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Arboricultural Report

BS5837 Tree Survey

Impact Assessment

Tree Protection Method Statement & Specification

Site

**Westcourt Primary School
Silver Road
Gravesend
Kent
DA12 4JB**

Proposal

Proposed Nursery Extension

Client

The Primary First Trust

by

Curtis Barkel

RCArborA, F.Arbor.A, Prof Dip (RFS)

Ref: SA/2099/23

Date: 14 February 2023



Arboricultural Consultant: Curtis Barkel - RCArborA, DipArb(RFS), FArborA
Fellow and Registered Consultant of the Arboricultural Association

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INTRODUCTION

Site Address	Westcourt Primary School, Silver Road, Gravesend, Kent. DA12 4JB.
Survey Date	01 December 2022
Report Date	14 February 2023
Surveyed by	Curtis Barkel

1.0 Instructions

- 1.1 Sylvanarb has received instructions to carry out a BS5837 tree survey and provide a tree protection specification in respect of the proposed development as detailed on the Clay Architecture, Proposed Ground Floor Plan, Ref: 5279/PL/130.

2.0 Documents Supplied

- G. French, Topographical Survey, Ref: 22/02/A
- Clay Architecture, Proposed Ground Floor Plan, Ref: 5279/PL/130.

3.0 Aim of Report

- 3.1 To survey existing trees in accordance with BS5837 2012: *Trees in Relation to Design, Demolition and Construction* (BS5837), in order to assess the condition and quality of trees located on/adjacent to the proposed area of works.
- 3.2 To assess the impact of the proposed works on the existing trees.
- 3.3 To advise on tree retention/removal and provide a specification for tree protection measures required to protect trees identified for retention during development works.
- 3.4 To advise on tree work required to accommodate the proposed development.

4.0 Scope of Report

- 4.1 The survey has been carried out in accordance with British Standard 5837:2012 *Trees in Relation to Design, Demolition and Construction* (BS5837).
- 4.2 Subject trees have been inspected considering the current and proposed site use. Assessment categories have been allocated on the condition and merits of the individual tree irrespective of the proposed development.
- 4.3 A detailed condition survey and hazard assessment of the subject trees has not been carried out, where obvious faults have been noted a further detailed condition assessment may be recommended in the tree survey comments column (see Appendix A).
- 4.4 The 'Required Tree Works' set out in Section 17.0 detail the tree works required to accommodate the proposal.
- 4.5 Prior to any tree work being carried out the Local Authority is to be consulted to ascertain whether prior permission is required to carry out such work.
- 4.6 A tree with internal structural faults will often display associated external evidence of such faults, these would be noted in a visual tree inspection. However such signs are not apparent at all times of the year, for example pests and diseases or leaf size and condition. The following findings and recommendations have been drawn from the evidence present on the day of inspection.
- 4.7 All advice given in this report is based on the information available on the day of inspection. Should additional information not available or apparent on the day of inspection come to light, the right is reserved to modify the conclusions found within this report. This report is valid for 12 months notwithstanding change of site conditions, extremes of weather or other such overriding environmental changes.

5.0 Survey Method

- 5.1 The survey includes those trees located on and adjacent to the area of development with a stem diameter greater than 75mm measured at 1.5m from ground level.
- 5.2 Subject trees have been allocated identification numbers prefixed with 'T'.
- 5.3 Where appropriate several trees growing closely together have been surveyed as groups. In such cases the group value is recognised and graded as a whole, as opposed to grading the individual members of the group. Groups are allocated identification numbers prefixed with 'G'.
- 5.4 Subject trees have been plotted on the arboricultural plans over the locations provided on the Topographical Survey. The locations of all trees are assumed to be accurate.
- 5.5 The survey was carried out with the help of the following inspection aids:
- Digital Clinometer To calculate tree heights
 - Diameter tape To measure stem diameters
 - Laser measure To plot trees where necessary and canopy extents

- 5.6 Each tree was inspected from ground level noting external faults and features only. The inspection did not include an aerial crown inspection, detailed excavation of the root system or the use of internal decay detection equipment.

