by the project arboriculturalist for an excavator to undertake the demolition and removal of the foundation but it must be situated outside of the RPA, on top of the hard surfacing working away from the RPAs or from suitable ground boarding capable of handling the expected loading.

If it is likely that there will be any soil collapse or the trench begins to collapse within the RPAs of retained trees which will lead to the loss of rooting environment, excavations are to be stopped immediately and the trench is to be shored up to prevent further soil collapse.

Where the removal of foundations occurs within the RPAs of retained trees these voids are to be back filled with clean top soil.

Hard Surfacing

Where it is required for hard surfacing is to be removed and or re-surfaced within the RPAs of retained trees it is to be undertaken under direct on-site arboricultural supervision, during the landscaping phase of the development.

The wearing course will be broken up using a hand held pneumatic breaker, hand tools and wheel barrows to break up and remove the surfacing. Where is necessary to remove the sub base this is to be undertaken using a fork to loosen the material and moved using shovels and wheel barrows.

In some situations and at the discretion of the arborist it may be possibly to use an excavator using a hydraulic breaker and a suitably sized toothless grading bucket. If an excavator is to be used it must be situated outside of the RPAs, on top of the hard surfacing working away from the RPAs or from ground boarding.

Whichever system is used there is to be **NO** disturbance of the soil beneath. If roots are found they are to be covered over with damp hessian and a layer of either sharp sand, wood chip or top soil will be applied as soon as practicably possible to prevent desiccation.

Existing Underground Services

Existing services within the site should be retained where ever possible. Where existing services within RPAs require upgrading, the upmost care must be taken to minimise disturbance, and where feasible trenchless techniques are to be employed, and only where necessary should open excavations be considered.

Construction

Prior to construction, a copy of the construction method statement should have been submitted and approved by the project arboriculturist and LPA tree officer, to ensure that there is no conflict with this method statement.

All excavations and construction work within or immediately adjacent to RPAs or canopies of retained trees is to be undertaken under the direct on-site supervision of an arboriculturist.

Foundations design

New foundations for the new building, hard landscaping and steps situated within the RPAs of tree nos. 1, 2, 3, 4, 5, (G1), 15, 16, 18, 19, 20 and 47 to 49 are to be designed in conjunction with arboricultural advice to accommodate the likely loading of the structure. The foundations will be been designed to limit the amount of excavation required within RPAs to retain roots that are important to the trees stability as identified during the site investigations.

The use of strip foundations within RPAs of retained trees can cause extensive root loss and as such are to be avoided.

Design of foundations for the new steps are to be designed to minimise the adverse impact upon the tree and should pay particular attention to the existing ground levels and proposed finished floor level. Foundation design should be undertaken using site specific information in conjunction with the project arboriculturist and engineer.

Root damage can be minimised using:

- Piles, with a site investigation it is possible to determine their optimal location whilst avoiding damage to roots important for the stability of the tree. Investigative excavations are to be undertaken with the use of hand tools or compressed air displacement to a minimum depth of 600mm;
- Beams laid at or above ground level and or cantilevered as necessary to avoid tree roots identified by the site investigation
- Multi-dimensional confinement systems.

These are just an example of a few types of foundations that can be used to minimise root damage. In order to arrive at a suitable solution, site specific and specialist advice regarding foundation design should be sought from the project arboriculturist and engineer.

Small structures

Slabs for smaller structures (less than 20% of the total area of the un-surfaced RPA) such as garages and shed may be formed / constructed directly onto the existing soil surface. It may be possible to use a multi-dimensional confinement system such as CellWeb ^{TM} or similar as the foundation for these structures (specialist advice should be sought from the manufacturer).

Where piling is to be installed near to trees, the smallest practical pile diameter should be used, as this reduces the possibility of striking major tree roots, and reduces the size of the rig requires to sink the piles. If a piling mat is required, this should conform to the specification for ground boarding.

All and any excavations that may be required for foundations within the RPAs of retained trees will initially be undertaken manually under arboricultural supervision (see Manual excavation).

The proposed building is not situated within any RPAs and as such does not impact upon any of the retained trees and will not require any specialist construction methodology.

Boundary fences

Proposed and or replacement boundary fence posts are to be excavated manually (see Manual excavation) within RPAs of retained trees, individual posts may require moving to prevent damage of roots 25mm or greater in diameter.

Concrete foundations

Prior to concrete being poured to form the foundations within or immediately adjacent to the RPAs of retained trees the excavation is to be lined and sealed to prevent any leaching of the concrete into the soil and causing desiccation of retained roots by concrete run off.

Manual excavation

Excavation within RPAs will be undertaken by hand under direct on-site arboricultural supervision of the required depth of the foundation; Or to a minimum of 600mm deep of any excavation, whether for proposed foundations, hard surfacing or underground services. The total depth of the manual excavation will be determined by the arboriculturist whilst on site.

The soil is to be loosened with the aid of a fork or pick axe and then cleared with the aid of an Air-spade, Air-vac and or shovel. Any roots found will be cleanly severed by the arboricultural consultant with either a hand saw or secateurs.

Any roots found with a diameter of less than 25mm shall be cleanly severed by the arboricultural consultant. Any roots of 25mm and above shall be excavated around without damaging them; the arboricultural consultant shall decide if it's feasible or necessary to retain the root, if not it shall be severed.

The edge of the excavation closest to the trees will be covered with damp hessian to prevent soil collapse or contamination by concrete.

Soil beneath the depth may be sheet piled, regular piled or excavated deeper. Machinery may be used for this providing that it is situated outside of the RPA or has appropriate ground protection in place to move around on and work upon.

Services

Detailed drawings of proposed underground services are not available at this time; hence it is not possible to identify any specific potential impacts associated with the scheme at this stage.

Existing services within the site should be retained where ever possible. Where existing services within RPAs require upgrading, the upmost care must be taken to minimise disturbance, and where feasible trenchless techniques are to be employed, and only where necessary should open excavations be considered.

Where new services are to be introduced into the site they should be located outside of RPAs, where they will not interfere with tree roots. If any excavations are required within the RPAs all trenches are to be excavated by hand and radially to the tree trunks under direct on-site arboricultural supervision and are to be carried out under NJUG guidelines.

Final positions of any proposed services should be verified and approved by the arboricultural consultant and local authority tree officer before implementation.

