



Arboricultural impact appraisal and method statement

Southleigh Park House, Eastleigh Road, Havant, Hampshire PO9 2PE

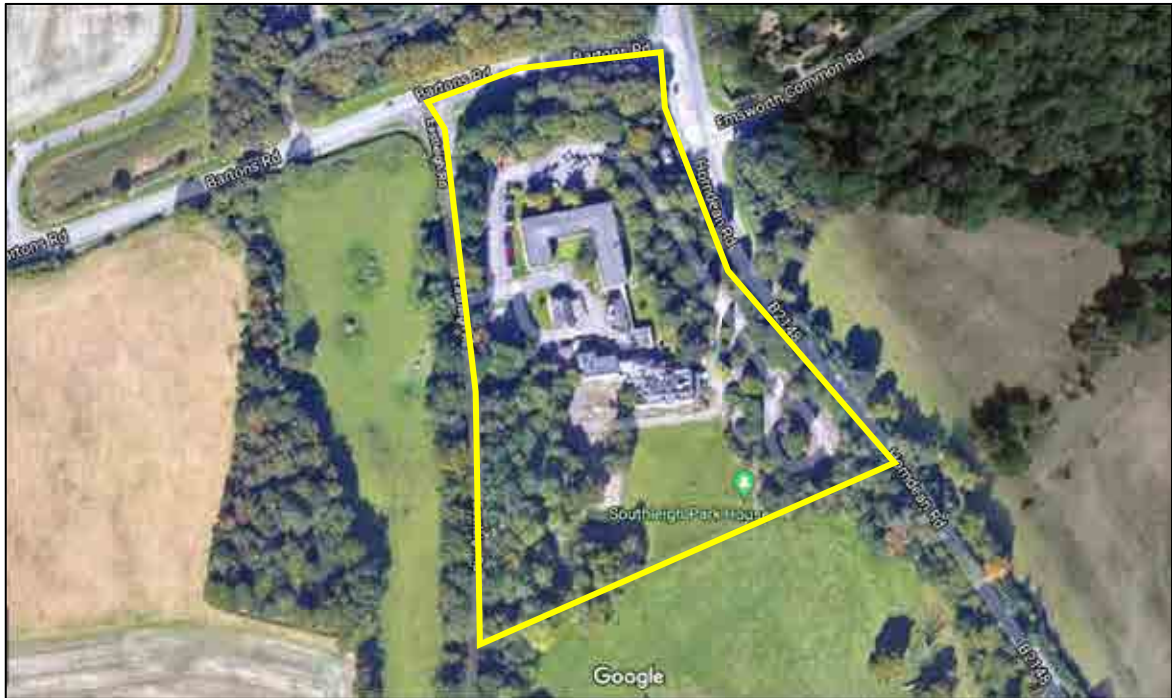
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29th February 2024
20122-AIA-290224-JB

1 Site location, relevant background information, and report purpose

1.1 Site location



This aerial image is supplied courtesy of Google. The yellow line shows the approximate site boundary and is illustrative only.

1.2 Relevant background information

We first visited the site in July 2020 to advise on the emerging tree issues relating to tree removals within the site and access issues outside the boundaries. We subsequently visited in May 2021 to collect more detailed information, and in July 2021, met with Mr Gargett and Ms Stewart from the Local Planning Authority (LPA) to discuss tree removals for safety reasons. These works were agreed and subsequently carried out. During 2022 and early 2023, we contributed to evolving the layout design, and met Mr Gargett and Ms Miszewska from the LPA to discuss the emerging layout relating to trees. The current tree location plan and layout has evolved in the context of these visits.

In tandem with these visits, we also contributed tree advice relating to the highways design of the entrances into the site from Eastleigh Road. As part of the subsequent Section 278 consent, it was agreed that trees T695 and T697 could be removed, with provision for the highway authority to be compensated with a payment based on a CAVAT valuation. For clarification, these trees are outside the site boundary and not included in the red line for this submission. However, for completeness they have been shown on the tree protection plan for removal, but have not been considered in this impact appraisal because their loss is already agreed and is not part of this proposal.

1.3 Report purpose

This arboricultural impact appraisal report provides sufficient information for the LPA to consider the effect of the proposed development on local character from a tree perspective. It is fully compliant with the BS 5837 advice relating to the planning application stage of the process and it meets national standard planning application validation requirements.



1 Site location, relevant background information, and report purpose

More specifically, the development proposal is an amended submission for reserved matters (reference APP/21/01451) pursuant to hybrid/outline planning permission (reference APP/17/0863) at Southleigh Park House, Eastleigh Road, Havant, Hampshire PO9 2PE.

This report includes:

- A **Tree protection plan** illustrating tree locations, categories, the location of the proposed development, the location of new tree planting, the location of structural soil cells, and the proposed tree protection measures.
- An **Arboricultural impact appraisal** (section 2 of the report) providing an analysis of the tree issues to assist the LPA in assessing the impact on local character.
- An **Arboricultural method statement** (section 3 of the report) describing how retained trees will be protected and managed during the development activity.
- **Appendices** (**Appendix 1** – Background administrative information and data collection; **Appendix 2** – Tree schedule and explanatory notes; and, **Appendix 3** – QR Codes for Site Guidance Notes (SGNs).
- A companion document to supplement the main report titled ***Manual for managing trees on development sites (Version 3.0)***, which provides explanations of how retained trees will be managed on site in the form of SGNs covering the relevant issues.

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2.1 Table 1: Summary of trees affected and protected by the proposal

From our review of the constraints and the proposed layout, our assessment of the impact on trees, both during and after development, and those that need protection using special precautions, is summarised in Table 1:

	British Standard 5837 Category		
	A (High quality)	B (Moderate quality)	C (Low quality)
Remove	None	T431, T437, T443, T483, T486, T632, T635, T642, T643	G433, G435, G438, G464, G476, G553, G557, G630, G640, T412, T413, T415, T416, T417, T418, T423, T439, T440, T441, T442, T463, T477, T480, T481, T482, T487, T492, T495, T496, T497, T498, T499, T541, T542, T543, T558, T559, T560, T616, T617, T618, T619, T620, T621, T622, T623, T625, T626, T633, T636, T637, T638, T641, T645, T647, T648, T649, T650, T651, T652, T653, T654, T655, T656, T657, T659, T661, T662, T666, T667, T668, T669, T670, T671, T672, T673
Prune	None	None	None
Protect using special precautions See Notes below	All trees where new surfacing and structures extend over or into RPAs		

T = Tree; G = Group

Note on types of protection: All retained trees will be protected during development by using fencing and ground protection, and only those requiring special precautions to limit the impact of encroachment are listed in Table 1.

Note on RPA adjustment: Special precautions are only necessary where encroachment into RPAs occurs beyond the fencing and ground protection. Some of RPAs can be adjusted within the guidance set out in BS 5837, which is explained in more detail in 2.2 below.

Note on trees T695 and T697: Although these trees have been shown on the tree protection plan for removal, they are outside the red line for this submission and their loss has been previously consented in Section 278 submission. They are not part of this submission and have not been considered in this impact appraisal.

2.2 RPA adjustment

Trees near the pond and some long-standing existing buildings

BS 5837 (4.6.2 & 4.6.3) makes provision for adjusting the nominal circular RPA, if justified by pre-existing site conditions or other factors, if the total RPA is equivalent to the nominal circular RPA. On this site, we have assessed that this can be reasonably applied to some trees because their roots are unlikely to have grown beneath the pond and some of the long-established buildings, and appropriate adjustments are illustrated on the tree protection plan.

