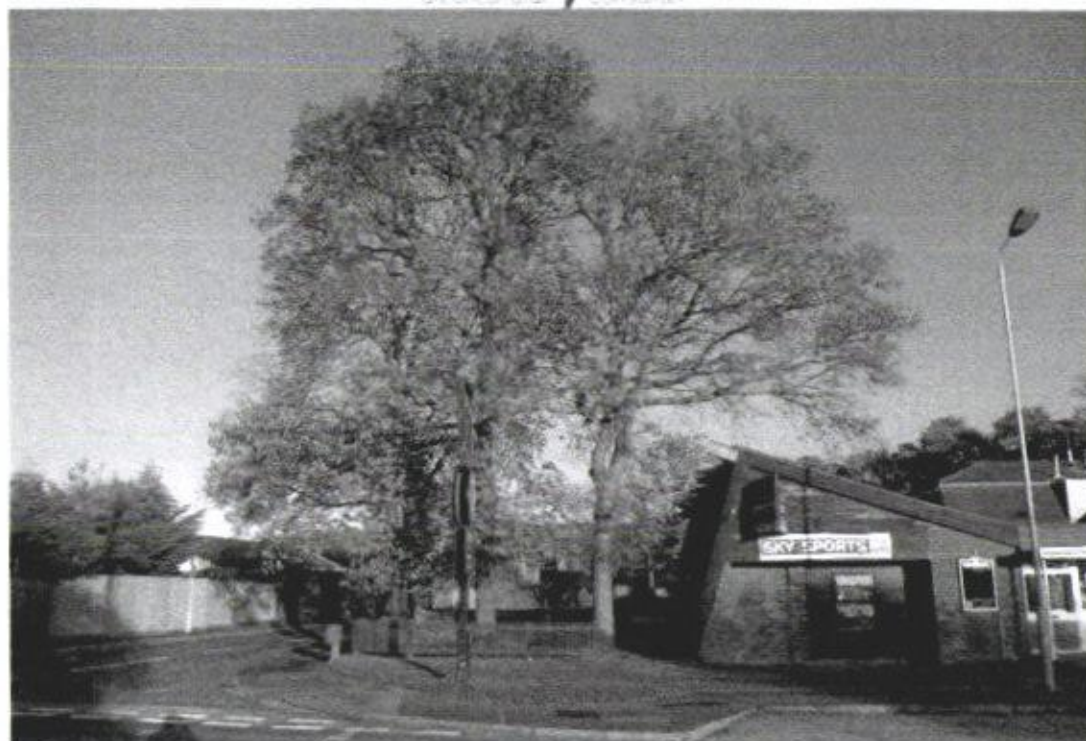




ARBORICULTURAL METHOD STATEMENT

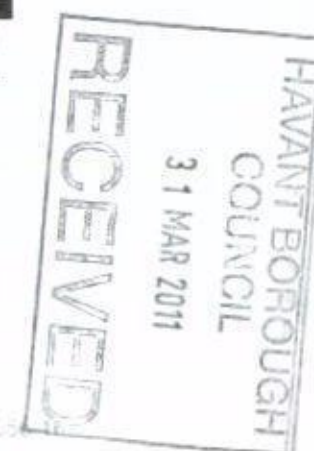
for

**The Brewmaster PH Site –
158 Hart Plain Avenue, Waterloooville**

- March 2011 -

Bernie Harverson M.Arb.

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ARBORICULTURAL METHOD STATEMENT (AMS)

Client	158 HART PLAIN AVENUE LTD
Site Location	The Brewmaster PH – 158 Hart Plain Avenue, Waterlooville
Project Arboricultural Consultant:	Bernie Harverson M.Arb.,
Date Report Prepared	March 2011

Section	Subject Heading
1	INTRODUCTION & CLIENTS BRIEF
2	DOCUMENT DISCLOSURE STATEMENT
3	LAND SURVEY & TREE SURVEY - (in accordance with Section 4 of BS5837)
4	TREE CONSTRAINTS PLAN – RPA & ABOVE GROUND CONSTRAINTS - (in accordance with Section 5 of BS5837)
5	ASSESSMENT OF TREE CONSTRAINTS – AIA & DESIGN ISSUES & TREE PROXIMITY - (in accordance with Section 6 of BS5837)
6	ARBORICULTURAL METHOD STATEMENT & TREE PROTECTION PLAN - (in accordance with Section 7 of BS5837)
7	PRE – DEVELOPMENT TREE WORK & WORKING WITHIN THE RPA - (in accordance with Section 8 of BS5837)
8	CONSTRUCTION EXCLUSION ZONE ; BARRIERS & GROUND PROTECTION - (in accordance with Section 9 of BS5837)

9	AVOIDING DAMAGE TO STRUCTURES BY TREES: DIRECT or INDIRECT ACTION - (in accordance with Section 10 of BS5837)
10	DEMOLITION & CONSTRUCTION IN PROXIMITY TO EXISTING TREES - (in accordance with Section 11 of BS5837)
11	SOFT LANDSCAPING WORKS - (in accordance with Sections 12; 13; 14 & 15 of BS5837)
12	MONITORING & SITE SUPERVISION
13	CONCLUSIONS
<u>Appendices</u>	<u>Subject</u>
BH1	Tree Survey Schedule (in accordance with – Table 1 of BS5837) + Figure 1 -Flow Diagram from BS5837 + Tree Survey Notes
BH2	Root Protection Area Schedule (RPA in accordance with – Table 2 of BS5837)
BH3	(AIA) Tree Constraints Plan – BH.01/02
BH4	Pre-Development Facilitation Tree Works Schedule (in accordance with Section 8 of BS5837)
BH5	Tree Protection Plan- BH.03 + BS5837 Figure 2 & 3 Diagrams + Example Warning Notices
BH6	BS5837 Extracts – including Table 3 and Sections 13 &14 & 15 & NJUG10 Extracts
BH7	Qualifications & Experience

1.0 INTRODUCTION & CLIENTS BRIEF

- 1.1 My clients seek planning approval to demolish the existing buildings and construct a mixed use development in its place.
- 1.2 My instructions come directly from - the owners of the land.
- 1.3 I have been commissioned to consider the impact that development might have on the existing tree stock.
- 1.3 I am instructed to prepare a **Method Statement & Tree Protection Plan** - based on the planning layout submitted to me.
- 1.6 My work is compiled in accordance with the Recommendations contained within BS5837:2005 and this report follows the sequential progression through this document with Sections 7 to 15 in the **AMS & TPP**.

2.0 DOCUMENT DISCLOSURE STATEMENT

2.1 A copy of the Land Survey Topographical drawing has previously been provided to me for the purposes of my work.

2.2 A copy of the Planning Layout drawing as prepared by **PLC Architects and referenced – 09-1682-117- P1- 1:200- March 2011** - has been provided to me for the purposes of my work and I rely totally on the accuracy of this drawing.

3.0 LAND SURVEY & TREE SURVEY

3.1 A Land Survey Topographical drawing has been prepared and to the best of my knowledge this accords with the requirements of BS5837 as listed at Section 4 – *Paragraphs 4.1.1 to 4.1.5*.

3.2 I conducted a full Tree Survey exercise on **17th November 2009** and re-visited on **Monday 14th March** to verify the data all in accordance with the requirements of BS5837 as listed at Section 4 – *Paragraphs 4.2.1 to 4.3.7. and Cascade Chart Table 1* – a copy of the survey schedule can be viewed at appendix BH1.

3.3 Additional Considerations –

- *BS5837 Para .4.4.1* – **I found no trees on site that might represent an immediate and serious hazard to life or property but there is significant Ganoderma heart rot decay in the base of Grp1c – Sessile Oak that may become an issue in the future.**
- *BS5837 Para .4.4.2* – **There are no trees on the development site which are suitable candidates for transplanting.**
- *BS5837 Para .4.4.3* – **There are no veteran trees on the development site.**

4.0 TREE CONSTRAINTS PLAN – RPA & ABOVE GROUND CONSTRAINTS

4.1 The RPA for each surveyed tree and group has been calculated using the Tree Survey data and by reference to Table 2 of BS5837.

4.2 A copy of the RPA schedule can be viewed at appendix BH2 and the data has been applied to the TCP prepared for this current scheme.

4.3 In compiling the data and applying it to the TCP full consideration has been given to BS5837 – *Paragraph 5.2.4 and items a) to e)*.

4.4 In this regard it is to be noted that in respect of item *e)* if trees and groups have crown spreads which exceed the specified RPA then this has been taken into account on the TPP for those trees which are to be retained and either an increased protection zone applied to encompass the crown or where deemed appropriate 'access facilitation' tree surgery works specified that will avoid unnecessary contact and damage from site traffic during the demolition and/or construction works. **This is relevant for Tree G1a in Group 1 – see Tree Works Specification at appendix BH4.**

5.0 ASSESSMENT OF TREE CONSTRAINTS –AIA & DESIGN ISSUES

5.1 An AIA report has been prepared for this project and duly guided the design process.

5.2 At Paragraph 6.2.2 of BS5837 there is a recommendation that *'Even if there are no trees on the site, areas for future planting should be plotted on the TCP and protected from damage, especially soil compaction due to construction activity, by the erection of barriers and/or ground protection. Where such pre –development protection is not implemented, prior remediation measures should be employed, such as soil ripping with a winged-tined plough or subsoil aeration.'* In practice this is extremely difficult to implement and the best that can be hoped for is that the ground is adequately protected and then appropriate decompaction, aeration and mulching undertaken at the completion of works during the soft landscaping works phase. The TPP may where appropriate indicate notional areas outside the RPA's where appropriate ground protection measures might be implemented to protect the ground during the course of demolition and construction works in anticipation of subsequent new tree planting.

5.3 At Paragraph 6.2.3 of BS5837 there is a recommendation that the following matters are taken into consideration:-

a) The presence of tree preservation orders or conservation area protection.

- **I am aware of an extant Tree Preservation Order covering the mature Oaks on this site and this will need to be taken into consideration before any tree works that may be recommended within this report are undertaken.**

b) The effect that development proposals may have on the amenity value of trees, both on and near the site,

- **This scheme will entail the loss of two middle aged low C graded TPO'd Oaks**
- **The losses can be readily mitigated by the provision of new quality semi-mature tree plantings along the road frontage as part of the Landscape proposals for this scheme.**
- **Two more trees of smaller stature and growth potential will also be planted in the northeast corner of the site.**
- **This project has no impact on any off site trees.**

c) The above and below ground constraints.

- **Fully assessed and a management strategy devised to minimise damage – see Section 6 of this report for further information in this respect.**

d) The construction of the proposed development.