New Underground services

Trenching for installation of underground services and drainage routes could sever any roots that may be present and as such adversely affects the health of the tree. For this reason particular care should be taken in routing and methods of installation of all

underground services. All underground services and drainage routes should be located so that no excavations are required within RPAs.
Where it has been impossible to keep underground services from passing through RPAs or within close proximity to trees, these sections are to be installed in one of three ways in accordance with the guidance set out in National Joint Utilities Group guidelines (NJUG 4), under on site arboricultural supervision.

Trenchless Techniques

There are three main types of trenchless techniques, these include, guided and unguided boring and pipe replacement by lining or bursting. These allow for the installation, maintenance or renewal of underground services, without the disturbance of soil in which roots are likely to be growing. Starting and receiving pits for the boring machinery are to be located outside of the RPAs of any retained trees, with the bore depth being maintained at a minimum depth of 600mm below the existing ground level. Techniques involving external lubrication of the equipment shall use no material other than water as other lubricants could contaminate the soil (e.g. oil, bentonite, etc.).

Manual Excavation

Excavation within RPAs will be undertaken by hand under direct on-site arboricultural supervision of the required depth of the foundation; Or to a minimum of 600mm deep of any excavation, whether for proposed foundations, hard surfacing or underground services. The total depth of the manual excavation will be determined by the arboriculturist whilst on site.

The soil is to be loosened with the aid of a fork or pick axe and then cleared with the aid of an Air-spade, Air-vac and or shovel. Any roots found will be cleanly severed by the arboricultural consultant with either a hand saw or secateurs.

Any roots found with a diameter of less than 25mm shall be cleanly severed by the arboricultural consultant. Any roots of 25mm and above shall be excavated around without damaging them; the arboricultural consultant shall decide if it’s feasible or necessary to retain the root, if not it shall be severed.

The edge of the excavation closest to the trees will be covered with damp hessian to prevent soil collapse or contamination by concrete.

Soil beneath the depth may be sheet piled, regular piled or excavated deeper. Machinery may be used for this providing that it is situated outside of the RPA or has appropriate ground protection in place to move around on and work upon.

Broken Trench – Hand Dug

This technique combines both trenchless techniques and manual excavation where excavation is unavoidable. Excavations should be limited to where there is clear access around and below the roots. All trenches are to shall be excavated by hand with the same precautions taken as for manual excavation. Open section of trench should only be large enough to allow access for linking to the next section.

Landscaping

The ratio of trees removed to trees replanted should not necessarily be 1:1. Instead, the ratio should take into consideration the available space for tree growth and development in order to ensure the trees are physically suited to the site at maturity. A specification for and notation relating to the precise alignment of replacement trees will be contained in the landscape proposals.

Landscaping around retained trees may only be carried out once all tree protection measures have been removed (planting, turfing, fencing etc.).

All excavations within the Root Protection Areas shall be undertaken by hand and without reducing current ground levels unless it is agreed in writing with the LPA. At no time is the use of a rotavator permitted within the RPAs of retained tree.

Any tree roots discovered will be left in-situ and shall not be cut or otherwise damaged. Where possible, the soil structure within the Root Protection area shall be preserved.

No works will be carried out within the RPAs of any trees if the soil moisture is of such a level that soil compaction may be likely. Should the soil become compacted or has poor structure which would hinder the development of the existing trees and plants or any new plantings the arboriculturist should be consulted about soil decompaction techniques.

Monitoring and Supervision

Where trees have been identified within this method statement and tree protection plan drawing no. Arbtech TPP 03 for retention, there should be an auditable system of arboricultural monitoring. This is to extend to arboricultural supervision whenever demolition or construction activity is to take place within or adjacent to any canopy or RPA.

The development's tree protection measures are to be monitored and all demolition and construction works to be undertaken within or adjacent to the RPAs of retained trees are to be supervised by Arbtech Consulting Ltd (project arborists), who should be retained to record and report observations to the council at appropriate intervals.

Pre-commencement site meeting

Prior to the commencement of any works or machinery and materials arriving on site a pre-commencement site meeting involving the project arborist, land owner/agent, site manager, contractors and engineer (as appropriate) and the relevant LPA officers will be held to ensure that all aspects of the arboricultural method statement and tree protection are understood and for all parties to swap contact details (see Appendix 3).

Monitoring and supervision schedule

The initial monitoring visit will be to check that the tree protective measures are in the correct location and as specified within the approved method statement; if so to sign off their installation.

There after monitoring visits are to take place at regular intervals, to ensure that tree protection measures are in place and are functioning as designed or whenever necessary to undertake works to be carried out under arboricultural supervision. The frequency of the monitoring visits is to be determined with the LPA tree officer at the pre-commencement site meeting.

A record of all arboricultural monitoring and supervision visits will be kept and any faults will be logged, this will then be copied to the site agent, developer and local planning authority in a digital format.

If during the course of the development it is necessary for areas to be re-designed so that they would require changes to the approved arboricultural method statement or tree protection plan and so affecting retained trees the project arborist and LPA tree officer will be invited to attend a site meeting with all relevant parties. Prior to any changes being implemented these must have been approved in writing by the LPA tree officer.

Supervision

The arboricultural consultant will be required to attend site to directly supervise all demolition and construction works that are to be undertaken within or adjacent to the RPAs of all retained trees and will be advised a minimum of 72 hours prior to the commencement of any works that require his attendance, these will include

1. Pre-commencement site meeting;
2. Location of protective measures;
3. Supervised demolition of hard surfacing, kerb edging and foundations within or immediately adjacent to the RPAs of all retained trees;
4. Any excavations within or adjacent to RPAs, including foundations, hard surfacing or underground services;
5. Removal of protective measures and sign off.

Completion meeting

Once all construction works have been completed all materials and machinery has been removed from site the project arborist shall be informed and will invite the LPA tree officer to meet on site to discuss the process and discuss any final remedial works that may be required and to sign the development off so that the protective measures may be removed.