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2.3 Insignificant encroachment into RPAs

All trees adjacent to new roads and buildings

There are instances of very minor encroachment estimated to be up to 5–10 % into the nominal radially defined RPAs for some of the trees adjacent to the new roads and buildings. However, BS 5837 (5.3.1) does allow for limited encroachment, if any new structures and surfacing are low impact, and if it can be demonstrated that any lost area can be compensated for elsewhere. In this situation, the encroachment is on the outer extent of the RPAs and relatively small compared to the area that will be left undisturbed, and provision has been made to compensate for this elsewhere near the trees. In our experience, healthy trees can tolerate such minor incursions into their RPAs without any significant adverse impacts on health, and our view is that this will be the case for these trees. In summary, if the guidance set out in the Manual accompanying this report is observed, our view is that the proposed works can be implemented near these trees without any significant adverse impact on them, and therefore local character.

2.4 Considerations relating to ash dieback disease (ADD)

All ash trees

We have noted advancing signs of ADD in all of the ash trees, and this is likely to progressively get worse, ultimately resulting in the trees having to be felled or severely pruned for safety reasons. We discussed this with the LPA officers during the consultation visits and, in the context of their inevitable loss in the near future, it was agreed that they should be assessed as Category C, i.e., low quality, and it would be inappropriate for them to dictate significant site adjustments because they are unlikely to survive beyond the short term. The protective measures that we describe has taken this into account and will allow the trees shown for retention to be retained without any additional adverse impacts beyond the decline that will result from ADD.

2.5 The impact of tree removals on local character

9 category B trees, 9 category C groups, and 67 category C trees (See Table 1 above)

All but 9 of these trees and groups are low quality. They are all well within the site and the retained boundary screening will prevent their loss being obvious from the outside views. None are prominent as skyline features from any public viewpoints outside the site, although some are visible in glimpses where the boundary cover is not complete. Although some of the losses may be visible within the immediate vicinity in the short term, the substantial new planting and retention of the boundary screening will ensure that these losses will not be noticeable in the wider setting and beyond the short term.

2.6 The impact of tree pruning on local character

Other than pruning for normal maintenance, no trees will be pruned because of this development and so there will be no impact on local character for that reason.

2.7 The impact of works in precautionary areas

Summary

All works within RPAs are shown as precautionary areas on the tree protection plan indicated with blue fill where the area sits within the protective fencing, and by the yellow fill where it sits outside

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the protective fencing. It is anticipated that the works within the fencing will be primarily related to removing existing surfacing and light structures, and carried out towards the end of the development, independently of the main construction activity. The yellow precautionary areas are either where existing surfacing will be left in place to act as ground protection during the development activity, or where new structures and surfacing will need to be installed in advance of any significant development activity, with the intention that the new installation acts as ground protection to prevent any degradation of RPAs during the construction phase. More specifically, our assessment of the impact of encroachment into RPAs that will be managed by special precautions is described below.

All trees adjacent to new roads and hard surfacing

There will be encroachment above the RPAs of many of the trees adjacent to these areas in the form of new no-dig surfacing. We have had extensive discussions and site meetings with the highway engineers and the installations in all these areas will use a three-dimensional cellular subbase with a permeable finished surface, all installed above the existing ground levels, without the need for any significant excavation into existing ground levels. Cross-sections of all the areas where new surfacing will be installed is included within the engineering drawings to confirm that these issues have been considered and the solutions designed to comply with the recommendations in BS 5837. We have carefully reviewed the levels in these areas, and it would be feasible to install custom designed no-dig specification surfacing without causing any significant disturbance to the RPAs. From our previous experience at installing such surfacing, we are confident that this can be implemented without any long-term detrimental impact on tree health, with the detail to be agreed as part of a planning condition. This surfacing solution is within the advice set out in BS 5837 (8.6) and would be appropriate in this situation.

In summary, if the guidance set out in SGN 7 *Excavating in RPAs* and SGN 9 *Installing/upgrading surfacing in RPAs* is observed, we believe that the proposed works can be implemented without any long-term detrimental impact on tree health, and therefore local character. All new surfacing must be installed before any construction access to prevent damage to the RPAs from the construction activity.

All trees adjacent to new buildings and light structures

There will be encroachment into the RPAs of some trees adjacent to new buildings and lighter structures such as walls. As described in 2.2 above, near the new buildings, the encroachment is only within a small proportion of the outer extent of RPAs, and we don't think it is likely to cause significant adverse impact due to the large proportions of RPAs that will remain undisturbed beyond the development area. Where new walls are proposed within RPAs, it is possible to install them on piles as illustrated in photographs SGN10-17, SGN10-18, and SGN10-19. From our previous experience at installing buildings on the outer extents of RPAs and walls within RPAs, we are confident that these proposals can be implemented without any long-term detrimental impact on tree health, with the detail to be agreed as part of a planning condition. These construction solutions are within the advice set out in BS 5837 (7.2 and 7.5) and would be appropriate in this situation.

In summary, if the more detailed guidance set out in SGN 3 *Ground protection*, SGN 7 *Excavating in RPAs*, and SGN 10 *Installing structures in RPAs* is followed, we believe that the proposed works can be implemented without any long-term detrimental impact on the health of these trees, and therefore local character.

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All trees adjacent to existing surfacing to be removed and reinstated as soft landscaping

Many trees have existing surfacing previously installed in their RPAs, shown by most of the blue precautionary areas on the tree protection plan. It is planned to carefully remove all this surfacing and reinstate it as soft landscaping to improve the ground conditions. From our previous experience, we are confident that this can be done without any long-term detrimental impact on tree health, with the detail to be agreed as part of a planning condition.

In summary, if the guidance set out in SGN 8 *Removing surfacing and structures in RPAs* and SGN 12 *Landscaping in RPAs* is observed, we believe that the proposed works can be implemented without any long-term detrimental impact on tree health, and therefore local character.

2.8 Post development considerations

If trees are retained or planted too close to occupied buildings and / or garden amenity space, it is sometimes claimed that they can cause excessive shade or anxiety, which interferes with the normal use of the property. In extreme cases, this can result in pressure from future owners to fell or severely prune, thus reducing the long-term contribution of the trees to local character. The counter position to this is that the benefits from trees close to occupied areas significantly outweigh any disadvantages caused by shade or anxiety, so there can be a range of perspectives. It is also relevant that important trees can be protected using tree preservation orders, which come with an overarching presumption to retain protected trees unless the normal use of the property is harmed to a significant extent. There is little published evidence to support either of the extremes, which means that each case must be intelligently assessed on its own merits and interpreted in the context of the experience of the assessor.

We have considered all the relevant issues in this situation and our assessment is that there will be no adverse impacts because of future pressure to fell or severely prune retained trees once the development is completed and occupied.

2.9 New tree planting to enhance local character

To supplement retained trees and enhance local character, the project landscape architect has specified a comprehensive new tree planting scheme. We have indicated the tree locations with a green-filled tree crown icon on the tree protection plan, and their broad anticipated size potential as large (1), medium (2), and small (3), by the number within that icon. However, our understanding is that the final selection of species, size, and location, is flexible and open to amendment, as appropriate, in response to a landscaping planning condition.