- As shown on the planning layout drawings and detailed in Section 6.0 of this report.

e) Whether the design and/or construction of the proposed development can be modified to accommodate retention of trees that would otherwise be at risk or lost. This includes appropriate tree surgery works that acceptably mitigate adverse effects caused by trees.

- NO – this project has been carefully assessed at the AIA stage and this is now considered to be the most appropriate layout. For both the clients aspirations and the preservation and protection of the existing tree stock.

f) Infrastructure requirements, e.g. easements for underground or above ground services; highway safety and visibility splays; and other infrastructural provisions, such as substations, refuse stores, lighting, signage and CCTV requirements.

- There are already utility service runs in place to serve the existing buildings on this plot (from Hart Plain Avenue) and these are some distance from the trees affected by these current proposals.
- To the best of my understanding there is no intention to transgress through RPA's with new service utility links.

g) The end use of the space

- This is ultimately an issue for Planners to consider but in arboricultural terms it is my opinion that the trees which are indicated for retention can exist in harmony with the proposed redevelopment without pressure to prune or fell.
- The closest tree is the Oak in G1a and this will be in exactly the same relationship as exists at present with a single storey element to the buildings within the crown spread and RPA for this tree.
- Clearly due consideration will have to be taken during the Demolition and then Construction phases – but with adequate monitoring and supervision this should not be an issue.
- With regards to foundation design either the current footings can be used or if these are not deemed appropriate then an above ground beam formed over a piled foundation would be acceptable to protect tree roots.

h) Whether tree loss resulting from the development proposals can be acceptably mitigated by new tree planting.

- YES – please see comments at (b) above.

5.4 Proximity of trees to structures

This provision is to ensure that above ground the existing shade cast by the tree crowns is reasonable and acceptable and allowance has been made for their future growth and development without there being pressure to prune or fell or to impinge on useable space. In this instance the retained trees have limited crown overhang and where they do it will be a 'like for like' situation with that which exists at the present time (i.e. G1a in Grp1). Please see comments at g) above.

6.0 ARBORICULTURAL METHOD STATEMENT & TREE PROTECTION PLAN

6.1 The finalised planning layout drawing has been provided and an assessment made as to the viability of retaining trees as part of this layout in order that they meet the RPA requirements of BS5837.

6.2 The data is presented here in tabular format:-

Key: RSAM = Remove for sound arboricultural management reasons RTFD = To be removed to facilitate development UF of. = Under footprint of development

Tree No	Species	Cat	S or M	Stem Diam mm	BS5837:2005 Min.Radial Prot. Zone m	BS5837:2005 Min.Root Prot. Area m ²	Distance from Site Features (see key above)	Can Tree Be Retained
G1a	Pedunculate Oak <i>Quercus robur</i>	B1	S	520	6.3	122.4	2.3m to building line 8.4m to car park bays	YES (1)
G1b	Pedunculate Oak <i>Quercus robur</i>	B1	S	500	6.0	113.1	5.6m to building line 8.8m to car park bays	YES
G1c	SessileOak <i>Quercus petraea</i>	C1	M	760	7.6	181.5	8.2m to building line 5.6m to car park bays	YES (2)
G2a	Pedunculate Oak <i>Quercus robur</i>	C1	S	400	4.8	72.4	UF of development	NO – RTFD
G2b	Pedunculate Oak <i>Quercus robur</i>	C1	S	550	6.6	136.9	UF of development	NO – RTFD

Tree No	Species	Cat	S or M	Stem Diam mm	BS5837:2005 Min.Radial Prot. Zone m	BS5837:2005 Min.Root Prot. Area m ²	Distance from Site Features (see key above)	Can Tree Be Retained
G3a	Pedunculate Oak <i>Quercus robur</i>	C1	S	530	6.4	127.1	12.5m to building line	YES
G3b	Pedunculate Oak <i>Quercus robur</i>	C1	S	420	4.2	56.0	13.2m to building line	YES
G3c	Pedunculate Oak <i>Quercus robur</i>	C1	S	350	5.0	80.0	14.8m to building line	YES

6.3 NO – RSAM

- There are no trees within this classification on this project.

6.4 NO – RTFD - Tree G2a & G2b – Pedunculate Oaks

- Two trees that have received poor pruning work in the past and are hemmed in by tarmac and as a consequence are stunted by this and the pruning regime.
- They have merged crowns and are quite clearly a group and not individuals. Thus my assessment lists them as low C grade trees both individually and collectively.
- They have little to offer a new development and are cramping the development potential of the site. I have therefore advised that they be removed and **two new semi-mature Pedunculate Oaks planted on the road frontage of the new layout along with two fastigate Oaks in the northeast corner of the site.**
- In my opinion retaining two poor quality trees just because they are TPO'd would be poor planning and the new planting proposals would offer enhancement to the landscape in the long term and the LPA can readily TPO the new trees should they so wish.

6.5 YES - Trees G1b; G3a; G3b & G3c – Pedunculate Oaks

- Can all be retained and afforded full protection in accordance with the BS5837 recommendations (see Plan BH.03 for details).

6.6 YES (1) - Tree G1a – Pedunculate Oak

- This tree can also be retained and fully protected subject to the application of certain precautionary measures.
- Erect the protective fencing at a distance of 2m from the building line to facilitate standard scaffolding erection and building techniques – with the ground in this gap being protected in accordance with BS5837 Section 9.3 & Figure 3 recommendations (see Plan BH.03 for details).
- During the Demolition Phase the current building will have to be pulled in on its own footings and away from the tree.
- Below ground – an assessment will need to be made of the current footings to see if they are adequate to take the new structure.
- IF they are not then a bored pile footing will need to be applied and an above ground beam formed.
- It may be possible to sink the beam in 100mm to 150mm subject to 'hand dig excavation of the surface layers of the soil and advice from an arboricultural expert on whether root damage is likely to occur.
- Above ground there will be a need for some minor facilitation pruning to avoid damage during the build process.
- This involves minor 'tipping back' works that will give the crown a tighter and more compact form and have no impact on its health or amenity value and in giving it an upswept form avoid a repeat of the problem with regrowth filling in to the same area.
- All of these measures are detailed in this Method Statement and this can readily be Conditioned by the LPA to give them the security they will require that no damage will occur to this tree.

6.7 YES (2) - Tree G1c – Sessile Oak

- This tree has a significant Heart Rot Fungus bracket of *Ganoderma* attached to its trunk at ground level.
- Subject to further investigation it may be that this tree has a very short life expectancy - nevertheless provision has been made for its retention as part of this scheme.
- The RPA is marginally impinged on by the new car parking bays planned for this site and this will require precautionary measures to be applied to ensure that the tree is given every chance to survive these works with only very minor root disturbance.

- I suspect that there will be very little root matter found in the 'Hand Dig' investigation work that will be necessary in the vicinity of the small overlap area and with direct supervision from an arboricultural expert during this process any small diameter root material (25mm diameter or under) that is found can be cleanly severed at the edges of the new car park area to promote new root production from these distal ends.
- This root material will be readily replaced by a tree of this age and species provided that there is a good soil medium laid to promote root growth. It would be my advice that the entire car parking areas have a porous form of sub-base layer and wearing course. *This will benefit the trees which have previously been used to an impervious tarmac surface.*

7.0 PRE-DEVELOPMENT TREE WORK and WORKING WITHIN THE RPA

- 7.1 Undertake all tree work as listed in the Tree Works Schedule – see appendix BH4. Inclusive of all development facilitation tree removal and pruning works for access or health and safety reasons.
- 7.2 The tree surgery specialist contractors are to be given clear guidelines and a remit that prohibits heavy plant (Lorries, Cranes and Work Platforms) tracking through the site within tree protection zones where there is no existing hard surfacing protection.
- 7.3 If there are to be heavy pedestrian movements within the RPA's then Ground Protection measures in accordance with Section 9.3.2 of BS5837 will need to be applied – *'installation of ground protection in the form of a single thickness of scaffold boards on top of a compressible layer laid onto a geotextile, or supported by scaffold.'*
- 7.4 *'For wheeled or tracked construction traffic movements within the RPA the Ground Protection should be designed by an engineer to accommodate the likely loading and may involve the use of proprietary systems or reinforced concrete slabs.'*
- 7.5 Where trees are to be felled in proximity to others that are to be retained it will be necessary to use special dismantling techniques to avoid both above and below ground damage, lowering sections to the ground in a careful manner with the aid of slinging ropes.
- 7.6 Unless otherwise specifically instructed - all cut wood and arisings are to be removed from site and safely disposed of.
- 7.7 Tree stumps within RPA's are to be ground out or retained in situ and **NOT grubbed out** to avoid damage to the root systems of retained trees.

8.0 CONSTRUCTION EXCLUSION ZONE : BARRIERS and GROUND PROTECTION

- 8.1 Protective fencing barriers are to be located exactly as specified on the **Tree Protection Plan BH03** and in full accordance with the recommendations contained within British Standard 5837:2005- Figure 2.
- 8.2 A copy of the Tree Protection Plan is to be pinned up in the temporary offices/mess hut on site for all site staff to see. The area within the construction exclusion zone is to be regarded as **sacrosanct** and the fencing shall not be taken down or relocated at any time, unless this has been agreed as part of *the planning* application consent process and is detailed in writing and shown on a plan.
- 8.3 The following prohibitions shall apply within the area enclosed by the Tree Protection Fencing :-
- No mechanical digging or scraping (once the initial ground cover vegetation has been cleared and the site fenced of).
 - No storage of plant, equipment or materials
 - No vehicular or plant access
 - No fire lighting within 10m of tree canopies
 - No handling, discharge or spillage of any chemical substance, including cement washings and vehicle washings within 10m
 - No action likely to cause localised water-logging
 - No alteration of ground levels
 - No construction of hard surfaces
 - No attachment of boards, hoarding, cables or notices or fencing to trees

Special care is to be taken on sloping ground where spillages could run towards the trees – a collecting channel dug along the outer line of the protective fencing would be one method of avoiding such damage.

- 8.4 Barriers must be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s).
- 8.5 Special attention must be paid to these barriers during the course of works to ensure that they remain in situ and rigid and complete. Any breaches or failures are to be repaired immediately and no works undertaken in the vicinity until they have been fully restored/repared.
- 8.6 Barriers should consist of a scaffold framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. Onto this Weldmesh or Wooden Hoarding Panels should then be securely fixed with wire or scaffold clamps.

- 8.7 It may be appropriate on some sites (not applicable here) to use temporary site office buildings as components of the tree protection barriers along with the necessary ground protection measures beneath them. In such cases all doors must open outwards away from the trees with no access into the RPA and all discharges (clean or effluent) must be piped outside the RPA and into an existing drainage system. No excavation will be permitted within the RPA to make water or sanitary pipe connections to the offices or toilet blocks.
- 8.8 Where specified on the Tree Protection Plan – Ground Protection measures must be applied in accordance with Figure 3 and Sections 9.3.2 & 9.3.3 of BS5837 please see copy at appendix BH5.