Appendix 1 – Tree Survey Schedule

Client: RFC Development Ltd
Project: Royal Free Hospital, Hampstead
Survey Date: 17/03/2014 - 29/09/2014
Surveyor: David Garrick

BS5837:2012 Tree Survey

Arbtech Consulting Ltd

Unit 3 Wells House Barns
Chester Road
Chester
CH4 0DH
Phone: 01244 661170
Mobile: N/A

Tree and Tag No / Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations / Survey Comment	Cat ERC
C1											
A Group - -	8	1	350	N 5 E 5 S 5 W 5	2 2 2 2	SM	A: 55.4 R: 4.19	Good	C: Fair S: Good B: Good	A collection of Beech, Maple. Height from 7m-10m. Stem diameters from 320mm - 390mm	**B.1.2** 20 to 40 yrs
G1											
London Plane *Platanus x hispanica*	12	1	550	N 6 E 6 S 6 W 6	5 5 5 5	SM	A: 136.9 R: 6.6	Good	C: Fair S: Good B: Good	5 trees. Previously pollarded. Includes Trees 1-5	**B.1.2** 20 to 40 yrs
G2											
Sycamore *Acer pseudoplatanus*	9	1	140	N 3 E 3 S 3 W 3	2 2 2 2	Y	A: 8.9 R: 1.68	Fair	C: Fair S: Ivy B: Fair	8 self sown trees. ivy on stems to 3/4 height. minor deadwood in crowns (<50mm)	**C.2** 20 to 40 yrs
G3											
A Group - -	9	1		N 3 E 3 S 3 W 3	2 2 2 2	Y	A: 0 R: 0	Fair	C: Fair S: Fair B: Good	Linear group along roadside. Some individual trees within group are category C. Includes tree 12-20	**B.2** 20 to 40 yrs
G4											
A Group - -	10	1		N 5 E 5 S 5 W 5	3 3 3 3	SM	A: 0 R: 0	Good	C: Fair S: Good B: Good	3 trees. London Plane and Lime. Includes trees 23-25	**B.1** 20 to 40 yrs

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
G5											
London Plane *Platanus x hispanica*	14	1	350	N 4 E 4 S 4 W 4	4 4 4 4	SM	A: 55.4 R: 4.19	Fair	C: Fair S: Good B: Good	5 trees.	**B.2** 20 to 40 yrs
G6											
A Group - -	5	1	130	N 2 E 2 S 2 W 2	1 1 1 1	Y	A: 7.6 R: 1.55	Good	C: Fair S: Good B: Good	Prunus, Ash, Maple. 15 trees	**C.2** 20 to 40 yrs
G7											
A Group - -	4	1	120	N 2 E 2 S 2 W 2	1 1 1 1	SM	A: 6.5 R: 1.43	Fair	C: Fair S: Fair B: Fair	Prunus, Sorbus,	**C.2** 10 to 20 yrs
G8											
Silver Birch *Betula pendula*	8	1	200	N 3 E 3 S 3 W 3	2 2 2 2	SM	A: 18.1 R: 2.4	Fair	C: Fair S: Fair B: Good		**B.1** 20 to 40 yrs
G9											
A Group - -	6	1	130	N 3 E 3 S 3 W 3	1 1 1 1	SM	A: 7.6 R: 1.55	Fair	C: Fair S: Fair B: Fair	Bay, Holly	**C.2** 10 to 20 yrs
G10											
A Group - -	8	1	210	N 4 E 4 S 4 W 4	2 2 2 2	SM	A: 20 R: 2.52	Fair	C: Fair S: Fair B: Good	Prunus, Ash, Willow, Sycamor3	**C.2** 20 to 40 yrs

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
1 London Plane *Platanus x hispanica*	0	1	730			M	A: 241.1 R: 8.76		C: S: B:		
2 London Plane *Platanus x hispanica*	0	1	710			M	A: 228.1 R: 8.52		C: S: B:		
3 London Plane *Platanus x hispanica*	0	1	480			M	A: 104.2 R: 5.75		C: S: B:		
4 London Plane *Platanus x hispanica*	0	1	490			M	A: 108.6 R: 5.87		C: S: B:		
5 London Plane *Platanus x hispanica*	0	1	680			M	A: 209.2 R: 8.16		C: S: B:		
6 Prunus *Prunus Unknown*	6	1	250	N 2 E 4 S 5 W 4	2 2 2 3	SM	A: 28.3 R: 3	Fair	C: Fair S: Fair B: Fair	Estimated Measurements Stem leans to west. previously crown lifted. overtopped and suppressed by neighbouring tree.	**C.1** 10 to 20 yrs

Age Classifications:
N Newly planted
Y Young
SM Semi-mature
EM Early Mature
M Mature
OM Over Mature

Condition:
C Crown
S Stem
B Basal area

Stems:
Ø Diameter
(Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
7											
Sycamore *Acer pseudoplatanus*	16	1	600	N 5 E 8 S 7 W 5	4 4 4 4	M	A: 162.9 R: 7.2	Good	C: Fair S: Good B: Good	Crown suppressed by neighbouring trees.	**B.1** 20 to 40 yrs
8										Estimated Measurements	
Common Oak *Quercus robur*	18	1	750	N 8 E 8 S 8 W 8	3 3 3 3	N	A: 254.5 R: 9	Fair	C: Fair S: Good B: Good	Tree is in fenced off area. Previously reduced. major deadwood in crown (>50mm)	**B.1** 20 to 40 yrs
9										Estimated Measurements	
Lombardy Poplar *Populus nigra 'Italica'*	18	2	602 (Eq)	N 4 E 4 S 4 W 4	5 5 5 5	SM	A: 164 R: 7.22	Good	C: Fair S: Fair B: Good	Tree was felled by others in June 2014	**B.1** 20 to 40 yrs
10											
Common Yew *Taxus baccata*	9	1	430	N 4 E 4 S 4 W 4	1 2 1 1	SM	A: 83.7 R: 5.16	Fair	C: Fair S: Good B: Good	Sparse needles in crown.	**B.1** >40 yrs
11											
Common or Black Elder *Sambucas nigra*	4	2	136 (Eq)	N 1 E 2 S 2 W 2	2 2 2 2	SM	A: 8.4 R: 1.63	Fair	C: Fair S: Fair B: Fair	Twinstemmed from base. minor deadwood in crown (<50mm)	**C.1** 10 to 20 yrs
12											
Sycamore *Acer pseudoplatanus*	0	2	394 (Eq)			SM	A: 70.3 R: 4.73		C: S: B:		

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
13 Sycamore *Acer pseudoplatanus*	0	1	270			SM	A: 33 R: 3.24		C: S: B:		
14 Sycamore *Acer pseudoplatanus*	0	1	320			SM	A: 46.3 R: 3.83		C: S: B:		
15 Common Ash *Fraxinus excelsior*	0	2	198 (Eq)			Y	A: 17.8 R: 2.38		C: S: B:		
16 Sycamore *Acer pseudoplatanus*	0	1	170			Y	A: 13.1 R: 2.04		C: S: B:		
17 Sycamore *Acer pseudoplatanus*	0	1	110			Y	A: 5.5 R: 1.32		C: S: B:		
18 Sycamore *Acer pseudoplatanus*	0	1	300			Y	A: 40.7 R: 3.59		C: S: B:		