BS5837 TREE SURVEY

6.0 Subject Trees

- 6.1 The survey identifies four individual trees and one group of trees.
- 6.2 The trees have been graded into quality assessment categories in accordance with recommendations provided in BS5837:2012 *Trees in Relation to Design, Demolition and Construction*. One tree is graded in Category B, all other trees are graded in Category C (see Appendix A for full category definitions):
- 6.3 Table 1 provides a breakdown of tree quality assessment:

Table 1: Retention Category Breakdown

BS5837:2012 Category	Tree Survey Numbers	Total
A	-	0
B	T3	1 x Individual
C	T1, T2, T4 G1	3 x Individuals 1 x Group
U	-	0

- 6.4 Trees classified in Category B are recognised as being trees of moderate quality and value with a minimum of 20 years potential. These trees serve to complement and enhance the environment of the existing setting. Tree T3 is located on the western site boundary, this is currently a moderate sized tree of good form with the potential to increase in size and prominence.
- 6.5 Trees classified in Category C are considered to be of poor form and/or offer limited current or long-term potential. Those trees graded in Category C are of limited public amenity value and contribute little to the character of the locality. Trees T1 and T2 are multi-stemmed trees of poor general form that have previously been heavily reduced, these trees have the potential to significantly increase in size if not periodically maintained. T4 is also of poor form, with structural concerns that are likely to prevent the tree from developing through to maturity. G1 is an unmaintained boundary hedgerow providing screening between the school and the adjacent residential properties.
- 6.6 It is understood that none of the subject trees are protected by Tree Preservation Order and the school is not located within a Conservation Area, however confirmation of this is to be gained prior to carrying out any tree work on the site.

PROPOSED WORKS

7.0 Planning Proposal

- 7.1 Planning permission is sought for the construction of an extension to the existing nursery building, along with landscaping works that include the replacement of an existing pedestrian ramp and associated paving works.
- 7.2 The proposal has been designed under arboricultural advice provided in the form of a Sylvanarb Tree Constraints Plan, in accordance with Section 5.1-5.3 of BS5837.
- 7.3 The proposals ensure that the key arboricultural features along the western boundary are retained to maintain screening between properties and to preserve the existing character of the wider setting.
- 7.4 Two low value trees adjacent to the nursery building are to be removed and replaced with better suited species for the location.
- 7.5 Existing impermeable paving within the Root Protection Areas of the boundary trees is to be removed and replaced with permeable surfacing, this serving to enhance the rooting environment of these trees.

8.0 Trees Requiring Removal to Accommodate the Scheme

- 8.1 The two trees identified for removal to accommodate the proposed works are considered to be of Low value, graded in BS5837 Category C. Table 2 provides brief details:

Table 2: Trees Requiring Removal to Accommodate Proposal.

Tree No.	Species	Condition/Comments	Reason for Removal	BS5837 Cat.
T1	Ash	Young 4-stem tree. (<180mm stem dia.) Topped at 5.5m, will outgrow setting.	Construction of paving/extension and to facilitate contractor access.	C1
T2	Ash	Young 3-stem tree. (<350mm stem dia.) Included bark at base, topped at 5.5m, will outgrow setting.	Construction of paving/ramp and to facilitate contractor access.	C1

- 8.2 Both of these trees are of poor general form and have been heavily reduced in the past. These trees have the potential to significantly increase in size and will undoubtedly come to outgrow the setting presenting the need for ongoing maintenance works to be carried out and becoming an increasing financial burden for the school. To add to this, the structure of both trees will increasingly present potential safety concerns as the trees increase in size.