9.0 AVOIDING DAMAGE TO STRUCTURES BY TREES: DIRECT or INDIRECT ACTION

9.1 Buildings should be constructed to allow for future growth of existing; planted or self sown trees.

9.2 Direct damage can be caused by :-

- a) the disruption of underground services and pipelines
- b) displacement of underground services and pipelines
- c) the impact of branches with the superstructure
- d) structural failure of the tree

In this respect the Tree Survey exercise will have identified any trees within categories c) or d) and tree works advised accordingly to remedy risk.

Items a) and b) can be avoided by judicious design and careful placement of utility services and by adherence to Table 3 planting distances.

9.3 Indirect damage by root action causing the shrinkage or swelling of clay soils can be avoided by adherence to the new tree planting distances specified under Table 3 – see at appendix BH6; and by having engineer designed foundations to accord with NHBC Standards.

10.0 DEMOLITION & CONSTRUCTION IN PROXIMITY TO EXISTING TREES

10.1 This project involves both a Demolition and a Construction phase.

10.2 Demolition Phase –

- **Under no circumstances** will the Demolition Company be permitted access to the site until satisfactory completion of the facilitation tree works and erection of Protective Fencing.
- Once the facilitation tree works have been undertaken the Protective Fencing **must** be erected as shown on **Tree Protection Plan BH03** at appendix BH5.

- Prior to commencement of demolition works on site the protective fencing and ground protection measures will be examined by either the Council Tree Officer or the appointed Arboricultural Expert (or Both) to verify that they are correctly positioned and fit for purpose.
- Once the above tasks have been satisfactorily completed the Demolition Company may have full access to undertake their works.
- **ALL** machine operators should undergo an induction session prior to being allowed to work on site, where the Method Statement is explained to them and a copy pinned up in the site office for their reference.
- Care must be taken when planning site operations to ensure that wide or tall loads, or plant with booms, jibs and counterweights can operate without coming into contact with retained trees.
- In addition a copy of the Tree Protection Plan will be provided and pinned up in the site hut and the trees which are to be retained and protected will be pointed out to the operator and they will also be shown which trees these are on site before they start work. In this way it is hoped that unnecessary damage, by root disturbance and collision of machinery booms and operating arms with tree crowns can be avoided.
- Debris and arisings generated by these works may be temporarily stored on hard surfaced areas but must be swiftly removed from site and safely disposed of.

10.3 Construction Phase –

Specific Actions:

- Prior to commencement of work on site a check is to be made by either the Council Tree Officer or the appointed Arboricultural Expert or Both to verify that all of the protective fencing barriers are where they should be by reference to the Tree Protection Plan and that they are in good order and fit for the purpose.
- Works may now proceed with caution exercised when working close to the protective fencing barriers.

Generic Actions:

- It is suggested that clear and concise points of contact and lines of communication are established prior to commencement of the works on site including:- Arboricultural Consultant; Local Authority Tree Officer; Local Authority Planning Officer; Site Manager and Foreman
- It is advised that the Site Manager establishes his own listing of contact details at the Pre-Start site meeting and pins this up in site office for all to refer to.

- Care must be taken when planning site operations to ensure that wide or tall loads, or plant with booms, jibs and counterweights can operate without coming into contact with retained trees.
- **ALL** machine operators should undergo an induction session prior to being allowed to work on site, where the Method Statement is explained to them and a copy pinned up in the site office for their reference.
- In addition a copy of the Tree Protection Plan will be provided and pinned up in the site hut and the trees which are to be retained and protected will be pointed out to the operator and they will also be shown which trees these are on site before they start work. In this way it is hoped that unnecessary damage, by root disturbance and collision of machinery booms and operating arms with tree crowns can be avoided.
- The exact route of underground service connections is not confirmed but it is intended that they would link in with the existing service runs. This matter is probably best dealt with to satisfy a Condition of Planning Approval and it can be worded to allow for the need for a further Method Statement and Protection Plan **if required** prior to undertaking any excavations for the implementation of service runs.
- In the interim details of NJUG 10 Guidelines are included (at **appendix BH6**) as a basic Method Statement and as the basis for further detailed discussion in the unlikely event that it should prove necessary to run service routes through RPA's.
- *It will be necessary to submit a further Method Statement to cover the provision of the detailed specification for the car park surfacing in the vicinity of tree G1c and how this will be laid - this is best dealt with by a Condition of Planning Approval.*

11.0 SOFT LANDSCAPING WORKS

- Any soft landscape works within the protected areas shall be in accord with Table 3 and Sections 13 & 14 of BS5837:2005 (see copy extracts at appendix BH6).
- It is strongly recommended that the plans and specifications for the landscaping of this development are drawn up by a qualified Landscape Architect.
- On completion of all building works and immediately prior to landscaping works being undertaken and with the agreement of the LPA Tree Officer the Protective Fencing may be removed and the area within opened up for soft landscaping and final surface treatments.
- At this juncture appropriate decompaction, aeration and mulching should be undertaken on any areas designated for planting, which for practical operational reasons could not be fully protected during the build process.

- This is to be hand excavation works only with no machinery being used unless specific ground protection has been laid. Even then only lightweight mini excavators are to be permitted access.
- It is acknowledged that by the nature of the works some surface excavation is needed to prepare for tree and shrub planting or laying of lawns. This work shall be undertaken with hand forks and any exposed roots are to be cleanly severed to encourage new growth and an adequate soil medium laid around them to encourage same.

12.0 MONITORING & SITE SUPERVISION

- It is recommended in BS5837:2005 that either an arboriculturist or a person suitably experienced in the subject is retained to advise on all tree related aspects of site monitoring and supervision and it is the local authority's responsibility to make this a condition of planning approval with the said Condition ideally requiring a set schedule of operations and timings prior to undertaking works on site.
- It is important in this case to have this *Condition applied* to fully protect trees G1a and G1c in particular.
- It is suggested that a pre-start meeting is organised for both the Demolition and Construction phase of work and that further visits are scheduled as necessary to cover specific items such as the hand digging of the area at the edges of the RPZ for tree Grp1c.

13.0 CONCLUSIONS

- Provided that the methodology prescribed in this AMS & TPP report is strictly adhered to I would expect the retained trees to survive the development and to continue to grow on safely and healthily in the future.
- There are two low C graded Oaks that will need to be removed to accommodate the layout proposed but the planting of four replacement trees will more than mitigate this initial loss and end up in an enhancement of the landscape associated with this site.
- This is therefore in my opinion a fully supportable scheme in arboricultural terms.

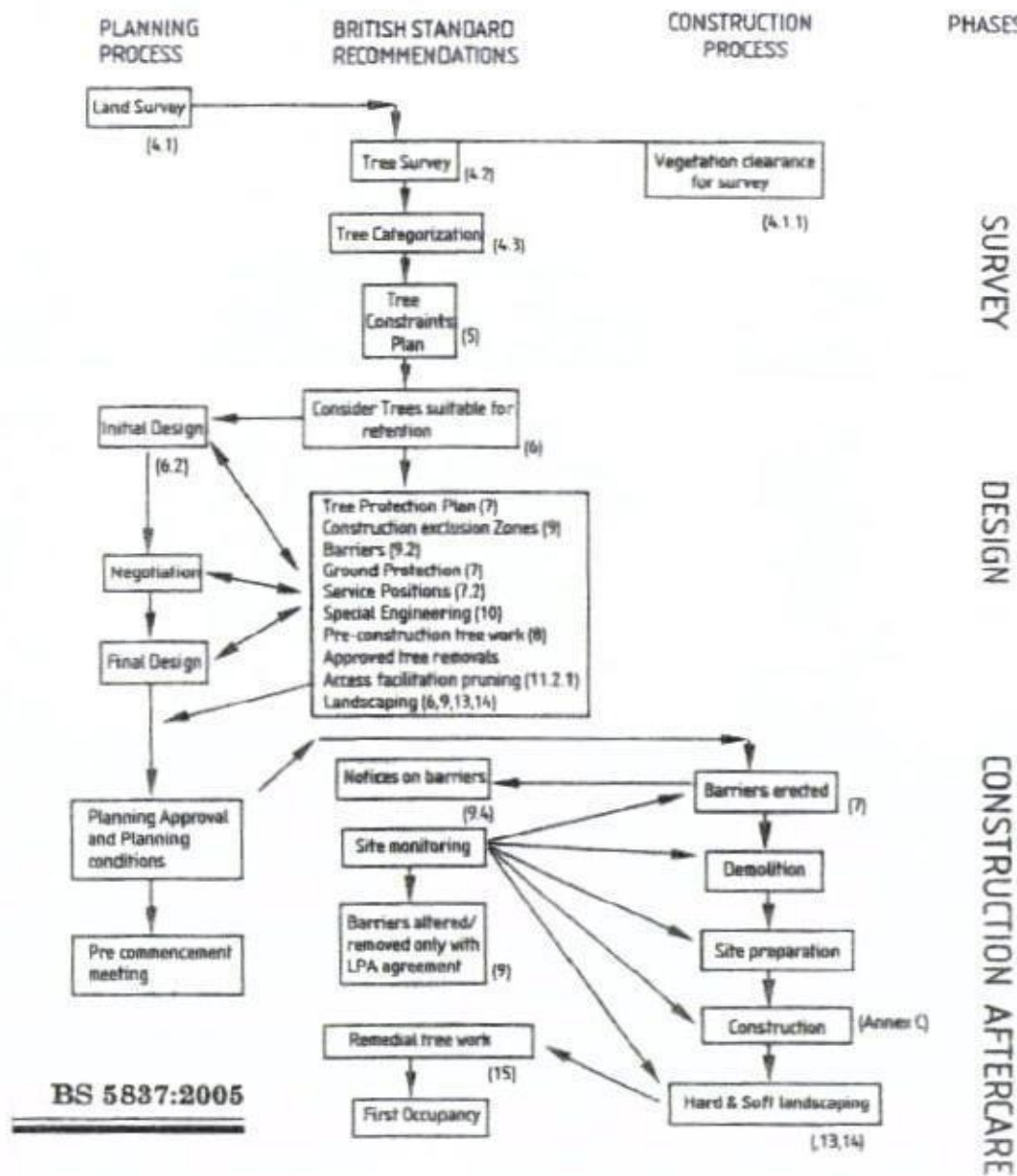


BH 1

Tree Survey Schedule

(in accordance with Table 1 of BS5837)

+ Tree Survey Notes + Flow Diagram



Figures in brackets refer to Clause numbers.