More specifically, in addition to new trees being planted in areas of open soil, there is also provision to introduce new trees in to areas of hard surfacing through the use of soil cells. These are indicated by the red cross hatch on the tree protection plan. Soil cells are an effective solution to counter the difficulties of establishing new trees in hard surfacing, where the soil is put into a framework of rigid containers that support the pavement above without loading the soil within their structure, thus allowing a more normal rooting environment beneath the supported pavement. There are several product options proven over the last few decades as being effective in assisting tree establishment in heavily urbanised landscapes, and close to existing services, e.g., Greenfix (<https://greenfix.co.uk/products/tree-root-barriers-and-engineered-trees-pits/treebunker%E2%84%A2.html>), DeepRoot (<https://www.deeprout.com/products/silva-cell/>), and Green Blue Urban (<https://greenblue.com/gb/products/rootSPACE/>).

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The use and installation of soil cells is considered and covered in Clause 10 and Annex F of BS 8545, and is a well-documented approach to tree planting in challenging locations. Their modular nature allows them to be installed around existing services, providing the opportunity to connect asymmetrical pockets of space and maximise the soil volume accessible to tree roots adjacent to the planting location. Planting into linear trenches or connected pockets of space rather than isolated pits also seems to assist in tree establishment and survival. However, one of the potential disadvantages is that the limited soil volume can restrict growth as trees reach maturity and run out of new soil to grow in. In some situations, this can be partially overcome by ensuring that there are exits or pathways from the confinement of the cells into the surrounding soil to provide an opportunity for roots to eventually grow beyond the cells into any areas that could support root growth.

Soil cells also have the added advantage of doubling up as surface water runoff buffering capacity because the soil can absorb and temporarily hold excessive rainwater. This has the significant benefit of reducing the rainwater burden on the drainage system, allowing the water time to soak into the surroundings through the permeable walls of the soil cell installation and support the trees through dry spells. However, the surrounding surfacing must be profiled to direct rainwater into the tree pits to optimise the benefits and reduce the length of time it takes the new trees to successfully establish and adapt to the local conditions.

In summary, all new trees will be specified and planted in accordance with the recommendations in BS 8545 (2014) *Trees: from nursery to independence in the landscape –Recommendations*. These new trees would have the potential to reach a significant size without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local character.

2.10 Unanticipated upgrading of existing services or installation of new services

Retained trees may be adversely affected by the installation of new services and / or the upgrading of existing services if that work encroaches into their RPAs. However, it is often difficult to know the detail of service locations until the construction is in progress, and sometimes encroachment into RPAs is unavoidable. Where possible, the default approach must be to use any existing service runs and keep all new services outside RPAs. Where existing services within RPAs require upgrading, or new services must be installed in RPAs, great care must be taken to minimise any disturbance. Trenchless installation will be the preferred option, but if that is not feasible, any excavation must be carried out by hand according to the guidelines in SGN 11 *Installing services in RPAs*.

2.11 Summary of impact on local character

The current layout has evolved over the last two years in the context of detailed discussions with LPA officers about trees, within the immediate setting of the listed buildings, and more broadly within the wider setting. This current proposal focuses on retaining all the existing high-quality boundary tree cover intact with nearly all of the tree losses within the central area of the site to minimise any adverse visual impact on local character. To mitigate the tree losses, which are primarily low-quality category C trees, a comprehensive landscape design includes significant new tree planting, both within the built form, and around the boundaries, to supplement and enhance the retained trees. The construction activity has the potential to adversely affect retained trees if proper protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural method statement included in this report, our assessment is that the development proposal will have no detrimental impact on the contribution of trees to local character.

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3.1 Site Guidance Notes (SGNs)

This section of the report identifies which trees on this site will be protected and managed, and by what means. This site-specific summary is supplemented by more detailed explanations and descriptions of specific operations set out in the accompanying *Manual for managing trees on development sites*. That document is a compilation of 12 individual SGNs addressing the following tree protection and management issues that regularly arise in the construction phase of development:

- SGN 1 *Monitoring tree protection* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-1-Monitoring-V3.pdf>)
- SGN 2 *Fencing protected trees* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-2-Fencing-V3.pdf>)
- SGN 3 *Ground protection* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-3-Ground-Protection-V3.pdf>)
- SGN 4 *Pollution control* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-4-Pollution-V3.pdf>)
- SGN 5 *Site cranes & piling rigs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-5-Cranes-Rigs-V3.pdf>)
- SGN 6 *Height restrictions* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-6-Height-V3.pdf>)
- SGN 7 *Excavating in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-7-Excavation-in-RPAs-V3.pdf>)
- SGN 8 *Removing surfacing and structures in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-8-Removing-Surfaces-V3.pdf>)
- SGN 9 *Installing/upgrading surfacing in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-9-Installing-Surfacing-V3.pdf>)
- SGN 10 *Installing structures in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-10-Structures-V3.pdf>)
- SGN 11 *Installing services in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-11-Services-V3.pdf>)
- SGN 12 *Landscaping in RPAs* (<https://www.barrelltreecare.co.uk/assets/Uploads/SGN-12-Landscaping-V3.pdf>)

NOTE: Each individual SGN can be downloaded by using the links above and the QR Code links in Appendix 3.

3.2 Identification of areas to be protected

The tree protection plan shows the areas where protective measures are necessary. The fencing location is shown by the heavy black dashed lines, with the construction exclusion zone behind as the lighter black diagonal hatch. Precautionary areas outside the fencing are shown by a yellow fill and precautionary areas inside the fencing is shown by a blue fill.

3.3 Arboricultural supervision

An arboricultural consultant will be appointed to advise on the tree management for the site and to attend:

- a pre-commencement meeting before any work starts;

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- regular supervision visits to oversee the agreed tree protection, as agreed at the pre-commencement meeting; and
- further supervision visits, as necessary, to oversee any unexpected works that could affect trees.

The detail of how the arboricultural supervision will be carried out is explained in SGN 1 *Monitoring tree protection* in the accompanying Manual.

3.4 Table 2: Summary of the site operations requiring arboricultural input

For this site, arboricultural input will be needed for the following operations:

Brief operation summary	Trees affected	Location of detailed explanations
Pre-commencement meeting: Meeting on site with all parties to agree protective measures, as described in SGN 1. <u>Will be carried out before any significant site works begin.</u>	All retained trees	SGN 1 <i>Monitoring tree protection</i>
Tree felling and pruning: Contractor will carry out agreed works as described in Appendix 2. <u>Will be completed before any significant site works begin.</u>	Fell trees in Table 1	Appendix 2
Installing fencing and ground protection: Agreed tree protection measures will be installed and checked, as described in SGN 2 and SGN 3. <u>Will be completed before any significant site works begin.</u>	All retained trees	Tree protection plan, SGN 2 <i>Fencing protected trees</i> , and SGN 3 <i>Ground protection</i>
Pollution control near retained trees: Any pollution control measures identified during risk assessment will be installed as described in SGN 4. <u>Will be completed before any potential pollutants arrive on site.</u>	All retained trees	SGN 4 <i>Pollution control</i>
Operation of site cranes and piling rigs: Provision will be made to prevent site cranes and piling rigs damaging trees, as described in SGN 5.	All retained trees	SGN 5 <i>Site cranes & piling rigs</i>
Installing height restrictions: Provision will be made to prevent damage to low branches by high vehicles, as described in SGN 6. <u>Will be installed before high vehicles arrive on site.</u>	All retained trees	SGN 6 <i>Height restrictions</i>
Regular arboricultural supervision: Provision will be made to carry out and record agreed arboricultural supervision, as described in SGN 1.	All retained trees	SGN 1 <i>Monitoring tree protection</i>
Excavating in RPAs: These operations will be carried out as described in SGN 7.	All retained trees	SGN 7 <i>Excavating in RPAs</i>
Installing/upgrading surfacing in RPAs: These operations will be carried out as described in the SGN 9.	All retained trees	SGN 9 <i>Installing/upgrading surfacing in RPAs</i>
Installing structures in RPAs: These operations will be carried out as described in SGN 10.	All retained trees	SGN 10 <i>Installing structures in RPAs</i>
Installing services in RPAs: These operations will be carried out as described in SGN 11.	All retained trees	SGN 11 <i>Installing services in RPAs</i>