Age Classifications:
N Newly planted
Y Young
SM Semi-mature
EM Early Mature
M Mature
OM Over Mature

Condition:
C Crown
S Stem
B Basal area

Stems:
Ø Diameter
(Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
19 Sycamore *Acer pseudoplatanus*	0	1	200			Y	A: 18.1 R: 2.4		C: S: B:		
20 Norway Maple *Acer platanoides*	0	2	170 (Eq)			Y	A: 13.1 R: 2.04		C: S: B:		
21 Common Lime *Tilia europaea*	8	1	280	N 4 E 4 S 4 W 4	2 3 2 2	SM	A: 35.5 R: 3.36	Good	C: Fair S: Good B: Good	Previously crown lifted.	**B.1** 20 to 40 yrs
22 Goat Willow *Salix caprea*	4	1	120	N 3 E 3 S 3 W 3	1 1 1 1	Y	A: 6.5 R: 1.43	Good	C: Fair S: Good B: Good		**C.1** 20 to 40 yrs
23 Common Lime *Tilia europaea*	0	1	340			SM	A: 52.3 R: 4.08		C: S: B:		
24 London Plane *Platanus x hispanica*	0	1	350			SM	A: 55.4 R: 4.19		C: S: B:		

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
25 London Plane *Platanus x hispanica*	0	1	430			SM	A: 83.7 R: 5.16		C: S: B:		
26 London Plane *Platanus x hispanica*	18	1	660	N 8 E 6 S 6 W 7	5 5 5 5	M	A: 197.1 R: 7.92	Good	C: Fair S: Good B: Good	Previously crown lifted.	**B.1** 20 to 40 yrs
27 London Plane *Platanus x hispanica*	18	1	820	N 9 E 8 S 8 W 5	5 5 5 5	M	A: 304.2 R: 9.84	Good	C: Fair S: Good B: Good	Previously crown lifted	**B.1** 20 to 40 yrs
28 London Plane *Platanus x hispanica*	7	1	650	N 2 E 2 S 2 W 2	4 4 4 4	M	A: 191.2 R: 7.8	Good	C: Fair S: Good B: Good	Recently pollarded	**B.1** 20 to 40 yrs
29 London Plane *Platanus x hispanica*	7	1	90	N 2 E 2 S 2 W 2	2 2 2 2	Y	A: 3.7 R: 1.08	Good	C: Fair S: Good B: Good		**C.1** >40 yrs
30 London Plane *Platanus x hispanica*	12	1	730	N 4 E 3 S 3 W 3	2 2 2 2	M	A: 241.1 R: 8.76	Fair	C: Fair S: Fair B: Good	Previously stem removed and topped. Decay at sites of old pruning wounds	**B.1** 20 to 40 yrs

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
31											
Common Lime *Tilia europaea*	18	1	450	N 4 E 4 S 4 W 4	2 2 2 2	SM	A: 91.6 R: 5.39	Fair	C: Fair S: Good B: Good	Recently thinned	**B.1** 20 to 40 yrs
32											
Common Lime *Tilia europaea*	16	1	430	N 5 E 4 S 4 W 4	2 2 2 2	SM	A: 83.7 R: 5.16	Fair	C: Fair S: Good B: Good	Recently reduced	**B.1** 20 to 40 yrs
33											
Sycamore *Acer pseudoplatanus*	14	1	240	N 5 E 4 S 2 W 4	2 2 2 2	Y	A: 26.1 R: 2.88	Good	C: Fair S: Good B: Good		**B.1** >40 yrs
34											
London Plane *Platanus x hispanica*	18	1	890	N 8 E 8 S 8 W 6	6 4 4 4	M	A: 358.4 R: 10.68	Good	C: Fair S: Good B: Good	Twinstemmed from 4m.	**A.1** 20 to 40 yrs
36											
Prunus *Prunus Unknown*	5	1	130	N 2 E 2 S 2 W 2	2 2 2 2	Y	A: 7.6 R: 1.55	Good	C: Fair S: Good B: Good		**C.1** 20 to 40 yrs
37											
Prunus *Prunus Unknown*	6	1	210	N 3 E 3 S 3 W 3	2 2 2 2	SM	A: 20 R: 2.52	Good	C: Fair S: Good B: Good		**B.1** 20 to 40 yrs

Age Classifications:
N Newly planted
Y Young
SM Semi-mature
EM Early Mature
M Mature
OM Over Mature

Condition:
C Crown
S Stem
B Basal area

Stems:
Ø Diameter
(Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
38											
Swedish Whitebeam *Sorbus intermedia*	6	1	170	N 3 E 4 S 3 W 3	2 2 2 2	Y	A: 13.1 R: 2.04	Good	C: Fair S: Good B: Good		**B.1** 20 to 40 yrs
39											
Prunus *Prunus Unknown*	8	1	150	N 3 E 3 S 3 W 3	2 2 2 2	Y	A: 10.2 R: 1.8	Good	C: Fair S: Good B: Good		**C.1** 20 to 40 yrs
40											
Norway Maple *Acer platanoides*	12	1	360	N 4 E 4 S 4 W 4	2 2 1 2	SM	A: 58.6 R: 4.31	Good	C: Fair S: Good B: Good		**B.1** 20 to 40 yrs
41											
Norway Maple *Acer platanoides*	10	1	310	N 3 E 3 S 3 W 3	2 2 2 2	SM	A: 43.5 R: 3.72		C: Fair S: Good B: Good		**B.1** 20 to 40 yrs
42											
Norway Maple *Acer platanoides*	12	1	410	N 5 E 5 S 5 W 5	2 2 2 2	SM	A: 76.1 R: 4.92	Good	C: Fair S: Good B: Good		**B.1** 20 to 40 yrs
43											
Norway Maple *Acer platanoides*	6	1	230	N 4 E 4 S 4 W 4	3 3 3 3	SM	A: 23.9 R: 2.75	Good	C: Fair S: Good B: Good		**B.1** 20 to 40 yrs