Figure 1 — Flow diagram, summarizing planning for trees on development sites



TREE SURVEY NOTES

These Tree Survey Notes have been prepared in accordance with the recommendations of **British Standard 5837:2005** and define the criteria for pre – development tree surveys.

- Each tree/group has been allocated a unique number (**No.**). Where specifically commissioned small durable numbered metal tags can be applied to each tree/group surveyed.
- The tree species (**Species**) is provided in both English and Latin formats.
- Height assessments (**Ht**) are estimated in metres. This will be adequate for the majority of cases, but where accurate heights become a critical issue it may be necessary to return to site, as a separately commissioned exercise, to collect accurate measurements with the aid of optical instruments.
- Trunk/stem diameters (**Trunk Diam**) are measured in millimetres at 1.5m above ground level and denoted as **S** single stemmed trees or **M** for multi-stemmed trees which are measured immediately above the root flare.
- Radial crown spread assessments (**Brch Sprd**) are estimated in metres from the centre of the trunk/group to each of the four primary points of the compass (**N**-north; **E**-east; **S**-south and **W**-west) in order to achieve a representation of the crown shape which will be recorded on the accompanying tree survey plan. These provide a general guide as to the main bulk outline of a tree/groups crown but are not tape measured dimensions. These would only be undertaken as part of a separately commissioned exercise, where precise dimensions are critical to the project at hand.
- The average ground clearance (**Grd Cl**) is estimated and shown in metres.
- An assessment of a tree/groups age (**Age**) class is made in terms of its site specific maturity as part of the surrounding landscape, taking into account its overall shape and form in that setting, and is recorded thus :-
 - Y** - Young tree/group
 - MA** - Middle – aged tree/group
 - M** - Mature tree/group
 - OM** - Over – mature tree/group
 - V** - Veteran tree/group
- An assessment of a tree/groups overall physiological condition (**Fm**) is recorded as :-
 - G** - Good
 - F** - Fair
 - P** - Poor
 - D** - Dead
- Data on the structural condition (**Condition Comments**) of the tree/group is provided to give an indication of its visual appearance and any significant health and safety issues.
- Details of necessary tree works required at the time of survey is given under the heading – **Preliminary Management Recommendations**
- An estimate of a tree/groups future life expectancy (**Rem Cont**) is made and is recorded thus :-
 - 1-10; 10-20; 20-30; 30-40 or >40 years.**
- The category grading (**Cat**) for each tree/group is assessed according to the criteria provided within **BS5837:2005**. The assessment is made of the tree/group in its current condition and within the environment encountered bearing in mind its suitability for retention as part of any future proposed development; although the exact layout detail of any specific scheme will not be known at the time of surveying. The trees have been classified into one of four categories and colour coded as BS5837 recommends - **R** (dark red); **A** (light green); **B** (mid-blue) and **C** (grey). Please note that the numerical sub-categories which are also applied are for guidance only and do not carry any cumulative or increased value for the tree/group. This colour coding scheme will be applied to all drawings provided.

Table 1 – Cascade chart for tree quality assessment

TREES FOR REMOVAL				
Category and definition	Criteria			Colour on plan
Category R Those in such a condition that any existing value would be lost within 10 years and which should, in current context, be removed for reasons of sound arboricultural management.	- 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 R category 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 (e.g. Dutch Elm Disease), or very low quality trees suppressing adjacent trees of better quality			Dark Red
TREES TO BE CONSIDERED FOR RETENTION				
	Criteria – Subcategories			
	1	2	3	
Category A – Those of high quality and value: in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested)	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 which provide a definite screening or softening effect to the locality in relation to views into or out of the site, or those of particularly visual importance (e.g. avenues or other arboricultural features assessed as groups)	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	Light Green
Category B – Those of moderate quality and value: in such a condition as to make a significant contribution (a minimum of 20 years is suggested)	Trees that might be included in the high category, but are downgraded because of impaired condition(e.g. presence of remediable defects including unsympathetic past management and minor storm damage)	Trees present in numbers, usually as groups or woodlands, such that they form distinct landscape features, thereby attracting a higher collective rating 3than they might as individuals but which are not, individually, essential components of formal or semi-formal arboricultural features (e.g. trees of moderate quality within an avenue that includes better, A category specimens), or trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality	Trees with clearly identifiable conservation or other cultural benefits	Mid Blue
Category C – Those of low quality and value: currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150mm	Trees not qualifying in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value, and/or trees offering low or only temporary screening benefit	Trees with very limited conservation or other cultural benefits	Grey
Note: Whilst C category trees will usually not be retained where they would impose a significant constraint on development, young trees with a stem diameter of less than 150mm should be considered for relocation				



BJH.0388

TREE SURVEY SCHEDULE

Client : 158 HART PLAIN AVENUE Ltd.

Site Location : Brewmaster PH, 158 Hart Plain Avenue, Waterlooille

Surveyors : Bernie Harverson M.Arb. Original Survey : 17th November 2009
Re-Surveyed : 14th March 2011

No	Species	Ht m	S or M	Trunk Diam mm	Brch Sprd m	Grd Cl m	Age	F	Condition Comments	Preliminary Management Recommendations	Rem Cont yrs	Cat
Grp 1	English Oaks x3 of	16	S / M	520 to 760	N7 E7 S7 W7	2	M	F	Epicormics-crown shape dictated by group pressure-merged crowns-some deadwood and stubs-previously crown lifted to 4m-previously pruned to clear roof of pub	No work considered essential at time of survey	>40	B2
G1a	Pedunculate Oak <i>Quercus robur</i>	14	S	520	N1 E9 S9 W7	2	M	F	Suppressed to the north-crown shape dictated by group pressure-merged crowns-previously crown lifted to 6m-old pruning wounds failed to occlude	No work considered essential at time of survey	>40	B1
G1b	Pedunculate Oak <i>Quercus robur</i>	16	S	500	N7 E5 S2 W5	1	M	F	Epicormics-suppressed to the south-crown shape dictated by group pressure-merged crowns	No work considered essential at time of survey	>40	B1
G1c	Sessile Oak <i>Quercus petraea</i>	15	M	760	N8 E9 S1 W1.5	2	M	P	Very large fungal bracket of <i>Ganoderma applanatum</i> - Heart Rot Fungus attached on west side-bifurcated at 1m above ground level-suppressed to the south and west-crown shape dictated by group pressure-merged crowns	Advise decay detection exercise to determine the extent of the internal decay	10-20	C1
Grp 2	Pedunculate Oaks x 2 of	14	S	400 to 550	N7 E7 S7 W7	2	MA	F	Base and trunk smothered in ivy -crown shape dictated by group pressure-merged crowns-major deadwood and stubs-low branching habit	No work considered essential at time of survey	>40	C2

G2a	Pedunculate Oak <i>Quercus robur</i>	13	S	400	N8 E3 S0 W7	2	MA	P	Significant bark wounds on south side close to ground level-100m of soft decay-suppressed to the east and south-crown shape dictated by group pressure-merged crowns-major deadwood and stubs-tarmac damaged by root action	No work considered essential at time of survey	>40	C1
G2b	Pedunculate Oak <i>Quercus robur</i>	14	S	550	N2 E9 S8 W7	2	MA	P	Base and trunk smothered in ivy-suppressed to the north-crown shape dictated by group pressure-merged crowns-major deadwood and stubs-tarmac damaged by root action	No work considered essential at time of survey	>40	C1
Grp 3	Pedunculate Oaks <i>x3 of</i>	19	S / M	340 to 1000	N10 E7 S7 W8	2	M	P	Crown shape dictated by group pressure-merged crowns-deadwood throughout	No work considered essential at time of survey	>40	C2
G3a	Pedunculate Oak <i>Quercus robur</i>	19	S	530	N10 E6 S0 W0	2	M	P	Close grown with T3b and trunks entwined at ground level-bifurcated at 5m above ground level	No work considered essential at time of survey	30-40	C1
G3b	Pedunculate Oak <i>Quercus robur</i>	18	S	420	N5 E2 S4 W6	2	M	P	Close grown with T3a and trunks entwined at ground level-low crown density-minimal live crown area	No work considered essential at time of survey	30-40	C1
G3c	Pedunculate Oak <i>Quercus robur</i>	18	S	350	N0 E4 S6 W6	2	M	P	Low crown density-minimal crown area-small diameter deadwood throughout	No work considered essential at time of survey	>40	C1



BH 2

Tree Root Protection Area Schedule
(in accordance with Table 2 of BS5837)



BJH.0388

ROOT PROTECTION ZONE/AREA SCHEDULE

Client : 158 HART PLAIN AVENUE HD

Site Location : Brewmaster PH, 158 Hart Plain Avenue, Waterloooville

Tree No.	Tree Species	Grade	Single or Multi Stem	Diam. mm	BS5837:2005 Table2- Radial Protect. Zone m	BS5837:2005 Table2- Root Protect. Area m ²	Is An Offset Required To Cater For Existing Rooting Pattern Restrictions
Grp 1	Pedunculate Oaks x3 of	n/a	n/a	n/a	n/a	n/a	See individual assessments below
G1a	Pedunculate Oak <i>Quercus robur</i>	B1	S	520	6.3	122.4	NO – there are pressures all around this tree which cancel each other out
G1b	Pedunculate Oak <i>Quercus robur</i>	B1	S	500	6.0	113.1	NO – there are pressures all around this tree which cancel each other out
G1c	SessileOak <i>Quercus petraea</i>	C1	M	760	7.6	181.5	NO – there are pressures all around this tree which cancel each other out
Grp 2	Pedunculate Oaks x 2 of	n/a	n/a	n/a	n/a	n/a	See individual assessments below
G2a	Pedunculate Oak <i>Quercus robur</i>	C1	S	400	4.8	72.4	NO – there are pressures all around this tree which cancel each other out
G2b	Pedunculate Oak <i>Quercus robur</i>	C1	S	550	6.6	136.9	NO – there are pressures all around this tree which cancel each other out
Grp 3	Pedunculate Oaks x3 of	n/a	n/a	n/a	n/a	n/a	See individual assessments below
G3a	Pedunculate Oak <i>Quercus robur</i>	C1	S	530	6.4	127.1	NO – fairly free rooting to all directions

G3b	Pedunculate Oak <i>Quercus robur</i>	C1	S	350	4.2	56.0	NO – fairly free rooting to all directions
G3c	Pedunculate Oak <i>Quercus robur</i>	C1	S	420	5.0	80.0	NO – fairly free rooting to all directions