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Brief operation summary	Trees affected	Location of detailed explanations
Landscaping in RPAs: These operations will be carried out as described in SGN 12.	All retained trees	SGN 12 <i>Landscaping in RPAs</i>
Removing tree protection: <u>Protection can only be removed when there is no risk of damage to retained trees, as described in SGN 1.</u>	All retained trees	SGN 1 <i>Monitoring tree protection</i>

The operations summarised in this table, and supplemented by the more detailed explanations set out in the SGNs and the rest of this document, form the arboricultural method statement for this site. The Site Manager will ensure that its details and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents will be available on site. All personnel who could have an impact on trees will be briefed on the specific tree protection requirements as part of the site induction procedures. This requirement will be written into the site management documentation.

If unanticipated issues arise on site requiring work approved by the LPA, but not referenced in the above explanations, for example the unexpected need to install services in RPAs, or landscaping in RPAs, further guidance on how to manage them can be found in the accompanying Manual.

3.5 Construction method statement (heads of terms summary)

A construction method statement is a description of how operations that may affect trees will be carried out to minimise any adverse impact on them. The details of how the site will be managed are construction and contractual matters that can only be finalised once the post-consent detailed planning begins. For that reason, at this stage in the planning process, as explained in clause 5.5.6 of BS 5837, it is normally sufficient to list a heads of terms summary of the issues requiring more detailed consideration once consent is issued. On this site, those issues are likely to include:

1. Preparation of a written site management protocol for dealing with tree issues, to be incorporated into formal site management procedures, and to specifically include induction training for all operatives related to tree protection.
2. The order of work on site, including demolition, site clearance, the installation of protective measures, the phasing of successive work locations, the removal of existing structures/surfacing, the installation of new structures/surfacing, the removal of tree protection, and any necessary reinstatement.
3. Erection and maintenance of tree protection measures.
4. Who will be responsible for protecting the trees on site.
5. Detailed proposals for inspecting and supervising the tree protection.
6. How accidents and emergencies involving trees will be managed, including accidental damage to roots and their treatment.
7. Details of facilitation pruning and access into site. What size vehicles will be used under canopies and will large machinery be lifted over trees.
8. The parking arrangements for workers and visitors.
9. A schedule of emergency contact numbers relating to trees.
10. Areas for loading and unloading of materials and storage of materials and plant.
11. Where site facilities will be located and when will they be installed.
12. How machinery and equipment (such as excavators, cranes and their loads, concrete pumps and piling rigs) will enter, move on, work on, and leave the site.
13. Pollution control to specifically consider chemical storage and wheel washing facilities in relation to trees.

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14. Recycling and storage of waste in relation to trees.
15. Details of earthworks, grading and mounding and removal of spoil, including any planned lowering or raising of ground levels.
16. Precise services locations, including the method of excavation when near trees.
17. Details of upgrading/removing/replacing existing surfacing and areas where this will happen, including detailed and precise cross-sections where no-dig surfacing is to be installed.
18. How post-construction impacts through compaction to soil near trees will be ameliorated.

Appendix 1: Background administrative information and data collection

A1.1 Table 3: Background administrative information

	Background administrative information
Report date & reference	29 th February 2024; 20122-AIA-290224-JB
Tree protection plan reference	20122-11
Instructing client	Bargate Homes
Instructions	Visit the site, assess the relevant trees, prepare a schedule of their details, describe the impact of the proposal on those trees and identify the tree protection issues in an arboricultural method statement with a tree protection plan.
Provided documents	- Topographical survey, drawing reference 6288, received by email on 8th July 2020. - Layout drawing reference BARG230130_SL.01_Rev H, received by email on 8th February 2024.
Report author and credentials	Jeremy Barrell is a Chartered Forester (www.charteredforesters.org), and a Registered Consultant of the Arboricultural Association (https://www.trees.org.uk/Registered-Consultant-Directory), and is fully qualified to undertake the assessments in this report (https://www.barrelltreecare.co.uk/who-we-are/).
Report limitations	- We have not checked if there is any statutory protection on the trees because this can delay the production of the report. If any tree works are proposed before a planning consent is given, then the possible existence of any statutory protection must be checked with the LPA. - This report does not consider ecological or archaeological issues, or any other matter beyond the assessment of the trees.
Technical references	In preparing the analysis in this report, we considered the guidance and advice in the following technical references: - Climate Change Act (2008) www.legislation.gov.uk/ukpga/2008/27/contents - Town and Country Planning Act 1990 www.legislation.gov.uk/ukpga/1990/8/contents - National Planning Policy Framework, published by the MHCLG www.gov.uk/government/publications/national-planning-policy-framework--2 - BS 5837 (2012) <i>Trees in relation to design, demolition and construction – Recommendations</i>, https://shop.bsigroup.com/ProductDetail?pid=000000000030213642 - BS 8545 (2014) <i>Trees: from nursery to independence in the landscape – Recommendations</i>, https://shop.bsigroup.com/ProductDetail?pid=000000000030219672 - BS 3998 (2010) <i>Tree work – Recommendations</i>, BSI https://shop.bsigroup.com/ProductDetail?pid=000000000030089960 <i>Trees in the Townscape: A Guide for Decision Makers</i>, published by the Trees & Design Action Group http://www.tdag.org.uk/ <i>Trees in Hard Landscapes: A Guide for Delivery</i>, published by the Trees & Design Action Group www.tdag.org.uk/ - National Joint Utilities Group (2007) Volume 4, Issue 2: <i>Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees</i> http://streetworks.org.uk/wp-content/uploads/2016/09/V4-Trees-Issue-2-16-11-2007.pdf

