Arboricultural Development Report

2 Akenside Road,

London,

NW3 5BS.

6 February 2015

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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 2 Akenside Road, London, NW3 5BS ("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: Georgia Masters

Site: 2 Akenside Road, London, NW3 5BS.

Brief proposal description: Rear extension, internal alterations, basement and landscape scheme.

Planning application reference: N/A

Documents referred to:

Document	Reference
Topographical survey drawing	7158 01
Proposed layout drawing	1256 PL 100A 1256 PL 101A 1256 PL 102A 1256 PL 103A 1256 PL 109A Pre App with landscape plan
Landscape master plan drawing	N/A
LPA pre-app comments	N/A
British Standard 5837:2012	“BS5837”
Arboricultural Impact Assessment	Arbtech AIA 01
Tree Protection Plan	Arbtech TPP 01

Tree Survey

Survey: An arboricultural survey to BS5837 of all trees within impacting distance of the site was undertaken by Jon Hartley on 20th February 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 01.

Trees to be removed

There are two trees that will need to be removed as they are in direct conflict with the proposed development.

U	A	B	C
0	0	0	2

Canopy cover is ecologically important and the loss of canopy cover by this tree 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 01.

Protective measures should be in accordance with this method statement and the Tree Protection Plan; drawing no. Arbtech TPP 01 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
3	Lime	Fell to ground level.	B_1
4	Holly	Fell to ground level.	C_1
5	Norway maple	Cut ivy.	A_{123}
6	Holly	Fell to ground level.	C_1
11	Lime	Remove decayed limb.	C_1
15	Lime	Fell to ground level.	C_1
16	Lime	Fell to ground level.	C_{123}
17	Lime	Crown clean; remove deadwood	B_1

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.

Stump removal - digging

Stump removal by digging out should include disposal/utilisation of woody material (see Clause **13**).

NOTE Whether done by hand or machine, digging out can cause severe disturbance of the site.

Where possible, when winching out a stump, a ground or other type of anchor should be used rather than a tree to be retained. If there is no alternative to using such a tree as an anchor, appropriate protective measures should be adopted.

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 TPP01) prior to the commencement of any works or the introduction of any machinery or material to site.

Upon installation of the protective measures around the retained trees the project arboriculturist will visit the site to insect and document the position and specifications of the protective measures.

In the event that the protective measures and their positions do not comply with this arboricultural method statement document number Arbtech AMS 01 (6th February 2015) and tree protection plan drawing number Arbtech TPP 01, the project arboriculturist shall inform the client and fencing contractor so adjustments can be made.

When the protective measures comply with document number Arbtech AMS 01 (6th February 2015) and tree protection plan drawing number Arbtech TPP 01, the project arboriculturist will sign off the protective measures in writing to the client and will send a copy to the fencing contractor, site agent and local authority tree officer.

If the protective measures become damaged or there is any accident or emergencies involving trees, these areas are to be cordoned off with immediately with high visibility plastic mesh fencing. The site agent is to photograph and document the damage and inform the project arboriculturist immediately after the incident and all work within in this area is to cease until the project arboriculturist has made a visit to the site. Any and all damaged sections of protective measures shall be replaced within 48 hours of the initial incident.

The protected area is sacrosanct and will not be invaded by the storage of materials, mixing of concrete or other products, accessed by machinery, equipment or pedestrians or in any other way disturbed by construction activity.

The protective measures will remain in place until the completion of all demolition, construction and hard landscaping works, there after they will be carefully dismantled only with the agreement of the project arboriculturist and or the local authority tree officer.

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 arboriculturist or LPA tree officer

upon the completion of the development or immediately prior to the installation of the permanent boundary measures.