BH 3

Tree Constraints Plan -BH01/02

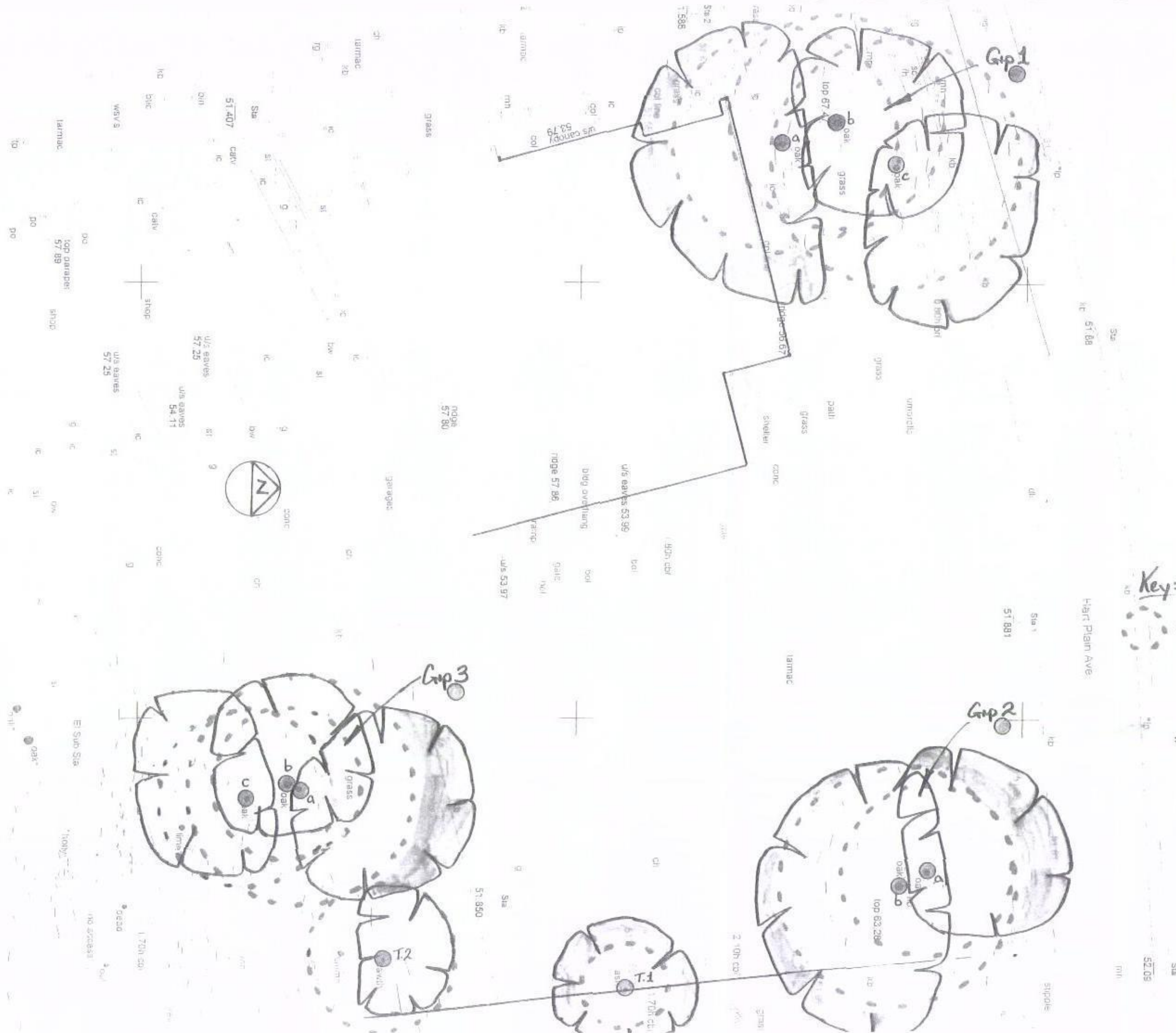


project:	The Brewmaster PH Hart Plain Avenue Waterloooville
client:	158 HART PLAIN AVENUE LIMITED
drawing title:	Tree Survey/Constraints Plan
drawing no.:	BH.01/02
scale:	1:200
date:	December 2009
job no.:	0388
drawn by:	bjh
Bernie Harverson M.Arb Tree Survey/Constraints Plan 158 Hart Plain Avenue Waterloooville, WI 53186	

Key:

 = Root Protection Area in accordance with B55837 recommendations

 = Crown spread exceeds RPA and therefore allow for either increased RPA or facilitation pruning where appropriate





BH 4

Pre-Development Facilitation
Tree Works Schedule



BH 5

Tree Protection Plan BH03

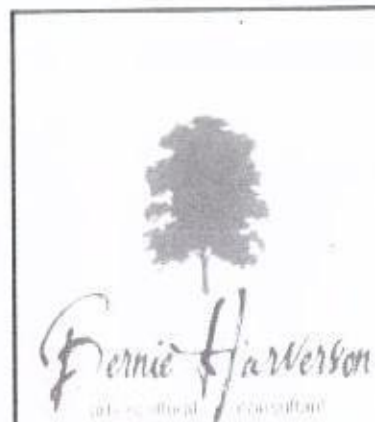
Key:

= Trees to be retained

= Trees to be removed

x = New tree planting positions

= Extent of recommended pruning works



project:	Brewmaster PH Hart Plain Avenue Cowplain				
client:	158 HART PLAIN AVENUE LIMITED				
drawing title:	Tree Protection Plan				
dwg ref:	scale:	job no:	date:	drawn by:	
BH03a	1:200	0388	March 2011	bjh	

Brewmaster PH Ltd

158 Hart Plain Avenue, Cowplain, Cumbria LA1 4JG

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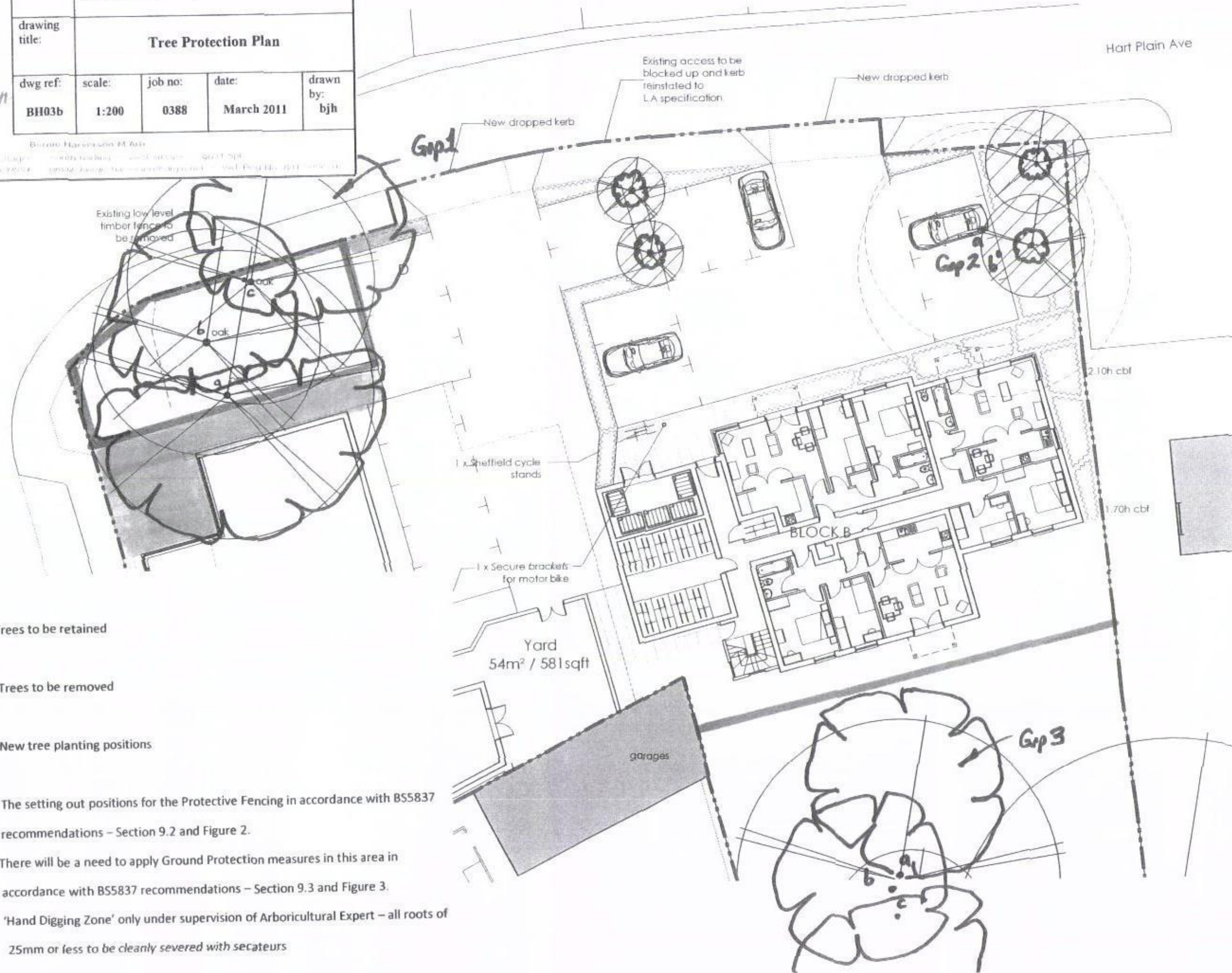


project:	Brewmaster PH Hart Plain Avenue Cowplain			
client:	158 HART PLAIN AVENUE LIMITED			
drawing title:	Tree Protection Plan			
dwg ref:	scale:	job no:	date:	drawn by:
BH03b	1:200	0388	March 2011	bjh

Brewmaster PH Ltd

158 Hart Plain Avenue, Cowplain, Warrington, Cheshire, WA11 1JH

01925 831111 Fax 01925 831112 Email: info@brewmasterph.co.uk Web: www.brewmasterph.co.uk



Key:



= Trees to be retained



= Trees to be removed



= New tree planting positions



= The setting out positions for the Protective Fencing in accordance with BS5837 recommendations – Section 9.2 and Figure 2.

= There will be a need to apply Ground Protection measures in this area in accordance with BS5837 recommendations – Section 9.3 and Figure 3.