Appendix 1: Background administrative information and data collection

	Background administrative information
BS 5837 compliance	This report is BS 5837 compliant. <i>BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations</i> is 10 years old. Since its publication, there have been significant advancements in technology and thinking, informed by a decade of practical experience of putting principles into practice. In the document Foreword, it states: “Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations”. This statement provides the opportunity for practitioners to claim compliance while moving best practice forward in the context of emerging technology, ideas, and experience. Although much of the BS 5837 content remains relevant and useful for managing trees in a planning context, there are now several aspects that are dated, and it is no longer appropriate to rigidly apply them to current planning submissions. Barrell Tree Consultancy (BTC) specialises in managing trees on development sites and retains a complete paper archive of every project it has carried out since starting business in 1980, with a digital data base listing those from 2004. In the decade since BS 5837 was published (April 2012), interrogation of the BTC archive confirms that we have been involved in a total of 3,884 projects, of which we estimate that about 3,845 were development related, and it is that depth of experience that informs the following statements on BS 5837 compliance. All BTC reports are prepared to be BS 5837 compliant and, although explanations are not explicitly required to claim compliance, the justifications for any deviations from its recommendations are set out below, referenced by the BS clause number: 4.3 – soil assessment: All BTC consultants have basic training relating to soil assessment and regularly deal with soil issues during their daily work, but none are soil specialists and BTC has no specialist investigation equipment for carrying out the type of soil assessment listed in this BS clause. In a modern development context, it is not for arboricultural consultants to demand or carry out professional soil investigations, and BTC does not do that. However, we will review soil information provided from appropriate specialists, if available, and incorporate that into our assessments. 4.4.2.1 – tagging trees: In some instances, it is not appropriate to tag trees, e.g., sensitive species, trees that are easily identified without a tag, inadequate access, project confidentiality, client instructions to the contrary, etc, and so although there will be a presumption to tag trees where feasible and appropriate, that may not be possible or necessary in every instance. 4.4.2.5 e) – branch spread: BTC only work from provided topographical surveys and where the branch spreads are shown correctly on those surveys, there is not normally any practical need to regurgitate that information in a schedule. Additionally, in closely spaced groups or in treacherous terrain, it is sometimes not safe or realistically possible to collect this data for every tree. For these reasons, BTC normally only collects crown spread data to the four cardinal points where the provided topographical survey is assessed as unreliable, or where a full

Appendix 1: Background administrative information and data collection

	Background administrative information
	canopy cover assessment is requested, and it is both safe and practically feasible to do so. 4. 4.4.2.5 f) – branch and canopy height: In the absence of any definition of ‘canopy’ or ‘significant’ relating to branches in the <i>Terms and definitions</i> clause, and the lack of any practical guidance for reliably assessing these characteristics, BTC has adopted the following default position. We will only identify the height and orientation of branches where they have the potential to be damaged by vehicular access, i.e., below a height of 6 m, or where their removal would be beyond what the tree could tolerate during normal maintenance management, i.e., the branch removal would significantly adversely affect the health of the tree and potentially compromise its current safe useful life expectancy. 5. 4.4.2.5 g) – life stage: BS 5387 offers examples, but no definitions of what those examples mean. In the absence of a specific BS 5387 recommendation, BTC has reviewed the concept of maturity in a planning context, taking maturity to be a simplistic indication of a tree’s ability to cope with change and its potential for further growth. For the purposes of development site advice, BTC conceptualises useful life-stage descriptions as; young indicating a potential to significantly increase in size and a high ability to cope with change; maturing indicating some potential to increase in size and a medium ability to cope with change; and, mature indicating little potential to increase in size and low ability to cope with change. 6. 4.4.2.5 i) – estimated remaining contribution: BTC accepts the category recommendations in Table 1 on the remaining contribution in the context of category, i.e., greater than 40 years for A trees, greater than 20 years for B trees, at least 10 years for C trees, and less than 10 years for U trees, and so this is also not listed separately in the schedule. 7. 4.5.4 – subcategories: BTC adopts a presumption that all trees are subcategory 1 (Mainly arboricultural qualities) unless noted to the contrary, and so for conciseness and to avoid complication, the subcategory is not listed in the schedule unless it is 2 or 3. 8. Table 2 and 4.4.2 – colour coding: The colours included in this table take no account of the inability of some people to distinguish between red and green, which is not helpful to people suffering with this form of colour blindness. To address this discriminatory failing with the BS approach, BTC has adopted a more intuitively obvious regime of green and blue colours, which can be easily distinguished by colour-blind people, with the best category A and B trees (High and moderate quality) being green, and the lower category C and U trees (Low quality and unsuitable for retention) as blue. The differentiation between the two categories in each colour is provided by symbols rather than using different colours. This is clearly shown on the plan key, so there can be no doubt about what category a tree is, which is an intuitive approach to avoiding discrimination of colour-blind people. In any event, the tree

Appendix 1: Background administrative information and data collection

	Background administrative information
	category is now included next to each number, so there can be no question about the category and BS 5837 compliance. 9. 5.2.1 – RPAs: This clause recommends that the RPAs for category A, B, and C trees are shown as the existing constraints on the plans used in the “<i>concept and design</i>”, i.e., the tree constraints plan. However, the BS does not explicitly recommend that all those constraints are shown on the tree protection plan, which is logical because only category A (High quality), and category B (Moderate quality) trees can realistically be material constraints, with category C (Low quality) and category U (Unsuitable for retention) trees obviously unsuitable to be determinative of the final design. Although it is not a BS recommendation to include the RPAs of category C trees on the tree protection plan because they cannot be material constraints, it is sometimes helpful as an informative to be able to see them if category C are planned for retention to assess if that is feasible. For that reason, BTC tree protection plans show the RPAs of category C trees as a thin grey line rather than the thicker grey line denoting category A and B RPAs. 10. 5.2.2 Notes 1 and 2 – shading: These notes offer general information on how shading can be assessed, which is presented in italics. The implications of the convention of using italics within the BS is set out in the Foreword as: “<i>Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.</i>” Our interpretation of that statement is that the application of Notes 1 and 2 is not part of the BS recommendations, and is not necessary for BS 5837 compliance. In our experience, the assessment of daylight issues is a specialist discipline and way beyond our expertise as arboriculturists, and so we would defer to an appropriate specialist, where any detailed guidance is required.

A1.2 Table 4: Data collection

	Data collection
Date of site visit	23 rd December 2022
People present during site visit	Jeremy Barrell
Weather & visibility	Dull, still, and dry, with average visibility
Limitations to observations	• The inspection of the trees for the purposes of assessing their condition and work requirements was made on the basis that they will be annually inspected in the future to identify any changes in condition and review the original recommendations. For these reasons, the tree assessment advice only remains valid for one year from the date that the trees were last inspected. • All observations were of a preliminary nature and did not involve any climbing or detailed investigation beyond what was visible from accessible points at ground level. • Observations of trees outside the site boundaries are confined to what was visible from within the site. • All dimensions were estimated unless otherwise indicated.

Appendix 1: Background administrative information and data collection

	Data collection
Tree location and numbering	Each tree and group was inspected and the numbering scheme is indicated on the tree constraints plan. All trees were tagged with a metal numbered tag stapled to their trunks.
Crown spreads	We estimated crown spreads according to the guidance in BS 5827, i.e., to the four cardinal compass points, with an approximate extrapolation illustrated on the constraints plan as the green outline. These radial spreads were estimated to the nearest metre and represent our assessment of the viable crown dimensions that would be retainable after normal management. For clarification, the viable crown spread is the size of the main body of the crown, and not necessarily the furthest extent of odd branches that extend out beyond this core of the crown.
Recording of tree data	For each identified tree and group, the information collected was recorded on the tree schedule in Appendix 2 and the tree protection plan.
Calculation of RPAs	The RPAs were calculated as recommended in BS 5837, and the nominal RPA radius for each tree is listed in the tree schedule in Appendix 2. Where appropriate, RPAs for trees on the site were adjusted as recommended in BS 5837 and illustrated on the plan.



Appendix 2: Tree schedule and explanatory notes

NOTE: Colour annotation is A & B trees with green background; C & U trees with blue background; trees to be removed in red text.