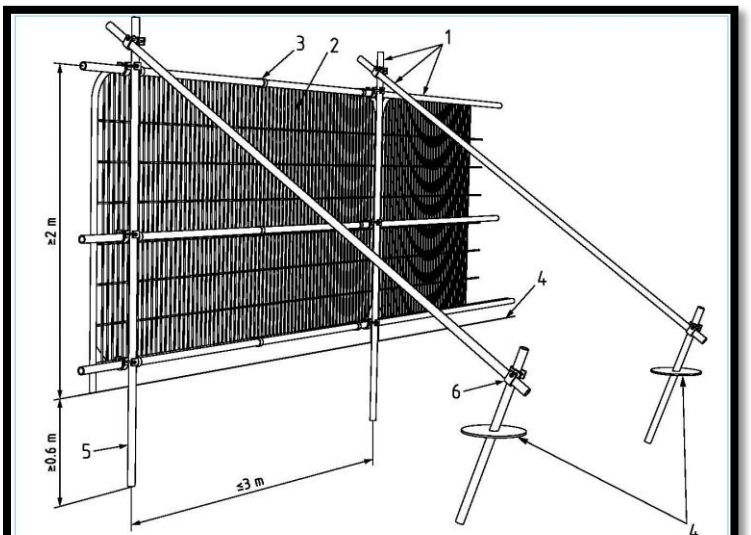
Proposed hard surfacing is to be installed immediately to act as ground protection, where it is decided that this is not a viable option these areas are to be covered by ground boarding as designed by the project engineer to cope with any likely loading.

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.

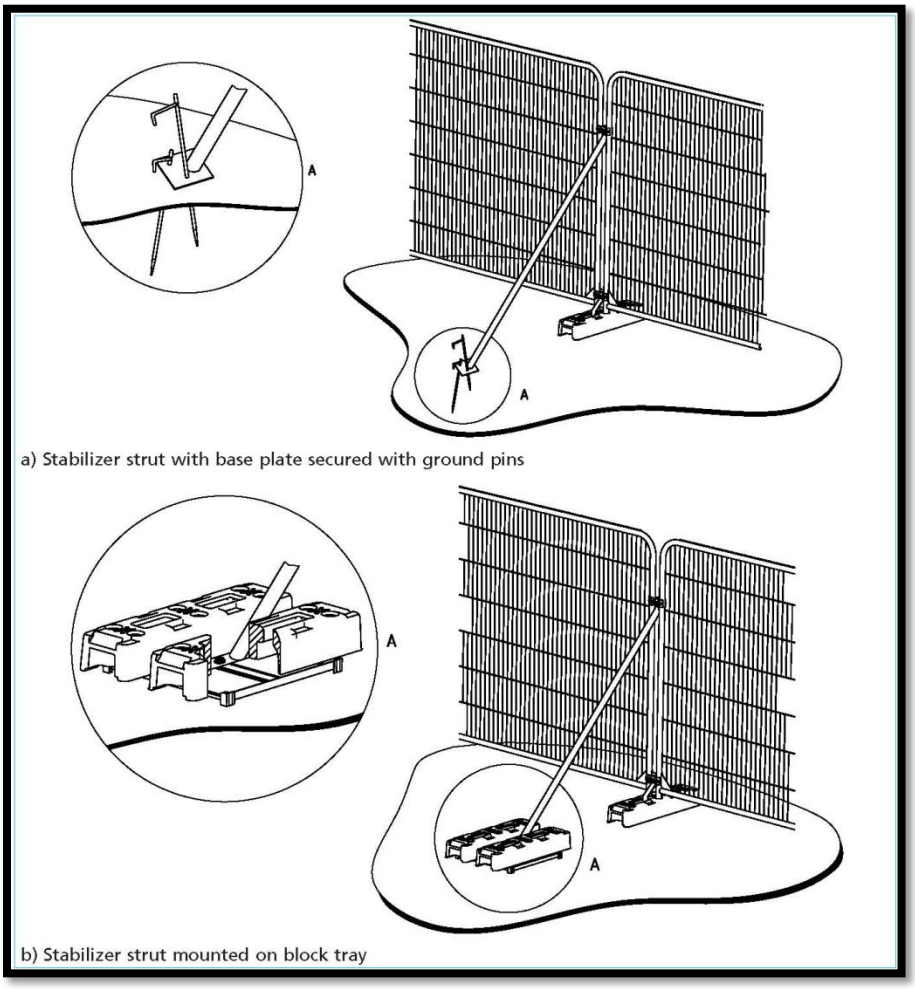
Protective Barrier Fencing

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.



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.



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

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

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.