= 'Hand Digging Zone' only under supervision of Arboricultural Expert – all roots of 25mm or less to be cleanly severed with secateurs

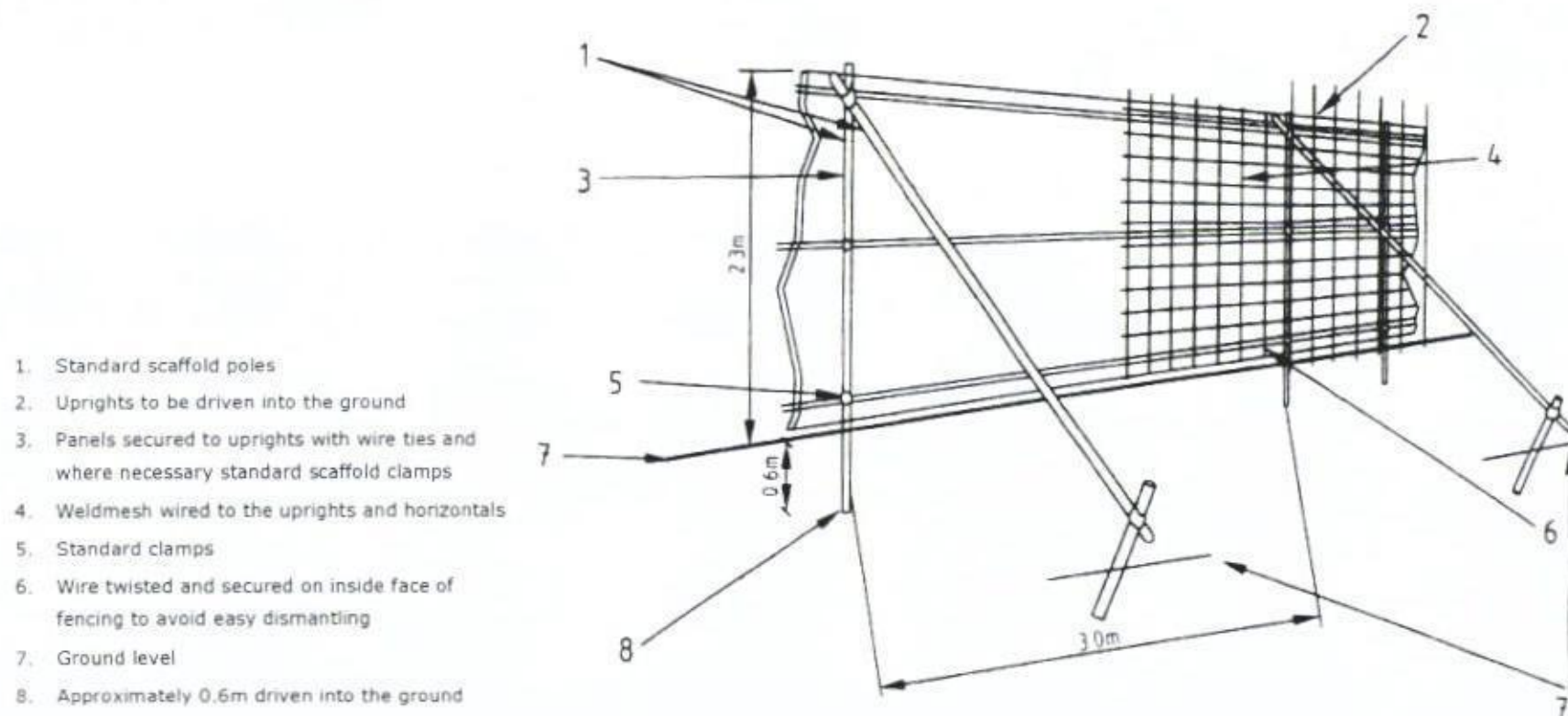


Figure 2 - Protective Barrier

Extract taken from BS5837:2005

9.2 Barriers

9.2.1 Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). On all sites, special attention should be paid to ensuring that barriers remain rigid and complete.

9.2.2 In most cases, barriers should consist of a scaffold framework in accordance with Figure 2, comprising a vertical and horizontal framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. Onto this, Weldmesh panels should be securely fixed with wire or scaffold clamps. Weldmesh panels on rubber or concrete feet are not resistant to impact and should not be used.

NOTE The above is preferred because it is readily available, resistant to impact, can be re-used and enables inspection of the protected area.

9.2.3 It may be appropriate on some sites to use temporary site office buildings as components of the tree protection barriers.

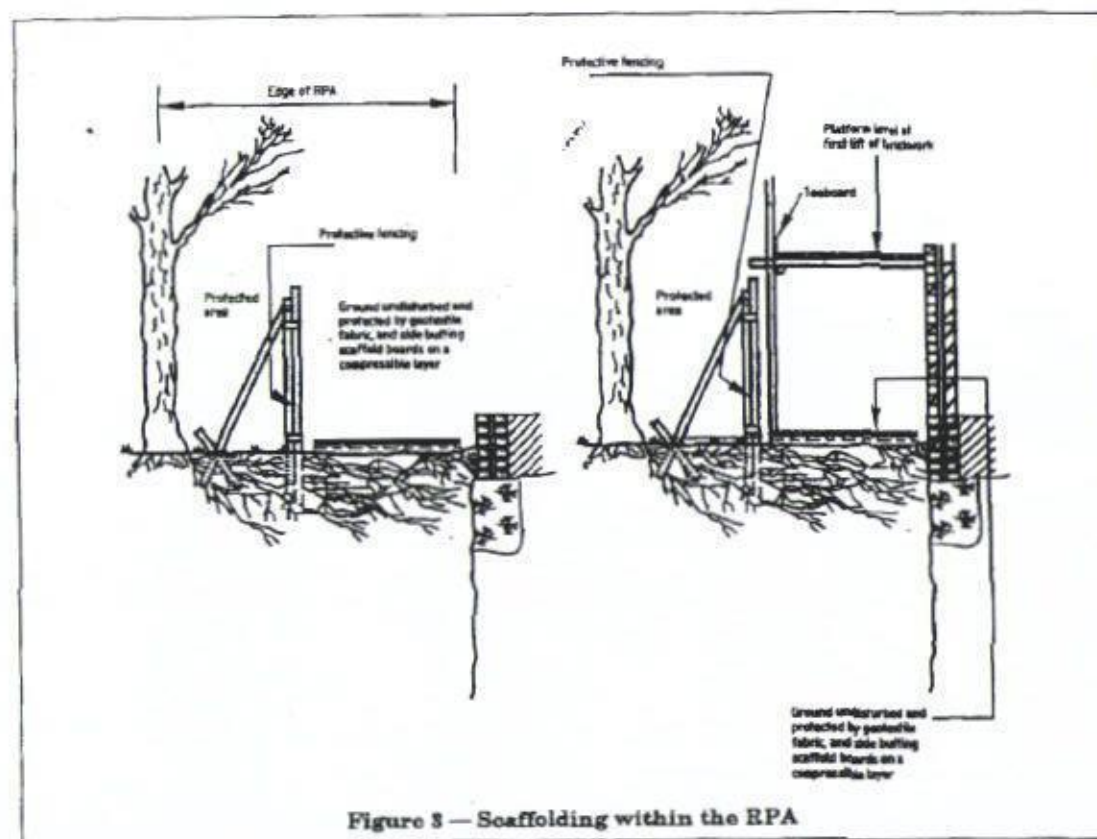


Figure 3 — Scaffolding within the RPA

Extract taken from BS5837:2005

9.3 Ground Protection

9.3.1 Where it has been agreed during the design stage, and shown on the tree protection plan, that vehicular or pedestrian access for the construction operation may take place within the root protection area (RPA), the possible effects of construction activity should be addressed by a combination of barriers and ground protection. The position of the barrier may be shown within the RPA at the edge of the agreed working zone, but the soil structure beyond the barrier to the edge of the RPA should be protected with ground protection.

9.3.2 For pedestrian movements within the RPA the installation of ground protection in the form of a single thickness of scaffold boards on top of a compressible layer laid onto a geotextile, or supported by scaffold, may be acceptable (see Figure 3).

9.3.3 For wheeled or tracked construction traffic movements within the RPA the ground protection should be designed by an engineer to accommodate the likely loading and may involve the use of proprietary systems or reinforced concrete slabs (see 11.8 and 11.9).

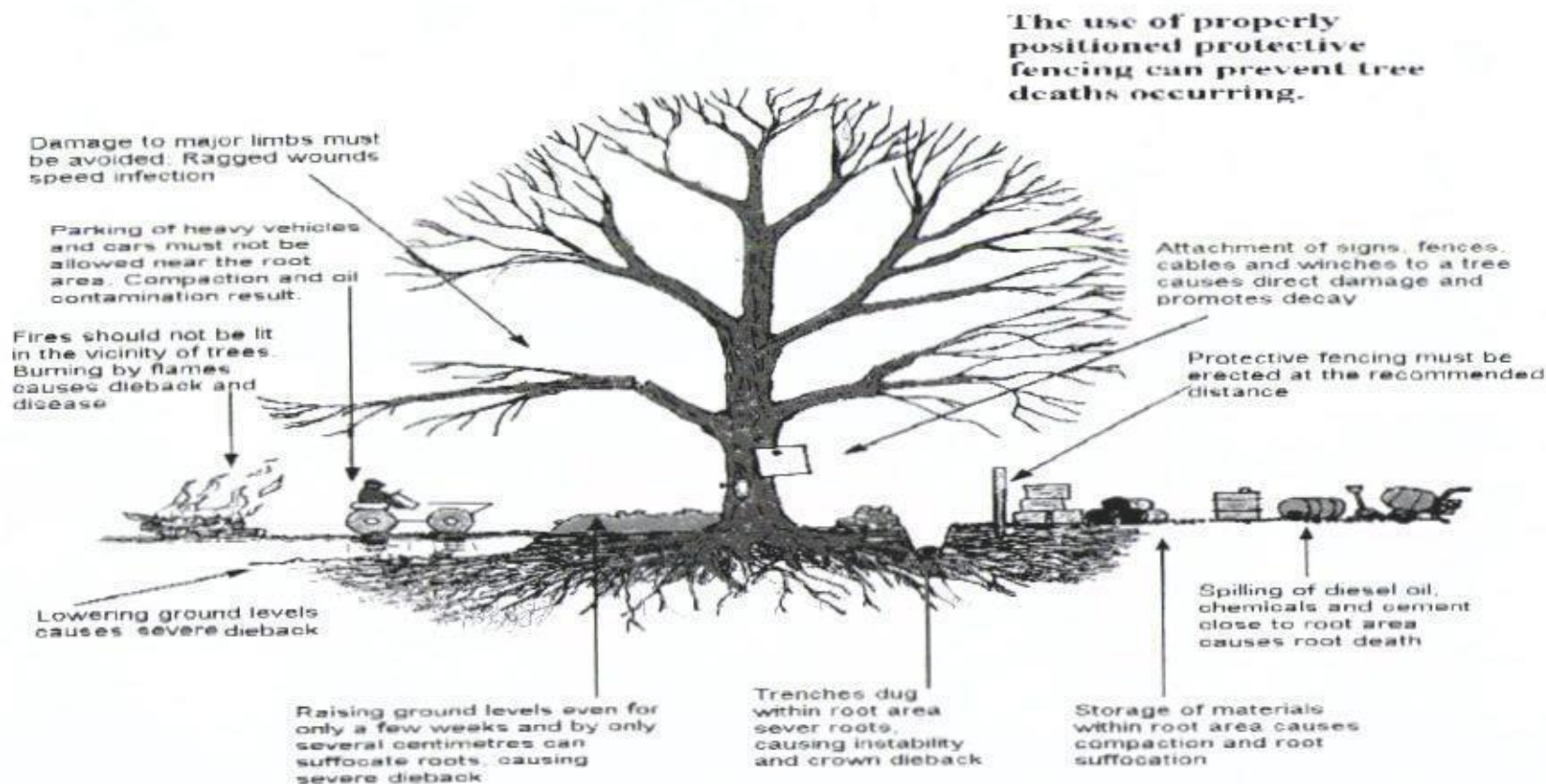
TREE PROTECTION AREA

KEEP OUT

- NO EXCAVATION OR TRENCHING WORKS PERMITTED
- NO STORAGE OF PLANT OR MATERIALS PERMITTED
- NO VEHICLE ACCESS PERMITTED
- NO FIRE LIGHTING PERMITTED
- NO CHEMICAL HANDLING
- VEHICLES WORKING CLOSE TO PROTECTIVE FENCING MUST AVOID CONTACT WITH OVERHANG FROM TREE CANOPY