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Tree and Tag No Species	Hght (m)	Stems No	Stems Ø (mm)	Crown Spread (m)	Crown Clear (m)	Age	RP A (m²) R (m)	Phys Condition	Structural Condition	Preliminary Recommendations Survey Comment	Cat ERC
44											
Norway Maple *Acer platanoides*	13	1	440	N 4 E 5 S 5 W 5	4 3 2 3	SM	A: 87.6 R: 5.28	Fair	C: Fair S: Good B: Good	Twinstemmed from 2m. previously pruned from building. major deadwood in crown (>50mm)	**B.1** 20 to 40 yrs
45											
Common Lime *Tilia europaea*	10	1	520	N 4 E 4 S 5 W 4	1.5 1.5 1.5 1.5	SM	A: 122.3 R: 6.23	Fair	C: Fair S: Good B: Good	Previously pollarded. recently crown lifted. minor deadwood in crown (<50mm)	**B.1** 20 to 40 yrs
46										Estimated Measurements	
Common Lime *Tilia europaea*	12	1	480	N 4 E 4 S 4 W 4	2 2 2 2	SM	A: 104.2 R: 5.75	Fair	C: Fair S: Good B: Good	Previously pollarded. recently crown lifted. minor deadwood in crown (<50mm)	**B.1** 20 to 40 yrs
47										Estimated Measurements	
Sycamore *Acer pseudoplatanus*	19	1	800	N 9 E 9 S 9 W 9	4 4 4 4	M	A: 289.6 R: 9.6	Fair	C: Fair S: Good B: Good	Tree is on neighbouring property behind fence. major deadwood in crown (>50mm)	**B.1** 20 to 40 yrs
48										Estimated Measurements	
London Plane *Platanus x hispanica*	18	1	1200	N 9 E 9 S 8 W 9	3 3 2 2	M	A: 651.5 R: 14.4	Fair	C: Fair S: Good B: Good	Tree is on neighbouring property visible over 1.6m fence. multistemmed from. 2m	**B.1** 20 to 40 yrs
49										Estimated Measurements	
Common Lime *Tilia europaea*	14	1	450	N 4 E 4 S 4 W 4	2 2 1 2	SM	A: 91.6 R: 5.39	Fair	C: Fair S: Good B: Good	Apical dieback within crown. minor deadwood in crown (<50mm)	**B.1** 20 to 40 yrs

Age Classifications: N Newly planted; Y Young; SM Semi-mature; EM Early Mature; M Mature; OM Over Mature

Condition: C Crown; S Stem; B Basal area

Stems: Ø Diameter; (Eq) Equivalent stem diameter using BS5837:2012 definition

Report selection criteria.

Projects.

Royal Free Hospital, Hampstead

Date Range.

Any Date

Work types.

----> -No Selection made-

Latest Survey.

All surveys for the selected trees.
---> Last survey for each selected tree.

Work Completed.

---> Work Completed
---> Work Not Completed

Number of trees in selected Project(s)	**59**
Number of trees in Report selection	**59**

Age Classifications:	N	Newly planted	EM	Early Mature	**Condition:**	C	Crown	**Stems:**	Ø	Diameter
	Y	Young	M	Mature		S	Stem		(Eq)	Equivalent stem diameter using BS5837:2012 definition
	SM	Semi-mature	OM	Over Mature		B	Basal area			

Appendix 2 – Tree Protection Notice

Appendix 3 - Contact Details

Name	Position	Company	Contact
	Client / Agent		
	Tree Officer		
	Arboricultural Consultant	Arbtech Consulting Ltd.	01244 660558 email@arbtech.co.uk
	Site Manager		
	Main contractor		

Document Production Record

Document number	Editor	Signature	Position	Issue number	Date
Arbtech AMS 03	Matthew Middle		Arboricultural Consultant	1	17/10/2014

Limitations

Arbtech Consulting Ltd has prepared this Report for the sole use of the above named Client/Agent in accordance with our terms of business, under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This Report may not be relied upon by any other party without the prior and express written agreement of Arbtech Consulting Ltd. The assessments made assume that the sites and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by Arbtech Consulting Ltd.

Copyright

Arboricultural Impacts

Impacts	Nos. of trees
Trees to be removed	15
Groups to be removed (Partial removals)	6 (1)
Trees to be transplanted	4
Groups to be transplanted	0
Trees with proposed incursions into RPAs	0
Groups with proposed incursions into RPAs	0
Trees that will pruning	0
Groups that will pruning	0

Tree Work Schedule

No.	Species	Works	Category
10	Yew	Fell to ground level; grind out stump	B_1
11	Elder	Fell to ground level; grind out stump	C_1
12 (G3)	Sycamore	Fell to ground level; grind out stump	B_2
13 (G3)	Sycamore	Fell to ground level; grind out stump	
14 (G3)	Sycamore	Fell to ground level; grind out stump	
36	Prunus sp.	Fell to ground level; grind out stump	C_1
37	Prunus sp.	Fell to ground level; grind out stump	B_1
38	Swedish whitebeam	Fell to ground level; grind out stump	B_1
39	Prunus sp.	Fell to ground level; grind out stump	C_1
40	Norway maple	Fell to ground level; grind out stump	B_1
41	Norway maple	Fell to ground level; grind out stump	B_1
42	Norway maple	Fell to ground level; grind out stump	B_1
43	Norway maple	Fell to ground level; grind out stump	B_1
45	Lime	Fell to ground level; grind out stump	B_1
46	Lime	Fell to ground level; grind out stump	B_1
G2	Sycamore	Fell to ground level; grind out stumps	C_2
G3	Sycamore	Partial removal - Fell to ground level; grind out stumps	B_2
G6	Various	Fell to ground level; grind out stumps	C_2
G7	Various	Fell to ground level; grind out stumps	C_2
G8	Silver birch	Fell to ground level; grind out stumps	B_1
G9	Various	Fell to ground level; grind out stumps	C_2
G10	Various	Fell to ground level; grind out stumps	C_2

All tree work is to be undertaken in accordance with British Standard BS 3998:2010 Tree work - Recommendations.
All arisings are to be removed and the site is to be left as found.
Care is to be taken of the ground around retained trees to make sure that it does not become compacted as a result of tree surgery operations. No equipment or vehicles such as timber lorries, tractors, excavators por cranes shall be parked or driven beneath the crowns of any retained trees, to prevent subsequent compaction and root death..

Arboricultural Method Statement

All tree work is to be undertaken in accordance with British Standard Please refer to Arbtech Consulting Ltd. Tree Schedule, Arboricultural Method Statement and Tree Protection Plan, for full details on all surveyed trees and how all aspects of the development maybe implemented without determent to retained trees.

Issue: Proposed walls within the RPAs of tree nos. 15, 16, 18, 19, 20 (G3) and 47 - 49.
Solution: Foundations of the proposed walls situated within the footprint of the existing footpath are to be situated no deeper than the existing sub-base; with the exception of any piles or pads that may be required. Foundations of all structures are to be designed in conjunction with site investigations and arboricultural advice.