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

Where machinery will be stored or used from the ground boarding within the RPAs of the retained trees an impervious barrier and or bunding to prevent oils, fuel or chemicals is to be installed to prevent leaching into the soil within or adjacent to the RPAs.

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.

Site management

The site manager will be responsible for briefing and inducting all personnel who will be working on any stage of this development and especially those who will be working within or adjacent to the 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 number Arbtech TPP 01; this is to include but not exclusively of the movement and or operation of plant, excavations, unloading deliveries, mixing and or pouring of 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 and or 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 arboriculturist 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 and inducting process of new site personnel or visitors in his absence.

If the site manager is replaced or is absent from site for more than three consecutive working days the project arborist will be informed and a pre start meeting will be held with the new or 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 the 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 01 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.

Out buildings

Demolition of the existing single storey extension beneath the canopies and within and adjacent to the RPAs retained trees nos.5, 13 and 18 as show on Arbtech TPP 01 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 buildings, structures and hard surfacing situated within the RPAs of retained trees 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 extension, garden room and hard surfacing within the RPAs of trees nos.3 – 11, 13 and 17 are to be designed to minimise the adverse impact upon trees 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.

Large structures

Slabs for larger structures such as the dwelling should be designed and constructed with a ventilated air space between the underside of the slab and the existing soil surface. A specialist irrigation system is to be installed underneath the slab e.g. rain water runoff from the roof.

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).

Subterranean construction with RPAs

Where it is proposed to form subterranean structures, within the RPA, it, is essential to avoid excavating down through rootable soil if trees are to be retained. In some cases, it might be technically possible to form the excavation by undermining the soil beneath the RPA.

The following factors should be taken into account, in light of site specific and specialist arboricultural, engineering and geotechnical advice:

- Future growth potential of the tree;
- A minimum depth of the overburden (i.e. that overlying the roof of the proposed structure) required for retention in situ to ensure the survival of the tree and its stability against the wind;
- The potential for vibration-induced granular flow within the retained overburden, caused by the undermining process, to destabilize the tree through reduced root adhesion;
- The mass of the tree and of the retained overburden;

- Potential for ponding (i.e. perched water table) and the need for a drainage/runoff control system;
- Potential for adverse effects on local soil hydrology, and the possible impact of these on the health of the tree.

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).

Basement

The proposed basement has been designed to be situated entirely outside of the RPAs of all retained trees within the footprint of the existing dwelling.

Prior to the excavation/installation of the basement sheet piling should be installed along the line of the basement to retain the rooting environment of all retained trees and to remove the need for any over dig.

Within and adjacent to the RPAs of tree numbers 3 and 5 excavations will be undertaken as per Tree Protection Plan drawing no. Arbtech TPP 01 along the line of the temporary retaining structure (see Manual excavation and supervised excavation).

Extension

The new single storey extension will be situated on a very similar footprint as that of the existing single storey extension, to our knowledge the proposed foundations have not been designed as yet design and should be designed so they are situated no deeper than the existing and in conjunction with arboricultural advice.

Garden Room

Arbtech Consulting Limited has not been informed of the type of construction of the garden room and to our knowledge the proposed foundations have not been designed.

The proposed foundations are to be designed in conjunction with arboricultural advice so that they are situated entirely above ground level.

Pergola

The supporting posts for the pergola frame work are to be installed under arboricultural supervision with all excavations being undertaken manually; it may be necessary to move individual posts to prevent damaging roots that are important to the stability of the trees (normally roots 25mm or greater in diameter).

Hard Surfacing

New hard surfacing to be situated within the RPAs of retained trees is to be designed in conjunction with arboricultural advice to accommodate the likely loading. The design should not require excavation however the removal of the turf layer or other surface vegetation may be acceptable if necessary, but ideally the construction will be situated entirely above the existing ground level.

Appropriate options for the sub base of hard surfacing situated within the RPAs of retained trees include multi-dimensional confinement systems (CellWeb^{TM} or similar). Alternatively piles, pads or elevated beams can be used to bridge over the RPAs, or following exploratory investigations to determine location, to provide support within the RPAs while allowing retention of roots of 25mm or greater in diameter.

Exploratory investigation is to be undertaken manually under arboricultural supervision using hand tools (See Manual excavation).