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
All retained trees								Carry out safety check and lift over site to 3–4 m as necessary.	
T391	Magnolia	10	48*	Mature	5 m N, S, W	B+	Severely imbalanced		5.8
T392	Oak	17	115*	Mature	5 m SE	A+	Some crown dieback		13.8
T393	Birch	18	38*	Maturing		C	Severe decay in one stem		4.5
T395	Birch	17	29	Maturing		C	Severely imbalanced		3.5
T396	Ash	20	36	Maturing		C	Ash dieback disease, weak union at 0.5 m		4.3
T397	Beech	18	40*	Maturing		A+			4.8
T398	Birch	20	47	Maturing		C	2 stems from ground level, weak union		5.7
T400	Oak	20	139*	Veteran		A+	Multiple defects in crown		15.0
T401	Goat willow	8	21	Young		C			2.5
T402	Yew	10	40	Maturing		B	Growing on an island		4.8
G403	Birch	14	15	Young		C	Group of tall thin trees growing on an island		1.8
T404	Yew	10	30	Young		C	Suppressed		3.6
T405	Goat willow	15	37	Maturing		U	Severely imbalanced stems from weak basal unions, recently suffered storm damage and so changed from a category C to U		4.4
G406	Portuguese laurel	18	25	Maturing		C	Tall, thin, imbalanced		3.0



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Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
G407	Portuguese laurel	16	30	Maturing		C	Multiple stems from ground levels with weak unions, some severely imbalanced		3.6
T408	Oak	20	54*	Maturing		C	Severely imbalanced		6.5
T409	Portuguese laurel	13	30	Maturing		C	Severe storm damage		3.6
T410	Portuguese laurel	12	25	Maturing		C	Poor form		3.0
T411	Ash	22	71	Mature		C	Ash dieback, severely imbalanced		8.5
T412	Ash	20	48*	Maturing		C	Deteriorating with ash dieback	Fell for development	5.8
T413	Portuguese laurel	10	25	Maturing		C	Severe stem defects	Fell for development	3.0
T415	Goat willow	12	40	Maturing		C	Decaying wounds in stem	Fell for development	4.8
T416	Goat willow	15	25	Maturing		C		Fell for development	3.0
T417	Ash	20	25	Maturing		C	Ash dieback, imbalance	Fell for development	3.0
T418	Ash	20	30	Maturing		C	Ash dieback	Fell for development	3.6
T419	Ash	20	40	Maturing		C	Ash dieback		4.8
T420	Ash	20	50	Maturing		C	Severe defects in crown and ash dieback		6.0
T421	Oak	20	55	Maturing		C	Severely imbalanced over pond		6.6
T422	Ash	20	25	Maturing		C	Tall thin form, severely imbalanced		3.0
T423	Portuguese laurel	10	50	Maturing		C	Severe decay in stem	Fell for development	6.0
T424	Ash	20	45	Maturing		C	Tall thin form, ash dieback		5.4
T425	Oak	20	54*	Maturing		B+			6.5
T426	Ash	20	40*	Maturing		C	Deteriorating with ash dieback		4.8
T427	Beech	20	80*	Maturing		C			9.6



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T428	Scots pine	18	72*	Mature		C	Deteriorating health, has become exposed through loss of adjacent tree, and poor canopy form now vulnerable to storm damage		8.6
T430	Coast redwood	25	130	Maturing		A+	5 stems (60, 65, 70, 50, 40)		15.0
T431	Holly	15	48	Mature		B	4 stems (25, 20, 20, 30)	Fell for development	5.8
G433	Laurel	15	25	Maturing		C	Poorly formed overgrown shrubs	Fell for management	3.0
G435	Portuguese laurel	12	25	Maturing		C	Tall, thin closely grown trees, poorly formed, some partially fallen	Fell for development	3.0
T437	Oak	18	70	Mature		B	Severely imbalanced and marginal B tree	Fell for development	8.4
G438	Leyland cypress	25	50	Maturing		C	6 closely grown stems, all severely imbalanced	Fell for development	6.0
T439	Oak	12	35	Maturing		C	Worsening imbalance and unsuitable for long-term retention	Fell for development	4.2
T440	Ash	12	15	Young		C	Ash dieback	Fell for development	1.8
T441	Horse chestnut	12	20	Young		C	Tall thin form, suppressed	Fell for development	2.4
T442	Ash	17	20	Young		C		Fell for development	2.4
T443	Cherry	11	70	Mature		B	Some stem defects	Fell for development	8.4
T444	Birch	20	24*	Maturing		C	Tall and thin		2.9
T445	Cherry	20	20	Maturing		C	Tall thin form		2.4
T447	Ash	20	30	Maturing		C	Ash dieback		3.6
T448	Ash	20	30	Maturing		C	Ash dieback		3.6
T451	Ash	20	25	Maturing		C	Ash to ash dieback		3.0
T452	Ash	20	25	Maturing		C	Ash dieback		3.0
T453	Holly	20	45	Mature		B+			5.4
T454	Cherry	18	15	Maturing		C	Tall thin form		1.8
T455	Hornbeam	20	25	Maturing		C	Severe basal damage		3.0



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T457	Ash	20	15	Maturing		C	Tall thin form		1.8
T458	Ash	20	20	Maturing		C	Tall thin form		2.4
T459	Birch	20	25	Maturing		C	Tall thin form		3.0
T460	Birch	20	30*	Maturing		C	Tall thin form, imbalanced over road		3.6
T461	Birch	20	20	Maturing		C	Tall thin form		2.4
T462	Yew	20	120*	Mature		A+			14.4
T463	Acacia	20	30	Maturing		C	Severe lean, declining health	Fell for development	3.6
G464	Hornbeam	20	20	Maturing		C	3 trees with severe basal damage	Fell for development	2.4
G465	Ash	20	20	Maturing		C	2 tall thin trees, ash dieback		2.4
T467	Birch	20	25	Maturing		C			3.0
T468	Yew	20	107	Mature		A+			12.8
T469	Acacia	23	42	Maturing		B			5.0
T470	Birch	18	25	Maturing		C	Suppressed by adjacent tree		3.0
T471	Birch	20	25	Maturing		C	Severely imbalanced		3.0
T472	Beech	20	17	Maturing		C	Tall thin		2.0
G473	Cherry	20	20	Maturing		C	3 cherries, tall thin form		2.4
G474	Ash	20	15	Maturing		C	Tall thin form, ash dieback		1.8
T475	Birch	20	25	Maturing		C	Tall thin form		3.0
G476	Acacia	20	15	Maturing		C	Tall thin form, multiple defects	Fell for development	1.8
T477	Birch	20	20	Maturing		C	Tall thin form	Fell for development	2.4
T478	Birch	20	25	Maturing		C	Severe lean over road, tall thin form		3.0
T480	Acacia	20	35	Maturing		C	Multiple stem defects	Fell for development	4.2
T481	Ash	22	39	Maturing		C	2 stems, ash dieback	Fell for development	4.7
T482	Ash	20	20	Maturing		C	Obvious ash dieback, tall thin form	Fell for development	2.4
T483	Sweet chestnut	20	30*	Maturing		B		Fell for development	3.6
T486	Cherry	20	27*	Maturing		B		Fell for development	3.2
T487	Cherry	17	10	Maturing		C	Tall thin form	Fell for development	1.2
T489	Sweet chestnut	20	30*	Maturing		B			3.6