Issue: Proposed retaining walls and steps within the RPA of tree no. 48.
Solution: Foundations of all structures are to be designed in conjunction with site investigations and arboricultural advice to reduce the amount of impact upon the tree. All excavations are to be undertaken manually under arboricultural supervision.

Issue: Proposed walls within the RPAs of tree nos. 15, 16, 18, 19, 20 (G3) and 47 - 49.
Solution: Foundations of the proposed walls situated outside of the footprint of the existing footpath are to be situated above the existing ground level; with the exception of any piles or pads that may be required. Foundations of all structures are to be designed in conjunction with site investigations and arboricultural advice.

Issue: Proposed subterranean development & building are situated within the RPAs of tree nos. 47 & 48.
Solution: All excavations are to be undertaken manually under arboricultural supervision. To prevent the lose of the rooting environment the edge of the subterranean development is to have sheet piling or similar retaining system installed to to prevent soil collapse, unless deemed unnecessary by the project engineers due to the geology of the site.

Note: Tree no.9 was removed by others in June 2014.

Note: Proposed subterranean development could cause a potential issue with the possibility of soil collapse within or adjacent to the RPAs of tree nos. 1-5 (G1).
To prevent this potential issue the line of subterranean development should have sheet piling or similar retaining system installed to retain the rooting environment, unless deemed unnecessary by the project engineers; if piling it is to be installed under arboricultural supervision.

Issue: Proposed hard landscaping within the RPAs of tree nos. 1-5 (G1).
Solution: Proposed hard landscaping features to be situated no closer than the existing; all foundations are to be situated no deeper than any existing foundations or sub-bases. Foundations of all structures are to be designed in conjunction with site investigations and arboricultural advice.

Tree Categories

Trees are categorised in accordance with the cascade chart in Table 1 of the British Standard BS 5837:2012 'Trees in relation to design, demolition and construction - Recommendations'

Category 'U' - Trees in such condition that they cannot realistically be retained as living trees in context of the current land use for longer than 10 years.
Category 'A' - Trees of high quality with an estimated remaining life expectancy of at least 40 years.
Category 'B' - Trees of moderate quality with an estimated remaining life expectancy of at least 20 years.
Category 'C' - Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm.

Root Protection Area

In order to avoid damage to the roots or rooting environment of retained trees, the Root Protection Areas (RPAs) should be plotted around each of the category A, B and C trees. This is a minimum area in m^2 which should be left undisturbed around each retained tree.

The RPA is calculated using the British Standard BS 5837:2012 'Trees in relation to design, demolition and construction - Recommendations.

The calculated RPA is capped to $707m^2$, which is the equivalent to a circle with a radius of 15m. Where there appears to be restrictions to root growth the root protection area is reshaped to more accurately reflect the likely distribution of the roots.

Foundations within RPAs

The use of traditional strip foundations can result in excessive root loss and as such should be avoided.
Designs for foundations that would minimize the adverse impact upon trees soul include particular attention to the existing levels, proposed finished levels and cross sectional details. Site specific and specialist advice should be sought from the project engineers and arboriculturist.

Root damage can be minimized by using;

- Piles with site investigation used to be determined their optimal location whilst avoiding damage to roots important for the stability of the tree, by means of hand tools or compressed air soil displacement, to a minimum depth of 600mm;
- Beams, laid at or above ground level, and cantilevered as necessary to avoid tree roots identified by site investigation.

Where a slab for minor structures (e.g. shed base) is to be formed within the RPA, it should bear on the existing ground level, and should not exceed an area greater than 20% of the existing unsurfaced ground.

Slabs for larger structures (e.g. dwellings) should be constructed with a ventilated air space between the underside of the slab and the existing soil surface (to enable gas exchange and venting through the soil surface. In such cases, a specialist irrigation system should be employed (e.g. roof run-off redirected under the slab). The design of the foundation should take into account of the effect on the load bearing properties of the underlying soil from the redirected roof run-off. Approval in principle for a foundation that relies on topsoil retention and roof run-off under the slab should be sought from building control authority prior to this approach being relied upon.

Where piling is to be installed near to trees, the smallest practical pile diameter should be used, as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. If a pilling mat is required, this should conform to the parameters for ground boarding. Use of the smallest practicle piling rig is also important where piling within the branch spread is proposed, as this can reduce the need for access facilitation pruning. The pile type should be selected bearing in mind the need to protect the soil and adjacent roots from the potentially toxic effects of uncured concrete, e.g. sleeved bored piles or screw piles.

This information is compliant with British Standard BS5837:2012 Trees in relation to design demolition and construction - Recommendations, section 7.5 Special engineering for foundations within the RPA.

ARBTECH Consulting Limited

Project:
The Pears Building,
Royal Free Hospital,
London,
NW3 2QG.

Client:
The Royal Free Charity

Drawing:
Arboricultural Impact Assessment

Based on:
Royal Free Proposed Site Base; & Stage D architectural drawings

Drawing No:	Rev:
Arbtech AIA 03	

Date:	Scale:	Drawn:
Oct 2014	1:200 @ A1	MGM

Key:

Tree Nos.:	1	Tree Canopies:		Trunks:	
RPAs:		Category 'A' trees:		Category 'B' trees:	
Category 'B' groups:		Category 'C' trees:		Trees to be removed:	39
Incursions - Hard landscaping		Incursions - Basement:		Incursions - Building:	

All dimensions should be checked on site. No dimensions are to be scaled from this drawing.
Please notify us of any discrepancies found. Arbtech Consulting Ltd. cannot be held responsible for inaccuracies in the base drawing in which this plan is based.
This drawing is designed to reflect the principles of the layout or design only, and relates only to the protection of retained trees.
This drawing is not to be read as a definitive part of the engineering or construction designs or method statement. An architect or structural engineer should be contacted over any matters of construction, detailing or specification and for any standards or regulatory requirements relating to proposed structures, hard surfacing or underground services.
This drawing was produced in colour - a monochrome copy should not be relied upon.