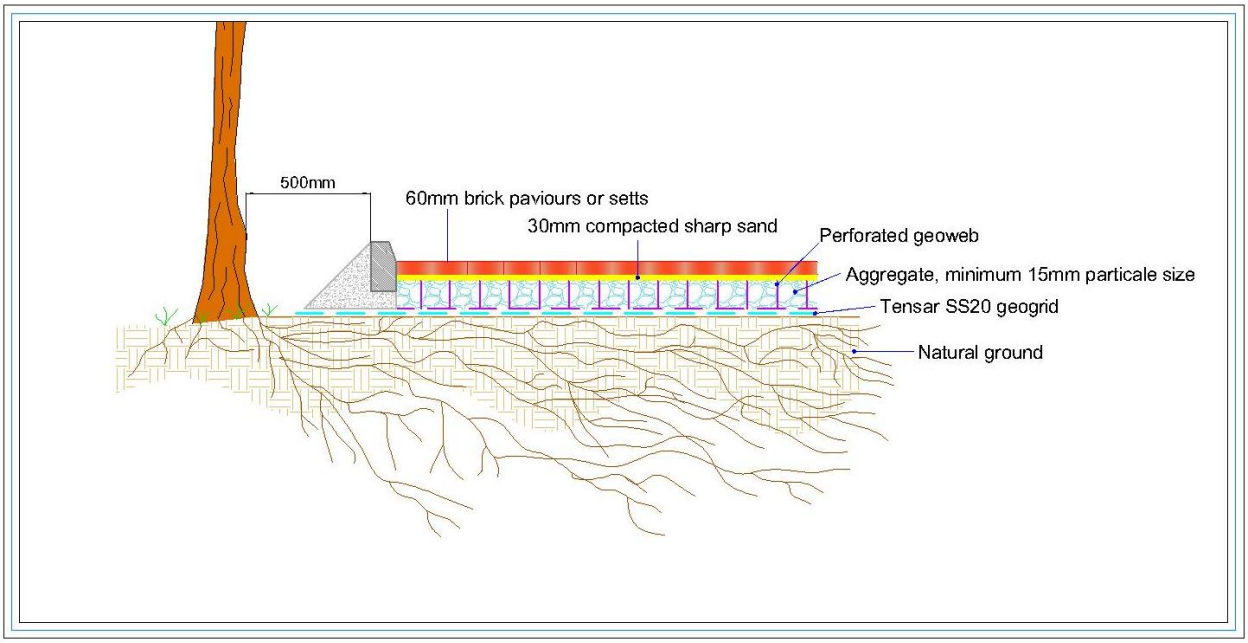
Prior to the installation of the hard surfacing within the RPAs vegetation may be removed using hand tools or sprayed with an approved non residual herbicide such as 'Glyphosate'.