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T492	Ash	20	15	Maturing		C	Tall thin form, advanced ash dieback	Fell for development	1.8
T495	Birch	20	24*	Maturing		C		Fell for development	2.9
T496	Weeping willow	12	44*	Maturing		C		Fell for development	5.3
T497	Birch	20	24*	Maturing		C	Imbalanced, tall thin form	Fell for development	2.9
T498	Crab	10	40	Mature		C	Severely imbalanced	Fell for development	4.8
T499	Weeping willow	17	55	Mature		C	Decay in trunk	Fell for development	6.6
T500	Oak	20	88*	Mature		A+			10.6
T501	Oak	20	73*	Mature		B+	Imbalance because part of group		8.8
G502	Holly	12	20	Maturing		C	Poorly formed, some stems with severe lean		2.4
T503	Oak	20	95*	Mature		A+	Storm damage and decayed stems, needs remedial work to retain		11.4
T504	Plum	7	15	Young		C			1.8
T505	Holly	12	35	Maturing		C	Severely imbalanced		4.2
T506	Beech	12	10	Young		C			1.2
T507	Beech	22	68*	Mature		B+			8.2
T508	Holly	13	20	Maturing		C	Decay in base, severely imbalanced		2.4
T509	Oak	23	76*	Mature		B+	Leaning trunk		9.1
T511	Holly	15	50*	Mature		B+	Partially suppressed by adjacent trees		6.0
T512	Oak	17	53*	Maturing		B+	Part of group, imbalanced		6.4
T513	Yew	15	56*	Maturing		B+	Partially suppressed		6.7
T514	Oak	20	56*	Maturing		B+	Declining		6.7
T515	Oak	23	70*	Maturing		B+			8.4
T516	Holly	8	14	Young		C	2 stems from ground level with weak unions		1.7
T517	Oak	18	45*	Maturing		C	Severe decline		5.4
T518	Oak	23	60*	Maturing		B+	Defects in upper crown		7.2
T519	Oak	24	65*	Maturing		B+			7.8



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T520	Oak	22	123*	Mature		A+	Declining crown, needs work to be retained		14.8
T521	Holly	7	25	Maturing		C			3.0
T522	Beech	17	22*	Maturing		B			2.6
T524	Oak	23	67*	Mature		B+	RPA modified by wall		8.0
T525	Yew	17	60*	Maturing		B+	RPA modified by wall		7.2
T526	Oak	24	83*	Mature		B+	RPA modified by wall		10.0
T527	Beech	15	30	Maturing		C	Severely imbalanced, RPA modified by wall		3.6
T528	Sycamore	18	20	Maturing		C	Tall thin form, RPA modified by wall		2.4
T530	Beech	20	43*	Maturing		C	Imbalanced, RPA modified by wall		5.2
T531	Yew	12	45*	Maturing		C	Severely imbalanced, RPAs modified by wall		5.4
T532	Yew	12	55*	Maturing		C	Severely imbalanced		6.6
T533	Beech	25	65*	Maturing		A+			7.8
G534	Ash, beech, sycamore	20	30	Maturing		C	Large group of closely spaced tall thin stems, individually most trees very poorly formed, some dead and dying trees, many imbalanced trees, important as a landscape feature but individually the trees are low quality		3.6
T535	Sycamore	15	15	Maturing		C	Severely imbalanced		1.8
T536	Beech	20	25	Maturing		C	Interfering with adjacent tree		3.0
T537	Beech	20	30	Maturing		C	Severely imbalanced, interfering with the adjacent tree		3.6
T538	Yew	18	72	Mature		B+	Partially suppressed		8.6
T539	Sycamore	18	15	Maturing		C	Severely imbalanced		1.8
T540	Yew	17	75*	Mature		B+	Partially suppressed		9.0



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Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T541	Sycamore	20	41	Maturing		C	Interfering with adjacent tree, severely imbalanced	Fell for development	4.9
T542	Sycamore	16	25	Maturing		C	2 stems from ground level, tall thin form, severely imbalanced	Fell for development	3.0
T543	Pittosporum	17	40	Mature		C	Imbalanced, tall thin form	Fell for development	4.8
T544	Bay	18	46	Mature		C	Tall thin form		5.5
T545	Bay	15	20	Young		C	Tall thin form		2.4
T546	Bay	15	28	Maturing		C	Multiple stems from ground level, tall thin form		3.4
T547	Yew	18	110*	Mature		A+			13.2
T548	Sycamore	22	76*	Maturing		B+			9.1
T549	Birch	23	30*	Maturing		C	Stem defect at 3 m, suppressed by adjacent tree		3.6
G550	Yew	6	15	Young		C	Severely imbalanced		1.8
T551	Yew	18	67	Maturing		C	Severely suppressed		8.0
T552	Yew	18	78*	Maturing		B+	Partially suppressed		9.4
G553	Sycamore	23	35	Maturing		C	Group of 7 individual trees, all severely imbalanced	Fell for development	4.2
T554	Sycamore	18	15	Maturing		C	Tall thin form		1.8
T555	Yew	13	30	Maturing		C	Severely imbalanced		3.6
T556	Unknown			Maturing		C	Recording error		
G557	Sycamore	18	20	Maturing		C	Tall thin form, severe imbalance	Fell for development	2.4
T558	Sycamore	22	30	Maturing		C	Severely imbalanced	Fell for development	3.6
T559	Irish yew	15	47	Mature		C	Multiple stems from ground level, some severely imbalanced	Fell for development	5.7
T560	Field maple	18	30	Maturing		C	Severely imbalanced	Fell for development	3.6
T561	Holly	9	15	Maturing		C			1.8
T562	Sycamore	18	27*	Maturing		B			3.2



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Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T563	Holly	12	30	Maturing		C	Decay in trunk		3.6
T564	Sycamore	23	35*	Maturing		B			4.2
G565	Holly	10	25	Maturing		C	Multiple stems with weak unions, some severely imbalanced		3.0
T566	Oak	21	44*	Maturing		B	Signs of decline		5.3
T567	Sycamore	23	32*	Maturing		B			3.8
T568	Yew	18	40*	Maturing		C	Interfering with adjacent tree		4.8
T569	Sycamore	21	30	Maturing		C	Severe stem defects at 3 m		3.6
T570	Sycamore	23	30	Maturing		C	Tall thin form		3.7
T571	Sycamore	23	66*	Mature		A+			7.9
T572	Portuguese laurel	15	30	Maturing		C	Poor form, interfering with adjacent tree		3.6
T573	Irish yew	15	28	Maturing		C	Severely suppressed		3.4
T574	Sycamore	17	31*	Maturing		B			3.7
T575	Sycamore	20	20	Maturing		C	Tall thin form		2.4
T576	Sycamore	21	25	Maturing		C	Tall thin form		3.0
T577	Yew	18	72*	Mature		B+			8.6
T578	Sycamore	22	30	Maturing		C	Interfering with adjacent tree		3.6
T579	Sycamore	22	30	Maturing		C	Interfering with adjacent tree		3.6
T580	Sycamore	20	20	Maturing		C	Tall thin form		2.4
T581	Sycamore	22	20	Maturing		C	Tall thin form		2.4
T582	Sycamore	20	25	Maturing		C	Severely suppressed, severely imbalanced over road		3.0
T583	Sycamore	10	20	Maturing		C	Severely suppressed		2.4
T584	Oak	22	80	Mature		B+	Partially suppressed by adjacent trees		9.6
T585	Yew	17	77*	Mature		B+			9.2
T586	Cherry	18	20	Maturing		C	Suppressed by adjacent tree		2.4
T587	Sycamore	12	20	Young		C	Poor form, stem damage		2.4