- 8.3 The loss of these trees will be of no significance to the visual amenity of the wider setting, whilst the proposal presents the opportunity to secure replacement trees, using specifically selected species, that will offer greater benefits than the existing trees.
- 8.4 It is expected that soft landscaping details and a specification for replacement tree planting will be agreed with the Local Authority under conditions attached to any planning approval granted. Suggested replacement species for this setting would be Amelanchier, rowan or ornamental cherry,

TREE PROTECTION MEASURES

9.0 Primary Tree Protection Considerations

- 9.1 It is understood that none of the subject trees are protected by Tree Preservation Order and the site is not located in a Conservation Area, as such the prior approval of the local authority to carry out works to trees on the site is not generally required.
- 9.2 However, should the planning application be approved, those trees identified for retention are likely to be protected under planning conditions, this may require that the permission of the Local Authority be gained prior to carrying out any work to the retained trees.
- 9.3 The majority of damage to tree root systems on development sites occurs either at the early stages of development when protection measures have not been installed promptly enough, or at the final stages of development when protective measures are taken down prematurely.
- 9.4 The tree protection measures specified in this report are to be maintained for the duration of the main construction phase and only removed prior to the approved landscaping works.
- 9.5 An individual, such as the Contract Manager, is to be identified as a point of contact for arboricultural affairs during works. This individual is to be fully aware of the arboricultural requirements on the site and is to be responsible for the monitoring and enforcement of tree protection measures.
- 9.6 The Contract Manager is to ensure that all contractors and operatives are aware of the reason and location of tree protection measures prior to commencing any works on site.

10.0 Operations Resulting in Damage to Trees

10.1 The following operations are likely to result in significant damage to trees. Damage resulting from these operations may take immediate effect resulting in the rapid death of a tree, or alternatively may result in years or even decades of gradual decline and ultimate early death.

10.2 *Compaction of Soil*

Whether from repeated pedestrian passage or due to just a single passing of a vehicle, soil compaction within a Root Protection Area will inevitably lead to root death and may ultimately greatly reduce the longevity of a tree.

10.3 *Storage or Spillage of Toxic Materials*

The following materials commonly used on development sites are toxic to trees:

- Builders Sand (due to salt content)
- Cement
- Fuels
- Tarmac

The uncontrolled storage or use of such materials on unsealed surfaces within 10 metres of trees is likely to be detrimental to their long-term health.

10.4 *Excavations / Soil Grading / Lowering of Levels*

Contrary to popular belief nearly all of a tree root system is located within the top 1 metre of soil, often with the majority of roots found within 600mm of the soil surface.

The Root Protection Area is the *minimum* area of protection required to retain a tree. The full root system of a tree will extend beyond this, usually to a distance at least equivalent to the height of the tree.

10.5 *Raising of Levels*

Roots absorb both oxygen and water from the soil and therefore develop in free-draining, aerated conditions.

Where levels are raised over tree roots the availability of oxygen is reduced and moisture filtration hindered, tree roots will subsequently be starved of oxygen and water leading to root death, potential disease and reduced longevity.

11.0 Monitoring and Maintenance

11.1 The trees identified for retention are likely to be protected under planning conditions. To cause damage to these trees may result in Planning Enforcement action being taken. It is therefore imperative that the recommended tree protection measures are fully complied with.

11.2 The contract manager is to be made aware of their responsibility to ensure that the protection of retained trees is maintained throughout the development of the site.

11.3 The location and reason for tree protection measures is to be highlighted at the induction of all new contractors visiting the site.

12.0 Tree Protection Fencing

- 12.1 No tree protection fencing is required on the site during works.
- 12.2 The existing boundary security fencing is to be retained, this will serve to prevent contractor access to the trees.

13.0 Temporary Ground Protection Measures

- 13.1 Temporary ground protection is required to protect the soil profile where contractor access is required through the unfenced sections of Root Protection Area.
- 13.2 The location for the required temporary ground protection is shown on the Tree Protection Plan. Part of this includes the existing footway hard surfacing, which is to be retained during the construction phase to serve as ground protection.
- 13.3 The additional temporary ground protection is to be installed in accordance with the principles provided at 6.2.3 of BS5837: 2012, the details of which are provided at Appendix C.
- 13.4 The ground protection is to be installed prior to the commencement of any other works on site.
- 13.5 Ground protection is to be maintained throughout the construction phase and through to completion of the extension and ramp construction and is only to be removed immediately prior to carrying out the approved landscaping works.