Multi-dimensional confinement system

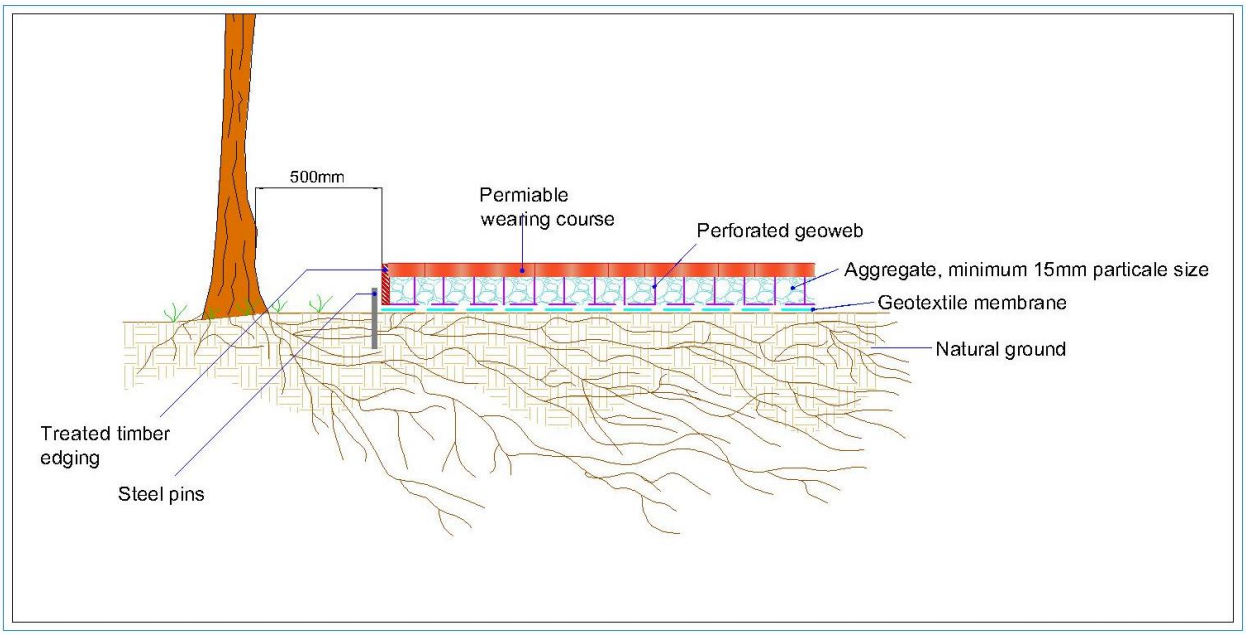
If a multi-dimensional confinement system (such as CellWeb^{TM} or similar) is to be used it is to be laid entirely above the existing soil surface over a geo textile membrane and or a bi-axel geo-grid (such as tensar TriAx). Prior to this any small hollows on the surface may be filled with clean sharp sand (not builders' sand) to a maximum depth of 150mm. The 'CellWeb' is to be backfilled by hand with no-fines aggregate of 20mm – 30mm. The use of an excavator/machinery to fill the confinement system may be possible at the discretion of the project arboriculturist.

The area of 'CellWeb' shall be covered with a permeable geotextile fabric and the finished wearing course laid on top. The wearing course shall be permeable to both water and air to comply with 'SUDS' regulations.

Edge supports of an appropriate size and strength should be set above ground level and should be secured with either haunching or steel pins driven into the ground. The outer edge of the supports may be banked up with clean topsoil (see Arbtech Consulting Ltd tree protection plan, number Arbtech TPP 01 for details).



Typical cross section for multi-dimensional confinement system using kerb edging



Typical cross section for multi-dimensional confinement system using timber edging

Installation of a multi-dimensional confinement system

a) Prepare the surface

- Remove any surface rocks and debris;
- Create a level surface by filling in any hollows with clean angular stone or sharp sand;

- Do not level off any high spots or compact the soil through rolling.

b) Layout Geotextile membrane

- Layout the permeable Geotextile membrane, overlaying edges of the required area by 300mm;
- Overlap any joints by 300m or more.

c) Layout multi-dimensional confinement system (MDC)

- Layout the collapsed MDC system on-top of the Geotextile membrane;
- Place one steel pin into the center cell at one end of the panel and secure it into the ground;
- Pull out the MDC to its full length (see manufacturers specifications), place a steel pin in the center at the opposite end and secure it into the ground;
- Pull out the MDC to its full width (see manufacturers specifications), and secure each corner into the ground with steel pins;
- Create a panel to the correct size using the required number of steel pins (as per the manufacture specifications);
- Makes sure all cells are fully extended (as per manufactures specifications);
- Staple adjacent panels together (as per manufacturers specifications);
- If a curved shape is required, the panels are to be cut down to the required size and shape once the MDC is pinned out. Do not curve or bend panels into place.

d) Infill with clean angular stone

- The infill material must be a clean (no fines) angular stone (as per manufactures specifications)
- Do not use M.O.T type 1 or crushed stone with fines within or adjacent to RPAs;
- Infill the MDC cells with clean angular stone, working towards the tree using the infilled panels as a platform;
- No compaction is requires of the infill. Do not use a whacker plate, roller or any other means of compaction.

e) Edge restraints

- All kerb edging should be situated on top of the MDC within RPAs, Do not excavate within RPAs to install kerb edging;
- Where edging is required for light structures, a peg and treated timber board edging is normally acceptable;

- Other options include wooden sleepers, plastic or metal edging;
- The outer edges of the supports may be banked up with clean top soil and or mulch.

f) Wearing course

- Install a permeable geotextile membrane, over lapping any joints by 300mm before laying the wearing course;
- Surfaces can include block paving, asphalt, loose gravel, resin bound gravel, concrete etc.;
- Within RPAs the wearing course shall be permeable to both water and air.