Common causes of Tree Death

BJH.0388



Please use copies of this as an on-site poster for personnel





BH 6

BS 5837:2005 Extracts

Table 3 - Sections 13, 14 and 15
& NJUG 10 Extracts

Table 3 – Minimum distance (m) between young trees or new planting and structures to avoid direct damage to a structure from future growth.

Type of Structure	Diameter of stem at 1.5m above ground level at maturity		
	<30cm	(30-60) cm	>60cm
Buildings and heavily loaded structures	-	0.5	1.2
Lightly loaded structures such as garages and porches	-	0.7	1.5
Drains and underground services:			
<1m deep	0.5	1.5	3.0
>1m deep	-	1.0	2.0
Masonry boundary walls ^a	-	0.5	1.0
	-	(1.0)	(2.0)
In situ concrete paths and drives ^a	-	0.5	1.5
	(0.5)	(1.0)	(2.5)
Paths and drives with flexible surfaces or paving slabs ^a	-	0.5	1.0
	(0.7)	(1.5)	(3.0)
^a These distances assume that some movement and minor damage might occur. Guidance on distances which will generally avoid all damage is given in brackets.			

13 Design considerations for new planting

13.1 General

13.1.1 The purpose of proposed new planting should be understood from the start of the design process so that appropriate choices of structure, location and species can be made. Advice on detailed design should be sought from a landscape architect or other competent person experienced in landscape design.

13.1.2 Trees may perform a variety of roles, both aesthetic and functional:

- shelter planting to benefit buildings, people, crops or stock;
- screen planting to hide the unsightly or create privacy;
- planting to define or divide spaces, or to define or direct routes or views;
- specimens or groups can be used for architectural effect to complement buildings;
- for their inherent aesthetic qualities;
- providing character or sense of place;
- softer, natural elements to counter the artificial lines of the built environment;
- for their contribution to nature conservation, biodiversity and biomass;
- reducing air pollution; providing shade and controlling erosion.

13.1.3 All new tree planting proposals should take into consideration the future use, layout and design of a development site, constraints of soil and climate, the local landscape character and the contextual surroundings. As trees generally form the dominant elements of the long-term landscape structure of a site, careful consideration should be given to their ultimate height and spread, form, habit and colour, density of foliage and maintenance implications.

13.2 Planting adjacent to buildings

13.2.1 On all soils, it is inadvisable to plant trees at distances closer to a structure than those shown in Table 3 unless special precautions have been taken. Paths, patios and driveways, where they are not constructed to appropriate standards (see **10.3** and **[14]**) can be vulnerable to damage by trees with surface rooting characteristics. In addition, on shrinkable soils account should be taken of the foundation construction of existing and proposed nearby structures; planting should not compromise the structural performance of the foundation.

13.2.2 The effect of shade created by new trees and the likely extent and density of the tree crown when fully grown should be taken into consideration before new planting adjacent to buildings. Careful design and species selection should allow residents to enjoy reasonable light and the trees to develop into mature specimens. Special care should be exercised when considering planting large and/or fast growing evergreen trees as screens or hedging as these can be particularly oppressive, obstructing light all year round and requiring frequent maintenance to restrict their growth.

NOTE For information on planting adjacent to boundaries see Annex A and [6], [12] and [13].

13.3 Planting adjacent to roads

Roadside trees can make a significant contribution to the character of new developments. Their siting and species selection should be carefully co-ordinated at an early stage with other highway design considerations and, in the case of adopted roads, with the agreement of the relevant highway authority. Sight line requirements, lighting schemes, CCTV, underground and overhead service routes and avoidance of physical obstruction or damage should all be taken into account with due consideration for future growth and periodic maintenance requirements.

13.4 Planting in the vicinity of services

Trees should not be planted where they might obstruct overhead power lines or cables. In new developments, underground services should be ducted or otherwise protected at the time of construction to enable trees to be planted nearby without conflict (see utilities guidance documents [17]). Root barriers should be constructed, where considered necessary, under expert advice to reduce the risk of tree root intrusion into service runs.

14 Ground works and preparation for new planting

NOTE BS 4428 contains recommendations and guidance on general landscape operations with sections on preliminary investigation, drainage, grading and cultivation, tree planting and woodland planting.

14.1 Drainage

New development may have an effect on the existing drainage pattern and ground water levels of a site, due to increased areas of hard surface and consequential drainage requirements. Existing trees may suffer due to an alteration in the supply of groundwater, whilst younger specimens and new plantings may be more likely to adapt to the changed conditions. Expert advice on both drainage and trees should be taken where ground water conditions are liable to such change.

14.2 Soil conditions

Before any of the landscape operations listed in BS4428 are undertaken and where contamination is apparent, soils in areas to be planted should be analysed for structure and content by a specialist laboratory and expert advice taken on remediation measures for new planting if this is required. If contaminants (e.g. oil or diesel fuel, toxic materials, heavy metals, etc.) are present, soils should either be removed to the full depth for planting and new soil imported or expert advice obtained on remediation measures, which may include limiting the choice of species for planting. Where the structure of the soil is in an unsuitable condition to encourage growth, a number of remediation measures may be required including physical decompaction by mechanical plant or compressed air injection, the incorporation of bulky additive materials and new drainage systems. The advice of an arboriculturist should be sought for all works in the root protection area.

14.3 Surfaces around newly planted trees

NOTE BS4428 provides recommendations for the treatment of soft surfaces, but excludes hard surfaces.

14.3.1 Where surfaces are paved, the settlement of the soil in tree pits which occurs gradually after planting may cause movement of the paved areas. This may involve the partial collapse or instability of paving or disruption of flexible surfaces, where these are laid over prepared pits. The unpaved area around new plantings should, therefore, be of an adequate size to enable surrounding paving to be retained by a conventional edging and foundation (e.g. brick, concrete, stone or treated timber) set at a distance where it is unlikely to be affected by settlement. It may be appropriate for the outer edges of the backfilled area to be treated as a transition zone using interlocking surface reinforcement grids backfilled with a surface dressing of a permeable, granular material (e.g. gravels, shingles and other aggregates) which can be topped up if required. Due allowance should be made for future growth of stem and roots of a tree when considering the finished dimensions and the design of edge or kerb treatments of tree pits and planted areas.

Where load-bearing paving is to be laid over pits, it should either:

a) be laid when the soil has settled and the level made good; or:

b) be laid on a supported foundation that spans the tree pit; or:

NOTE Such foundation may be constructed from reinforced concrete, or comprise bearers made from steel or concrete.

c) incorporate a tree grille with appropriate support around the edges.

d) utilise structural soil.

14.3.2 Where there is any risk of a tree pit receiving surface water run off that may be contaminated, for example by rock salt, fuel spillage or other materials that may be toxic or harmful to plants, paving should be designed and laid to fall away from the pit.

15 Post development management

15.1 Existing trees

15.1.1 Trees growing on a site before development takes place may, if adversely affected, be in decline over a period of several years before they die. This varies greatly depending on the age, species and condition of the tree, the soil conditions, climate and the extent of damage incurred during development. A programme of inspections and necessary work for the treatment of symptoms as they develop should be drawn up in conjunction with an arboriculturist. This programme may include recommendations for frequency of inspection and/or beneficial tree work and should take the form of an arboricultural management plan.

15.1.2 Where the trees in question are protected by planning controls, the planning authority should be informed and any necessary agreements obtained prior to such work.

15.1.3 Prior to handover, following completion of development, the arboriculturist should look for signs of intolerance to change in conditions and the effect of the development and any accidental damage to identify the need for further tree works in addition to those originally specified at the beginning of the development process.

15.1.4 An arboriculturist, should consider appropriate cultural operations. These may include irrigation, or measures to enhance the soil structure and organic nitrogen levels in the soil.

15.1.5 Where the development design incorporates the need for active management intervention following the completion of construction works, a tree or landscape management plan should be prepared and a copy supplied to all parties who may have an interest in the future management of the site or parts of it.

15.2 New plantings

Maintenance of newly planted trees is of particular importance during the critical establishment period, of at least two years and may, where required by planning conditions, be five years or more following planting. A detailed maintenance schedule covering the establishment period should be prepared in conjunction with the landscape design proposals and appropriate arrangements made for its implementation.

-EXTRACTS TAKEN FROM-

NJUG 10

NATIONAL JOINT UTILITIES GROUP

GUIDELINES FOR THE PLANNING, INSTALLATION AND MAINTENANCE OF UTILITY SERVICES IN PROXIMITY TO TREES

GAS - ELECTRICITY - TELECOMMUNICATIONS - WATER

UNDERGROUND SERVICES

2. HOW ROOTS ARE DAMAGED

2.1 Contrary to popular belief, the root system of a tree is not a mirror image of the branches, nor is there usually a 'tap root'. The majority of the root system of any tree is in the surface 600mm of soil, extending radially in any direction for distances frequently in excess of the tree's height. Excavation or other works within this area are liable to damage roots.

The root system

2.2 The base of the trunk typically flares out in buttresses, with these extending into the main lateral structural roots. These rapidly subdivide into the mass of smaller roots which serve to anchor the tree into the soil, and to conduct water and nutrients. Even a short distance (3m) from a large mature tree, most roots will be less than 10mm in diameter, but these may extend to well beyond the branch spread of the tree. A mass of fine roots, less than 1mm diameter, develop off all parts of this root system. These fine roots absorb the water and nutrients which are essential for the growth of the tree.