Tree Protection Area

KEEP OUT

Do **not** move this fence

(TOWN & COUNTRY PLANNING ACT 1990)
TREES ENCLOSED BY THIS FENCE ARE PROTECTED BY PLANNING CONDITIONS AND/OR ARE THE SUBJECT OF A TREE PRESERVATION ORDER. CONTRAVENTION OF A TREE PRESERVATION ORDER MAY LEAD TO CRIMINAL PROSECUTION

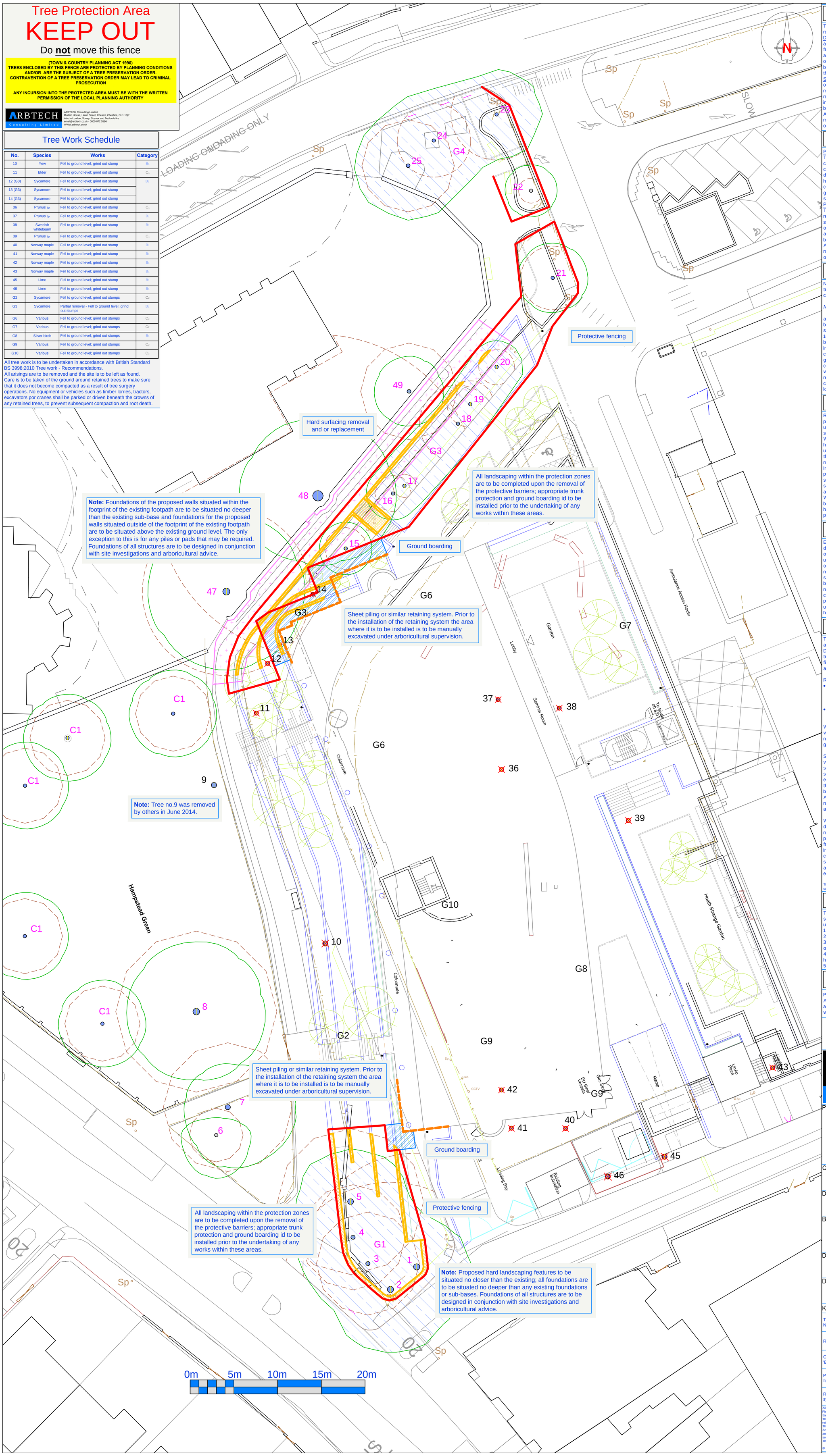
ANY INCURSION INTO THE PROTECTED AREA MUST BE WITH THE WRITTEN PERMISSION OF THE LOCAL PLANNING AUTHORITY

ARBTECH Consulting Limited
ARBTECH Consulting Limited.
Murlain House, Union Street, Chester, Cheshire, CH1 1QP
Also in London, Surrey, Sussex and Bedfordshire
email@arbtech.co.uk - 0800 072 5596
WWW.arbtech.co.uk

Tree Work Schedule

No.	Species	Works	Category
10	Yew	Fell to ground level; grind out stump	B_1
11	Elder	Fell to ground level; grind out stump	C_1
12 (G3)	Sycamore	Fell to ground level; grind out stump	B_2
13 (G3)	Sycamore	Fell to ground level; grind out stump	
14 (G3)	Sycamore	Fell to ground level; grind out stump	
36	Prunus *Sp.*	Fell to ground level; grind out stump	C_1
37	Prunus *Sp.*	Fell to ground level; grind out stump	B_1
38	Swedish whitebeam	Fell to ground level; grind out stump	B_1
39	Prunus *Sp.*	Fell to ground level; grind out stump	C_1
40	Norway maple	Fell to ground level; grind out stump	B_1
41	Norway maple	Fell to ground level; grind out stump	B_1
42	Norway maple	Fell to ground level; grind out stump	B_1
43	Norway maple	Fell to ground level; grind out stump	B_1
45	Lime	Fell to ground level; grind out stump	B_1
46	Lime	Fell to ground level; grind out stump	B_1
G2	Sycamore	Fell to ground level; grind out stumps	C_2
G3	Sycamore	Partial removal - Fell to ground level; grind out stumps	B_2
G6	Various	Fell to ground level; grind out stumps	C_2
G7	Various	Fell to ground level; grind out stumps	C_2
G8	Silver birch	Fell to ground level; grind out stumps	B_1
G9	Various	Fell to ground level; grind out stumps	C_2
G10	Various	Fell to ground level; grind out stumps	C_2

All tree work is to be undertaken in accordance with British Standard BS 3998:2010 Tree work - Recommendations.
All arisings are to be removed and the site is to be left as found.
Care is to be taken of the ground around retained trees to make sure that it does not become compacted as a result of tree surgery operations. No equipment or vehicles such as timber lorries, tractors, excavators por cranes shall be parked or driven beneath the crowns of any retained trees, to prevent subsequent compaction and root death.



Protective Fencing

To be erected prior to the commencement of all works on site, and retained in place throughout construction.
Default specification: To comprise either 2.4m wooden site hoarding; or a 2.3m high scaffolding framework comprising of vertical and horizontal framework, well braced to resist impacts, with uprights to be spaced at a maximum of 3.0m intervals and driven into the ground by a minimum of 600mm. On to this, standard anti-climb welded mesh panels are to be securely fixed to each other with at least two scaffold clamps and to the scaffold framework with wire.
Secondary Specification: To comprise of 2m tall welded mesh panels on rubber or concrete feet. Panels are to be joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence. The panels should be supported on the inner side by stabilizer struts, which should should be attached to a base plate and secured with ground pins.
All weather notices should be erected at regular intervals on the weld mesh panels with words such as "Construction exclusion zone - Keep out".