14.0 No-Dig Hard Surfacing

- 14.1 The proposed hard surfacing within the Root Protection Areas of the retained trees is to be designed in accordance with the following guidance.
- 14.2 The surfacing is to be entirely permeable (sub-base and finished surface), and constructed over existing ground levels in accordance with Section 7.4 of BS5837:2012. The design is to incorporate a three-dimensional cellular confinement system within the sub-base to minimise the compaction of soils within the protected area.
- 14.3 The existing impermeable footway within the RPA's of the boundary trees is to be removed and replaced with the permeable no-dig specification.
- 14.4 The location of the no-dig area of construction is shown on the Tree Protection Plan at Appendix B and a method statement for the required construction is provided at Appendix D.

15.0 General Protection Measures

- 15.1 Other than approved development, no level changes, service runs or storage of materials are permitted within the specified RPA's.
- 15.2 No fires are permitted where flames will reach within 5m of a tree canopy.
- 15.3 No storage or discharge of materials harmful to tree health is permitted on unsealed surfaces within 10m of any retained tree, including storage of fuels, tarmac, cement and oil.
- 15.4 No cement mixing is to be carried out on unsealed surfaces within 10m of any retained tree. This will require that all cement storage/mixing is either carried out to the front of the site i.e. within the car park area, alternatively an impermeable membrane is to be installed and a temporary concrete base laid to provide a mixing station closer to the extension. If cement mixing is to be carried out in the main working area the Project Arboriculturist is to be consulted prior to commencement to agree the specification for the required ground protection.

EXCAVATIONS WITHIN ROOT PROTECTION AREAS

16.0 Excavations Within RPA's - Services/Drainage/Level Changes etc.

- 16.1 Details of proposed drainage runs/services have not been provided at this stage, it is expected that these will tie in to existing runs. Finalised proposals will require arboricultural consultation on design and the approval of the local authority. It is expected that such details will be approved under conditions attached to any planning approval granted.
- 16.2 No trenching or excavations are to be carried out within the specified Root Protection Areas of retained trees, as shown on the Tree Protection Plan, without prior arboricultural consultation. Root damage associated with trenching or excavations may result in the reduced longevity of trees or trees being left in an unsafe condition.
- 16.3 Contractors responsible for the installation of services/drainage are to be instructed to carry out such works in accordance with industry guidelines provided in NJUG Vol.4.
- 16.4 Particular care is required to ensure that any tree roots of 25mm diameter or greater are not severed or damaged without first seeking arboricultural advice. Should such roots be encountered, the works are to be stopped and further advice is to be sought from the arboricultural advisor or LPA tree officer prior to continuing.

TREE WORK REQUIRED TO ACCOMMODATE THE SCHEME

17.0 Required Tree Works

17.1 Table 3 provides details of the tree work required to accommodate the proposal.

Table 3: Proposed Tree Work

Tree No.	Schedule of Works
T1, T2	Fell and grind/grub-out stumps.

- 17.2 The specified tree works are considered to be required to accommodate the proposed development. Should detailed planning approval for the development be granted it will be assumed, unless the LPA informs otherwise, that the tree works detailed at Table 3 may be carried out under the planning approval without any additional notification of intent or application for tree works.
- 17.3 The proposed tree work is to be carried out prior to the commencement of any site clearance/ development operations on the site.
- 17.4 Tree work is to be carried out by a competent arborist in accordance with the British Standard for tree work BS3998: 2010 'Recommendations for Tree Work'.
- 17.5 Upon completion of the specified tree work, the prescribed tree protection measures are to be installed as detailed on the Tree Protection Plan at Appendix B.