2.3 The main structural roots (close to the trunk) develop as the tree grows in response to the need for the tree to have physical stability. Beyond these major roots, root growth is influenced by the availability in the soil of water, air and nutrients. The cultivation of soil provides ideal conditions for root growth. Services are often cooler than surrounding soil, encouraging moisture within the soil to condense on the surface, thereby encouraging roots to grow close to the service. For all these reasons, root growth is often most prolific within the backfilled trench and in the soil around the services. The variability of soil conditions and the presence of obstacles to root growth results in a very variable and unpredictable distribution of the roots within the general guidance in para 2.1.

Types of damage

2.4 Root systems can be damaged by:-

- The severance of a root, for example by trenching, which will destroy all parts of the root beyond that point. Even roots less than 10mm diameter may be serving the fine roots over a wide area. The larger the root severed, the greater the impact on the tree.
- Damage to the bark on the root. The bark protects the root from decay, and is also essential for further root growth. It is loosely attached and easily damaged. If damage to the bark extends around the whole circumference, the root beyond that point will be killed.
- Compaction of the soil. Compaction which is avoidable may occur from storage of material or passage of heavy equipment over the roots. This can restrict or even prevent gaseous diffusion through the soil, and thereby asphyxiate the roots. The roots must have oxygen for survival, growth and effective functioning.
- Alterations in soil level. Lowering the level will strip out the mass of roots near the surface. Raising levels will have the same effect as soil compaction.
- Incorrect application of herbicide.
- Spillage of oils or other harmful materials.

2.5 If roots are damaged:-

1. close to the trunk, the anchorage and stability of the tree can be adversely affected.
2. anywhere along their length, all of the fine roots which they serve will be destroyed.

Damage to the fine roots by severance of a main root, or by compaction or alteration in levels, will prevent these fine roots from absorbing the water and nutrients which are essential for the well-being and growth of the tree. The effects of damage from different causes, for instance by successive excavations for different services, or by excavation in one part and compaction in another part of the system, will be cumulative.

2.6 If the root system is damaged, new roots must develop to sustain the tree. These may develop from damaged root or by increased growth of other parts of the system. It may take years to replace all the lost roots. Vigorous young trees are the most likely to be capable of rapid root regeneration, but mature trees find it very difficult to recover from major root damage, if at all. While roots may regenerate, they will not necessarily provide their original anchorage.

2.7 Trees with damage may not show any immediate symptoms. If the root system is capable of rapid regeneration the tree may recover without any noticeable ill-effects, but usually the symptoms will take several years to develop. Such symptoms may range from only minor branch dieback to deterioration and ultimate death of the tree, dependant on the severity of damage and the ability of the roots to regenerate.

2.8 There is frequently a need for operational land (e.g. substations) to be kept clear of weed growth for safety and as a fire precaution. Herbicides provide an efficient method of killing both herbaceous and woody weeds. There are several types of herbicide with different modes of action and persistence. The most attractive chemicals are those that can be applied to the ground, usually as a granule, and which remain active in the soil for long periods. The wide-ranging root system of a tree may extend into the operational land from adjoining properties, and may absorb some types of herbicides which have been applied to the ground. Material absorbed in one part of the root system can kill the whole tree.

2.9 Other materials which can leach into the soil can also damage the root system. For instance, oil spilled into the soil is broken down by soil bacteria which deplete the soil of oxygen and so asphyxiate the roots. Other materials may have a direct toxic effect on roots.

4 HOW TO AVOID DAMAGE TO TREES

4.1 This section gives general guidance on methods of work to minimise damage to trees which should be adopted by utilities. The local authority (or for privately owned trees, the owner or his advisor), should be informed about planned work at an early stage prior to commencement.

4.2 Wherever trees are present, precautions should be taken to minimise damage to the root system. As the shape of the root system is unpredictable, there should be careful control and supervision of any excavation, particularly if this involves digging through the surface 600mm where the majority of roots develop.

4.3 The precautions advocated in this section are applicable to any excavations or other works occurring within a distance from the tree equal to 4 times the circumference of the trunk (circumference measured around the trunk at a height of 1.5m above ground level; distance measured from the centre of trunk to nearest part of any excavation or other work). This area around the trunk is referred to as "the precautionary area" hereafter.

4.4 Although, ideally, services should be diverted or re-aligned outside the precautionary area, it is recognised that this will not always be practicable. Where works are required for the laying or maintenance of any service within the precautionary area, there are various techniques to minimise the damage. The appropriate method of laying will depend on the circumstances, such as:

- scope of the works (one off repair, or part of an extensive operation)
- degree of urgency (for restoration of supplies)
- soil conditions
- amenity value of tree
- cost

Acceptable techniques in order of preference are:-

1. **Trenchless**
2. Broken trench – hand dug
3. Continuous trench – hand dug

Excavation of open trenches by machine is totally unacceptable within the precautionary area.

4.5 **Trenchless**

4.5.1 Wherever possible trenchless techniques should be used. The pit excavations for starting and receiving the machinery should be located outside the precautionary area.

4.5.2 IN order to avoid damage to roots by the **mole**, it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the mole with materials other than water (e.g. oil, bentonite) should be avoided, unless precautions are taken to ensure that there is no contamination of the soil within 600mm of the surface within the precautionary area.

4.6 **Broken Trench**

4.6.1 This technique combines hand dug trench sections with trenchless techniques. If excavation is unavoidable, it should be limited to practical access and installation around/below the roots. The trench is excavated by hand with precautions taken as for continuous trench below. Open sections of the trench should only be long enough to allow access for linking to the next section. The length of sections will be determined by local conditions, especially soil texture and cohesiveness, as well as the practical needs for access. In all cases the open sections should be kept as short as possible.

4.7 Continuous Trench

4.7.1 The object of the exercise is to use manual excavation so as to retain as many roots as possible, bearing in mind the need for working space, access to the service in question and room to install the new service. Hand digging needs to be undertaken with great care and for this reason is likely to require closer supervision than normal operations and an understanding by all operatives and staff as to exactly what is expected.

4.7.2 After careful removal of the hard surface material, digging should proceed with hand tools. All roots greater than 25mm diameter should be retained and worked around. Where clumps of smaller roots (including fibrous roots) are found these should also be retained. During the excavation great care should be taken to minimise damage to retained roots, including the bark around the roots. Roots with a diameter in excess of 25mm must not be severed without the advice of the owner of the tree or the local authority arboriculturist, who should respond within one working day. If severance is unavoidable, roots must be cut back using a sharp tool (as listed below), leaving the smallest wound.

Suggested tools required: fork, breaker bar, secateurs, handsaw (folding, silky or bow saw), post hole shoveller and hand fork and trowel.

4.8 Backfilling

4.8.1 Any reinstatement must comply with the requirements of street works in Great Britain must comply with the requirements of the code of practice approved under the New Roads and Street Works Act 1991 (Specification for the Reinstatement of Openings in Highways). Without prejudice to the requirements of this code as to the specification of materials to be used and the standards of workmanship to be observed, backfilling of any excavation should be carefully carried to avoid direct damage to the retained roots and excessive compaction of the soil around them.

4.8.2 The backfill should, where possible, include the placement of an inert granular material mixed with top soil or sharp sand (not builders sand) around the retained roots. This should allow the soil to be compacted for resurfacing without damage to the roots, and should secure a local aerated zone enabling the root to survive in the longer term.

4.8.3 Backfilling outside the highway limits should be carried out using the excavated soil. This should not be compacted but lightly "tamped" and usually left slightly proud of the surrounding surface to allow natural settlement. Other materials should not be incorporated into the backfill.

4.8.4 Fine roots are vulnerable to desiccation once they are exposed to the air. Larger roots have a bark layer which provides some protection against desiccation and temperature change. The greatest risk to these roots occurs when there are rapid fluctuations in air temperature around them, e.g. winter diurnal temperatures. It is important, therefore, to protect exposed roots where a trench is to be left open overnight when there is a risk of frost. In winter, before leaving the site at the end of the day, the exposed roots should be wrapped with dry sacking. This sacking must be removed before the trench is backfilled.

4.10 Special Considerations when planning service routes

4.10.1 The potential for future conflict with trees can be reduced at the stage of initial planning approval by the appropriate alignment of services and the provisions for future tree and shrub planting. Appropriate and separate space should be provided for each. Local authorities should liaise with developers.

4.10.2 If planning requirements and site constraints dictate that trees (existing or to be planted) and services share the same area, consideration should be given to increasing the depth of services, if possible to a minimum of 600mm, and to laying the service in ducts which will resist root penetration but allow replacements to be laid without extensive excavation. As this may incur additional costs, allowance must be made for these costs and the responsibility for meeting them at the planning stage.

4.10.3 When laying new services or replacements, to avoid risk of future direct damage, allowance should be made for future root growth.

4.10.4 Services laid in clay or peat should be constructed to tolerate movements associated with swelling or shrinking of the subsoil caused by root activity. Special precautions for differential movement should be incorporated where services join rigid structures founded at a different depth to the service.



BH 7

Qualifications & Experience



QUALIFICATIONS AND EXPERIENCE

- My name is Bernie Harverson and I am a self employed independent arboricultural consultant in private practice. I take instructions primarily in the South of England but also on occasions work nationwide and abroad and have offices at : –
3 Foxcombe Cottages, South Harting, West Sussex GU31 5PL and also at Cedar Court, 5 College Street, Petersfield GU31 4AE
- I hold the following arboricultural qualification - **Master of Arboriculture** (Royal Forestry Society – 1976)
- I have **forty** years of practical and managerial experience in the arboricultural industry including periods in both the public and private sectors.
- My Local Government sector experience comprises one year as a tree surgeon with Brighton Parks and nine years spent in Arboricultural Officer posts with both Westminster City Council and Portsmouth City Council
- My past practical experience in the private sector includes two years at Tilhill Forest Nursery and over ten years for various companies as a Climbing Arborist/Tree Surgeon.
- Managerial work in the private sector includes two years as manager of Beechings tree surgery company and twelve years with CBA Trees as an Arboricultural Consultant.
- As an independent self employed Arboricultural Consultant I now provide a comprehensive range of services including :-
tree surveys, appraisals, assessments and inspections with particular reference to planning and development and tree safety audits with a service offered as a climber to undertake full climbing inspections to better understand the condition of a given tree before prescribing a management strategy.
 - I also undertake litigation work appearing as an Expert Witness in Court Actions and at Planning Appeals, Hearings and Public Local Inquiries.

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