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.

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.

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.

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.

Monitoring and Supervision

Where trees have been identified within this method statement and tree protection plan drawing number Arbtech TPP 01 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 project arboriculturist, 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 or 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 the buildings, structures, hard surfacing, kerb edging and all associated foundations within or immediately adjacent to the canopies and RPAs of all retained trees;
4. Manual excavation of site investigations, temporary retaining structures, foundations and support posts within and immediately adjacent to the RPAs of tree nos.3, 7, 8, 9, 10, 11 and 13;
5. Installation of ' No Dig' hard surfacing;
6. Any excavations within and immediately adjacent to RPAs, including foundations, hard surfacing or underground services;
7. 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: NGM Consult Ltd.
Project: 2 Akenside Road
Survey Date: 20/02/2014
Surveyor: Jon Hartley

BS5837:2012 Tree Survey

Arbtech Consulting Ltd.

Unit 3, Well House Barns
Chester Road
Chester
Cheshire
CH4 0DH
Phone: 01244 66 05 58

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											
Magnolia *Magnolia Unknown*	6	2	297 (Eq)	N 3 E 2.5 S 4 W 3.5	3.5 3 3 3	M	A: 39.9 R: 3.56	Good	C: Fair S: Good B: Poor	Previously topped at 4m, maturing epicormic growth makes up 50percent of the crown. Bifurcates at ground level, significant included bark at stem union.	B.1.2.3 10 to 20 yrs
2											
Common or Black Elder *Sambucas nigra*	5	2	193 (Eq)	N 1 E 1.5 S 3	5 2.5	M	A: 16.9 R: 2.31	Fair	C: Fair S: Fair B: Fair	Twin stemmed. From ground level, subordinate stem is dead. Dominant stem is in contact with the roof. Another stem has previously rubbed and damaged this stem at 1.5m. The crown is wholly asymetrical with its entirety over the roof.	C.1.2.3 10 to 20 yrs
3											
Common Lime *Tilia europaea*	10	1	430	N 2 E 3 S 3 W 3	4 6 6 6	M	A: 83.7 R: 5.16	Good	C: Fair S: Good B: Fair	Historically pollarded at 7m with with normal cavities present. Approximately 5 years since kast pollard but reduced recently to present height. Tree grows on top of a 1m poored concrete retaning wall which is no longer vertical.	B >40 yrs
4											
Common Holly *Ilex aquifolium*	4	1	100	N 1 E 1 S 1.5 W 1.5	2 2 2 2	Y	A: 4.5 R: 1.19	Good	C: Good S: Good B: Good	Provides some level of privacy from neighbors	C 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
5											
Norway Maple *Acer platanoides*	12	1	450	N 5 E 5 S 5 W 5	4 4 4 4	M	A: 91.6 R: 5.39	Fair	C: Good S: Good B: Good	Crown recently reduced and thinned as per regular management regime. Gows from a position atop a 1m retaining wall in neighbors property.	A.1.2.3 20 to 40 yrs
6											
Common Holly *Ilex aquifolium*	5	4	102 (Eq)	N 1 E 2 S 2 W	1 1 1 1	Y	A: 4.8 R: 1.23	Good	C: Fair S: Good B: Fair	Previously topped at 2m. Included bark at stem unions.	C 10 to 20 yrs
7											
Maidenhair Tree *Ginkgo biloba*	15	2	669 (Eq)	N 2 E 4 S 5 W 5	5 5 5 5	M	A: 202.4 R: 8.02	Good	C: Poor S: Poor B: Poor	Previously topped at 7m, approximately 7 stems persist from this point. Stem unions are congested with included bark present. Bud density is good. Stems codominant from ground level with included bark to 2m.	C.1.2.3 10 to 20 yrs
8											