Appendix A

Tree Survey Data & Plan

Gravesham Borough Council

Tree Survey Key

Tree No.	Tree Number - cross-referenced with tree numbers shown on Tree Survey Plan.		
Hgt (m)	Height - estimated in metres.		
Dia. at 1.5m (mm)	Stem Diameter - in millimetres taken at 1.5m above highest adjacent ground level		
No. of Stems	Number of main stems arising from below 1.5m above ground level. M = Multi-stemmed tree.		
Crown Spread N,E,S,W (m)	Given as a radial measurement in metres from the centre of the stem to the extremity of the canopy at the four main compass points NESW.		
Crown Cl/nce (m)	Crown Clearance - Height in metres of crown above adjacent ground level.		
Age Class	Y	Young	Staked or recently established tree at the fast growing early stage of establishment.
	SM	Semi mature	An established tree at a stage of rapid growth with increasing future growth potential
	M	Mature	A tree that is at a stage of constant growth nearing ultimate canopy size.
	V	Veteran	A mature tree, often of great ecological or heritage importance, that has reached a stage of natural decline.
Physiological Condition	Provides some evidence of the general well being of the tree. Assessed by comparison of growth characteristics with similar species in the locality and/or from personal experience.		
	Given in four classifications:		
	G	Good	
	F	Fair	
	P	Poor	
	D	Dead	

Preliminary Mgt Recommendations for tree work to bring the trees to an acceptable and safe standard in context with the current site use.

Category Category of quality assessment allocated to a tree derived from an individuals potential contribution to a site: considering tree health, condition, age and value. Full description given on Table 1 of BS5837:2012 'Trees in Relation to Demolition, Design and Construction'. Trees are colour coded on the attached Tree Survey plan.

Given in four categories:

A - Green - Trees of high quality and value
(likely to contribute a further 40+ years)

B - Blue - Trees of moderate quality and value
(likely to contribute a further 20-40 years)

C - Grey - Trees of low quality and value
(likely to contribute a further 10-20 years)

U - Red - Trees which may require removal on health and safety grounds, be in decline, infected by significant pathogens or, due to their current condition would lose their existing value within 10 years.

A provisional category may be allocated pending further advised inspection/tree work.

RPD (m) Root Protection Distance - The distance in metres of the radius of a circle depicting the root protection area required for an individual tree.

RPA (m) Root Protection Area – The total area of ground to be protected around an individual tree.

(p) Provisional quality assessment category – the highest expected category is allocated to the tree based on an incomplete preliminary visual inspection due to limited access ie. ivy clad, basal growth, dense undergrowth or off-site tree.

(e) Estimated figure due to obstruction such as ivy or off-site tree.

Tree Survey Data

TREE NO	SPECIES	HEIGHT (m)	DIAMETER AT 1.5m or art (mm)	NO. OF STEMS	CROWN SPREAD N,E,S,W (m)				CROWN CLINCE (m)	AGE CLASS	PHYSIOLOGICAL CONDITION	STRUCTURAL CONDITION	PRELIMINARY MGT RECOMMENDATIONS	ESTIMATED REMAINING CONTRIBUTION	CATEGORY	RPD (m)	RPA (m2)	NOTES
T1	Ash	11	160 180 150 170	4	3	1.5	2.5	3	3	Young	Good	Fair		20-40	C1	4.0	50	Multi-stem, topped at 5.5m, in contact with roof, will outgrow setting.
T2	Ash	11	250 150 200	3	3.5	4.5	3.5	2	2	Young	Good	Fair		20-40	C1	4.3	57	Bifurcated at base with included bark, topped at 5.5m, occluding stem wound at 2m to S.
T3	Norway Maple	13	280e	1	3	3	4	4	4	Semi- mature	Good	Good (p)	Assess.	>40 (p)	B1 (p)	3.4	36	Behind fence, full inspection not possible.
T4	Sycamore	13	250e 250e	1	4	3	4	4	5	Semi- mature	Good	Fair (p)	Assess.	20-40 (p)	C1 (p)	4.3	57	Bifurcated at 1m with included bark, behind fence, full inspection not possible.
G1	Hawthorn/ Elder	5	<200 e	M	2	2	2	2	2.5	Mature	Good	Good		20-40	C2	2.4	18	Behind fence, full inspection not possible.

Table 1 (BS5837:2012) – Cascade Chart for Tree Quality Assessment.