Trunk Protection

Protective trunk Wrapping:
To be attached to the trunks of retained trees prior to the commencement of all works on site, and retained in place throughout construction. To comprise of a minimum of three wrappings of clean dry hessian around the trunk from ground level up to 2.3m high and held in place using sisal. Onto the hessian a minimum of three wraps of chestnut pailing and is to be held in place by 2.50mm mild steel galvanized wire in three locations and fixed into place using fencing staples fixed into the chestnut pailing.
Protective hoarding:
To be erected prior to the commencement of all works on site, and retained in place throughout construction. To comprise of 2.4m wooden site hoarding constructed upon a timber frame work situated around the outside of the planting pit. Where the timber frame is constructed around the tree trunk a minimum of 4 layers of clean dry hessian is to be wrapped around the trunk to protect the bark.
All weather notices should be erected at regular intervals on the weld mesh panels with words such as "Construction exclusion zone - Keep out".

Ground boarding

New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

Note The ground protection might comprise one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100mm depth of woodchip), laid onto a geotextile membrane;
b) for pedestrian-operated plant up to a gross weight of 2t, proprietary inter-linked ground protection boards placed on top of a compression-resisiatnt layer(e.g.150mm depth of woodchip), laid onto a geotextile membrane;
c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary system or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

Hard Surfacing Removal

Removal of and or replacement of hard surfacing situated either partially or completely within the RPAs of retained trees shall be undertaken with care and under the direct on-site arboricultural supervision as these areas are likely to contain roots.
Where this is necessary the wearing course will be broken up using a hand held pneumatic breaker, hand tools and a wheel barrow to break up and remove the surfacing. If it is necessary to remove the sub base this is to be undertaken using hand tools such as a fork to loosen the material and removed using shovels and wheels barrows.
In some situations and at the discretion of the arborist it may be possibly to use an excavator using a hydraulic breaker and suitably sized toothless grading bucket. If an excavator is to be used it must be situated outside of the RPAs, on top of the hard surfacing working away from the RPAs or from ground boarding.
Which ever system is used the is to be **NO** disturbance of the soil beneath. If roots are found they are to be covered over with damp hessian and a layer of either sharp sand, wood chip or top soil to prevent desiccation.

Manual Excavation

Excavation within the RPAs will be initially undertaken by hand under direct on-site arboricultural supervision to a minimum of 750mm deep of any excavation, whether for proposed foundations, hard surfacing or underground services. The soil is to be loosened with the use of a fork or pick and then cleared with the aid of an air-spade and air-vac. All roots to be cut will be cleanly severed with the use of a hand saw or secateurs. The edge of the excavation closest to the retained trees will be covered over with damp hessian to prevent drying out, and where nesessary be shuttered to prevent soil collapse or contamination by concrete. If appropriate soil beneath the depth 750mm may be sheet piled, tegular piled or individual piles. Any deeper excavations may be undertaken by a machine provided it works form outside of the RPA or has appropriate ground protection in place to move and work upon.

Foundations within RPAs

The use of traditional strip foundations can result in excessive root loss and as such should be avoided.
Designs for foundations that would minimize the adverse impact upon trees soul include particular attention to the existing levels, proposed finished levels and cross sectional details. Site specific and specialist advice should be sought from the project engineers and arboriculturist.

Root damage can be minimized by using:

- Piles with site investigation used to be determined their optimal location whilst avoiding damage to roots important for the stability of the tree, by means of hand tools or compressed air soil displacement, to a minimum depth of 600mm;
- Beams, laid at or above ground level, and cantilevered as necessary to avoid tree roots identified by site investigation.

Where a slab for minor structures (e.g. shed base) is to be formed within the RPA, it should bear on the existing ground level, and should not exceed an area greater than 20% of the existing unsurfaced ground.

Slabs for larger structures (e.g. dwellings) should be constructed with a ventilated air space between the underside of the slab and the existing soil surface (to enable gas exchange and venting through the soil surface. In such cases, a specialist irrigation system should be employed (e.g. roof run-off redirected under the slab). The design of the foundation should take into account of the effect on the load bearing properties of the underlying soil from the redirected roof run-off. Approval in principle for a foundation that relies on topsoil retention and roof run-off under the slab should be sought from building control authority prior to this approach being relied upon.

Where piling is to be installed near to trees, the smallest practical pile diameter should be used, as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. If a piling mat is required, this should conform to the parameters for ground boarding. Use of the smallest practicle piling rig is also important where piling within the branch spread is proposed, as this can reduce the need for access facilitation pruning. The pile type should be selected bearing in mind the need to protect the soil and adjacent roots from the potentially toxic effects of uncured concrete, e.g. sleeved bored piles or screw piles.

This information is compliant with British Standard BS5837:2012 Trees in relation to design demolition and construction - Recommendations, section 7.5 Special engineering for foundations within the RPA.

Arboricultural Supervision

The arboricultural consultant will be required to attend site to directly supervise all demolition and construction works that have to be undertaken within the root protection areas. This will include:
1. Pre-commencement site meeting.
2. Location of protective measures.
3. Manual excavation of retaining systems and foundations within RPAs of retained trees.
4. Any excavations within or adjacent to RPAs, including foundations, hard surfacing or underground services.
5. Removal of protective measures.

Arboricultural Method Statement

Please refer to Arbtech Consulting Ltd. Tree Schedule and Arboricultural Method Statement, for full details on all surveyed trees and how all aspects of the the development maybe implemented without determent to retained trees.

ARBTECH Consulting Limited

Project:
The Pears Building,
Royal Free Hospital,
London,
NW3 2QG.

Client:
The Royal Free Charity

Drawing:
Tree Protection Plan

Based on:
Royal Free Proposed Site Base; & Stage D architectural drawings

Drawing No:	Rev:
Arbtech TPP 03	

Date:	Scale:	Drawn:
Oct 2014	1:200 @ A1	MGM

Key:

Tree Nos.:	1	Tree Canopies:		Trunks:	
RPAs:		Category 'A' trees:		Category 'B' trees:	
Category 'B' groups:		Category 'C' trees:		Trees to be removed:	39
Protective fencing:		Ground boarding:		Manual excavation:	
Retaining system:					