Common Lime *Tilia europaea*	20	1	620	N 2 E 2 S 3 W 4	5 5 5 5	M	A: 173.9 R: 7.44	Good	C: Fair S: Ivy B: Fair	Previously topped at 15m. bifurcates at 6m, union tensile in nature. Growing on top of a bank rising 1.5m to higher ground level in neighbors property.	B 20 to 40 yrs
9											
Common Lime *Tilia europaea*	20	1	600	N 2 E 3 S 5 W 2	7 7 7 7	M	A: 162.9 R: 7.2	Good	C: Poor S: Fair B: Fair	Historically topped at 4m but recently maintained at 16m. The stem must have an amount of dysfunctional wood but no thin walls of residual walls detected by hammer. grows on top 0f the same bank rising to higher ground level on neighbors property.	B 20 to 40 yrs
10											
Common Lime *Tilia europaea*	20	1	830	N 4 E 4 S 5 W 4	4 4 5 4	M	A: 311.7 R: 9.96	Good	C: Fair S: Ivy B: Good	Ivy obscures stem and all major branch unions. All limbs truncated by previous management regime. Tree grows on top of a bank rising to higher ground level on neighbors property.	B 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
11											
Common Holly *Ilex aquifolium*	5	1	140	N 3 E 1 3 S 4 3 W 2 3		Y	A: 8.9 R: 1.68	Good	C: Good S: Good B: Fair	Suppressed by Tree 10 the stem is angled at 50 degrees from from the horizontal. Appears to have been some root movement in the past.	C 20 to 40 yrs
12											
Hawthorn *Crataegus Unknown*	6	1	250	N 1 6 E 2 3 S 3 3 W 2 3		SM	A: 28.3 R: 3	Good	C: Fair S: Good B: Good	Suppressed by dominant trees to the north. 3 codominant stems fom 2m with included bark present.	B.1.2.3 10 to 20 yrs
13											
Laburnum *Laburnocytisus Unknown*	5	5	219 (Eq)	N 1 4 E 3 3 S 3 3 W 1 4		Y	A: 21.8 R: 2.63	Fair	C: Good S: Ivy B: -	In neighbors property, unable to access for identification or inspection.	C.1.2.3 10 to 20 yrs
14											
Laburnum *Laburnocytisus Unknown*	3	1	100	N 0.5 3 E 3 1 S 3 1 W 0.5 3		Y	A: 4.5 R: 1.19	Fair	C: Fair S: Fair B: Fair	In neighbors property.	C 10 to 20 yrs
15											
Bay *Laurus nobilis*	5	10	474 (Eq)	N 2 1 E 2 1 S 2 1 W 2 1		M	A: 101.8 R: 5.69	Good	C: Fair S: Fair B: Fair	Multiple stems with included bark present at stem unions.regularly trimmed to current height. Tree growth has damaged brick built boundary wall.	C 10 to 20 yrs
16											
Silver Birch *Betula pendula*	5	1	230	N 5 E 3 2 S 3 3 W 2 3		SM	A: 23.9 R: 2.75	Fair	C: Fair S: Good B: Good	Grows from paved surface at the base of retaining wall. suppressed by adjacent tree resulting in 30 degrees from vertical. stem angle. previously reduced to current height.	C.1.2.3 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
17											
Silver Birch *Betula pendula*	14	1	460	N 2 E 2 S 2 W 2	2 2 2 2	M	A: 95.7 R: 5.51	Good	C: Good S: Ivy B: Fair	Tree grows on top of 1m retaining wall in neighbours raised planting bed.	**B** 20 to 40 yrs
18											
Silver Birch *Betula pendula*	14	1	300	N 2 E 2 S 2 W 2	3 3 3 3	SM	A: 40.7 R: 3.59	Good	C: Good S: Good B: -	Tree grows in neighbours property which is approximately 1m higher ground level than the survey property, poored concrete retaining wall.	**B** 20 to 40 yrs

Age Classifications:

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

Condition:

C	Crown
S	Stem
B	Basal area

Stems:

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

Appendix 2 – Tree Protection Notice

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

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Appendix 3 - Contact Details

Name	Position	Company	Contact
	Client		
	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 01	Matthew Middle		Arboricultural Consultant	1	06/02/2015

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