Category & Definition		Criteria (Including subcategories where appropriate)			Identification On Plan
TREES UNSUITABLE FOR RETENTION (See Note)					
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline Trees infected with pathogens of significance to the health and/or safety of other trees nearby or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.				DARK RED
TREES TO BE CONSIDERED FOR RETENTION					
Category & Definition	Criteria — Subcategories				
	1 Mainly arboricultural values	2 Mainly landscape values	3 Mainly cultural values, including conservation		
Category A Trees of high quality With an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN	
Category B Trees of moderate quality With an estimated remaining life expectancy of at least 20 years	Trees that might be included in the high category, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	MID BLUE	
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	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value, and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	GREY	

Appendix B

Tree Protection Measures

- **Tree Protection Plan**
- **Tree Protection Specification**
- **Tree Protection Warning Sign**

Principles of Tree Protection

- i) The majority of damage to tree root systems on development sites occurs either at the early stages of development when protection measures have not been installed promptly enough, or at the final stages of development when removed prematurely.
- ii) The ground protection prescribed is to be installed prior to the commencement of any other works associated with the proposal.
- iii) The site manager is to be made aware of their responsibility to ensure tree protection measures are maintained throughout the development of the site.

General Precautions

- No materials that are likely to have an adverse effect on tree health such as oil, bitumen or cement will be stored or discharged on unsealed surfaces within 10 metres of the trunk of a retained tree. Consideration for the slope of the ground is to be considered when discharging or storing materials that are potentially harmful to trees.
- No fires to be lit where flames could extend to within 5m of foliage, branches or trunks of trees.
- No signs, cables or other items are to be attached to trees.
- Details of service runs have not been provided. Service runs are to avoid Root Protection Areas and will ideally be laid within one combined trench. Trenching operations are to be carried out in accordance with NJUG Vol.4.
- Should tree roots over 25mm in diameter be encountered whilst carrying out any excavations within the vicinity of retained trees advice from the arboricultural advisor or LPA tree officer is to be sought prior to continuing with works.
- Any proposed level changes within Root Protection Areas are to be approved by the Local Authority Tree Officer prior to work being carried out.

Appendix C

Temporary Ground Protection Specification

Gravesend Borough Council

Temporary Ground Protection Specification

- i) Tree protection requirements are to be included in the tender specification when seeking quotes from contractors to carry out the building works.
- ii) Prior to installing ground protection the contractor is to determine whether the area is to be used for vehicles/plant or for pedestrian use only. The following specifications are then to be used accordingly as recommended in BS5837:2012:

1. For pedestrian use only.

a) Side-buttressed scaffold boards (or other non-slip boarding) placed over a layer of compressible material.

- Lay a permeable geotextile membrane over the area to be protected.
- Spread a layer of compression-resistant material over the geotextile. Woodchips resulting from tree pruning operations may be used and spread to a depth of 100mm.
- Lay side-buttressed scaffold boards or similar boarding over the compressible layer.

b) Scaffold boards suspended over the ground on a scaffold framework.

- Install a raised scaffold framework across the area of protection.
- The framework is to cover the entire area of ground to be protected (see Tree Protection Plan) and form a level platform to support the suspended floor.
- Affix scaffold boards or similar to the framework to form a suspended floor over the protected area.

2. For vehicles/plant up to a gross weight of 2 tonnes.

a) Proprietary ground protection panels, such as *Traxpanels* from TPA Ltd, laid over compression-resistant material.

- Lay a porous geotextile membrane over the area to be protected.
- Spread a layer of compression-resistant material over the geotextile. Woodchips resulting from tree pruning operations may be used and spread to a depth of 150-200mm.
- Install proprietary ground protection panels across area of protection.

- iii) Ground protection is to be installed in the locations shown on the Tree Protection Plan at Appendix B.
- iv) The ground protection measures described are to be installed prior to any other development works being carried out on the site.
- v) Ground protection is to be maintained throughout the development phase and only removed immediately prior to landscaping works.
- vi) The contract manager is to be made aware of their responsibility to ensure tree protection is maintained throughout the development of the site.

TREE PROTECTION MEASURES ARE NOT TO BE ALTERED WITHOUT THE PRIOR APPROVAL OF AN
ARBORICULTURAL ADVISOR OR THE LPA TREE OFFICER.

Appendix D

No-Dig Hard Surface Method Statement

Gravesend Borough Council

Method Statement for No-Dig Hard Surface Construction POST CONSTRUCTION PHASE

Important Notes:

The Temporary Ground Protection, as shown on the Tree Protection Plan, is to be installed prior to any other operations on the site.

- i) It is important that the no-dig hard surface be designed to take account of the expected load and usage of the area. The suggested materials given below are used as examples only.
- ii) Design is to take into consideration the Californian Bearing Ratio of underlying soils and potential weight limit of any vehicles that may access the area when specifying the depth of cellular confinement system to be used.
- iii) The no-dig hard surfacing is to be constructed over existing ground levels. It is important to note that NO EXCAVATIONS, other than the removal of turf up to 50mm depth, are permitted within the specified area of no-dig surfacing without prior arboricultural consultation.
- iv) The sub-base material and finished surface are to be fully permeable to allow moisture and air through to the underlying soil, no cement is to be used in the construction of no-dig surfacing within tree Root Protection Areas.
- v) Permeable finished surfacing to consider are: resin bound gravel; contained loose gravel; or a permeable block paving system.
- vi) Prior to the installation of the load bearing element no vehicular activity or heavy machinery is permitted within unsurfaced sections of Root Protection Area.
- vii) All operations within the specified Root Protection Areas are to be carried out using hand operated tools only.
- viii) The following sequence of operations provides recommendations for the process of installing a no-dig hard surface incorporating a three-dimensional load bearing system in accordance with guidance provided in BS5837:2012. The recommended geotextile membrane and three dimensional cellular confinement system (*Cellweb*) can be sourced from the following company: Geosynthetics, Hinkley (01455 617139), other products are available. The manufacturers guidelines must be followed during the installation of these systems.

**Sequence of Operations for the Installation of a No-Dig Hard Surface
Within a Root Protection Area in accordance with BS5837:2012**

- Stage 1: Temporary ground protection is to be installed as shown on the Tree Protection Plan at Appendix B.
- Stage 2: Main development works undertaken.
- Stage 3: Upon completion of the extension and ramp works, remove ground protection and mark out the position of the proposed no-dig surfacing. The approximate area is shown on the Tree Protection Plan at Appendix B.
- Stage 4: Treat surface vegetation within area of construction using an approved translocated herbicide
- Stage 5: Once recommended time period for herbicide to act has passed, remove turf and all vegetation; also removing major protrusions such as rocks and stumps. NOTE: Vegetation removal is to be carried out using hand tools only. Other than turf removal to a depth of 50mm, the skimming off of topsoil is not permitted within the Root Protection Area without prior arboricultural approval.
- Stage 6: Level the area of construction by filling any hollows with sharp sand. Builders sand is not to be used as this can cause damage to tree root systems.
- Stage 7: Lay non-woven, permeable geotextile membrane over the area of construction and pin into place.
- Stage 8: Install retaining edge supports around the perimeter of the area. These may be either drilled concrete kerbstones or treated timber edging boards fixed by pins to provide adequate support. Alternatively railway sleepers pinned into place can create an attractive edging. No cement haunching is to be used, cement is toxic to tree root systems.
- Stage 9: Install the three-dimensional cellular confinement system (100mm depth is adequate for light domestic use, 150- 200mm depth is recommended for heavier vehicles – consult manufacturer) and pin into place.
- Stage 10: Fill cellular confinement system with washed, no-fines, 40/20mm, angular aggregate. (Aggregate is to be no fines angular granular material, Type 1 roadstone is *not* acceptable).
- Stage 11: **Final Surface Options**
- i) Lay second layer of non-woven geotextile membrane over sub-base and spread unbonded gravel over the membrane to form the finished surface.
 - ii) Lay second layer of non-woven geotextile membrane over sub-base, spread a bed of sharp sand or gravel over the membrane and install a dry-jointed permeable block paving system such as Hanson 'Formpave' *Aquaflow*.
 - iii) Permeable tarmac or permeable resin bound gravel laid directly over the sub-base.