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T588	Oak	15	15	Young		C			1.8
T589	Cherry	12	25	Maturing		C	Dying		3.0
T590	Lime	22	70	Maturing		B+	Previously topped at 12 m		8.4
T591	Birch	20	20	Maturing		C	Tall thin form, interfering with adjacent tree		2.4
T592	Birch	18	32*	Maturing		C	Interfering with adjacent tree		3.8
T593	Oak	16	30	Maturing		C	Severely suppressed		3.6
T594	Yew	18	50*	Maturing		B+			6.0
G595	Beech	20	15	Maturing		C	2 trees, tall thin form		1.8
T596	Ash	20	15	Maturing		C	Tall thin form		1.8
T597	Ash	20	25	Maturing		C	Severe ash dieback		3.0
T598	Birch	20	20	Maturing		C	Tall thin form		2.4
T600	Oak	20	53*	Maturing		B+	Signs of dieback		6.4
T601	Holly	18	30	Maturing		C	Severely imbalanced over road		3.6
T602	Beech	18	30	Maturing		C	Severely imbalanced		3.6
T603	Oak	22	58*	Maturing		B+	Imbalanced over road		7.0
G604	Portuguese laurel	10	30	Maturing		C	Severe defect, poor form		3.6
T606	Holly	10	20	Maturing		C			2.4
T607	Sycamore	18	25	Maturing		C	Imbalance over the road		3.0
T608	Hornbeam	20	20	Maturing		C	Tall thin form, basal damage		2.4
T610	Rowan	15	15	Maturing		C	Tall thin form		1.8
T612	Sycamore	20	50*	Maturing		A+			6.0
T613	Lime	20	37	Maturing		C	Multiple stems from ground level with weak unions		4.4
T616	Sycamore	12	15	Maturing		C	Severe stem damage, dieback	Fell for development	1.8
T617	Ash	20	25	Maturing		C	Severe ash dieback	Fell for development	3.0
T618	Birch	20	25	Maturing		C	Tall thin form	Fell for development	3.0



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T619	Birch	20	20	Maturing		C	Tall thin form	Fell for development	2.4
T620	Birch	20	20	Maturing		C	Tall thin form	Fell for development	2.4
T621	Birch	20	20	Maturing		C	Tall thin form	Fell for development	2.4
T622	Scots pine	18	15	Maturing		C	Tall thin form	Fell for development	1.8
T623	Birch	20	20	Maturing		C	Tall thin form	Fell for development	2.4
T625	Birch	20	35	Maturing		C	Tall thin form	Fell for development	4.2
T626	Birch	20	25	Maturing		C	Tall thin form	Fell for development	3.0
T627	Birch	20	20	Maturing		C	Severely imbalanced over road, tall thin form		2.4
T629	Sycamore	25	67	Maturing		A+			8.0
G630	Oak, birch, sycamore	18	30	Maturing		C	Group of closely spaced trees, all poorly formed, some with serious defects, little potential for individual retention	Fell for development	3.6
T632	Oak	17	43*	Maturing		B		Fell for development	5.2
T633	Birch	8	20	Young		C		Fell for development	2.4
T635	Atlantic cedar	10	44*	Maturing		B		Fell for development	5.3
T636	Persian ironwood	7	12	Young		C		Fell for development	1.5
T637	Persian ironwood	7	12	Young		C		Fell for development	1.5
T638	Persian ironwood	1	17	Young		C		Fell for development	2.1
T639	Oak	19	98*	Mature		A+			11.8
G640	Birch	10	20	Maturing		C		Fell for development	2.4
T641	Birch	10	20	Maturing		C	Severely imbalanced, stem defect	Fell for development	2.4
T642	Oak	17	55*	Maturing		B+		Fell for development	6.6
T643	Catalpa	8	34*	Maturing	2 m N	B		Fell for development	4.1



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T645	Oak	8	22	Maturing		C		Fell for development	2.6
T646	Mountain redwood	14	77*	Maturing		B+			9.2
T647	Hazel	7	14	Maturing		C	Coppice origin	Fell for development	1.7
T648	Holly	12	24	Maturing		C	Multiple stems from ground level, severe lean	Fell for development	2.9
T649	Beech	20	34*	Maturing		C	Imbalanced, weak union at 1 m	Fell for development	4.1
T650	Turkey oak	20	40*	Maturing		C	Severely imbalanced towards building	Fell for development	4.8
T651	Acacia	8	27*	Maturing		C	Acacia variety, suppressed by adjacent tree, severely imbalanced	Fell for development	3.2
T652	Hazel	2	9	Maturing		C	Coppice origin, regularly clipped	Fell for development	1.1
T653	Hazel	7	19	Maturing		C	Coppice origin	Fell for development	2.3
T654	Mountain redwood	30	208*	Mature	6 m	C	Lost top at 18 m with vigorous regrowth and needs work to be retained	Fell for development	15.0
T655	Sycamore	18	15	Young		C	Tall thin form	Fell for development	1.8
T656	Holly	10	15	Maturing		C	Tall thin form	Fell for development	1.8
T657	Sycamore	20	35*	Maturing		C	Interfering with adjacent tree	Fell for development	4.2
T659	Camelia sp	5	28	Maturing		C	Overgrown shrub	Fell for development	3.4
T660	Holly	12	10	Maturing		C	Multiple stems from ground level, severely imbalanced		1.2
T661	Hazel	7	10	Maturing		C	Coppice origin	Fell for development	1.2
T662	Hazel	10	16	Maturing		C	Coppice origin	Fell for development	1.9
T663	Birch	20	43*	Mature		B			5.2
T664	Coast redwood	30	132*	Maturing		A+			15.0
T665	Holly	12	40	Maturing		C	2 severely imbalanced stems		4.8
T666	Holly	14	25	Maturing		C		Fell for development	3.0
T667	Hazel	10	15	Maturing		C	Coppice origin	Fell for development	1.8



Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T668	Sycamore	20	30	Maturing		C	Severely imbalanced	Fell for development	3.6
T669	Sycamore	20	35	Maturing		C	Severely imbalanced, weak union at 1 m	Fell for development	4.2
T670	Lawson cypress	18	25	Maturing		C	Tall thin form, severe stem defect	Fell for development	3.0
T671	Hazel	8	12	Maturing		C	Coppice origin	Fell for development	1.5
T672	Sycamore	20	35	Maturing		C	Severely imbalanced, multiple crown defects	Fell for development	4.2
T673	Lawson cypress	20	45	Maturing		C	Multiple stem defects	Fell for development	5.4
T674	Sycamore	17	25	Maturing		C	Severely suppressed, imbalanced		3.0
T675	Oak	25	115*	Mature		A+			13.8
T676	Cherry	7	12*	Young		C	Severe imbalance		1.4
T677	Coast redwood	30	86*	Mature		A+			10.3
T679	Ash	25	56*	Maturing		C	Leaning stem, signs of ash dieback		6.7
T682	Beech	25	54*	Maturing		B	Imbalanced		6.5
T683	Cherry	14	28*	Maturing		B			3.4
T684	Ash	18	23*	Maturing		C	Ash dieback, imbalanced over road		2.8
T685	Yew	12	30	Maturing	W 3m	C	Suppressed with poor form		3.6
T686	Deodar cedar	30	90*	Mature		B+	Severely imbalanced and requires work to be retained		10.8
T687	Yew	10	30	Maturing		C	Severely suppressed		3.6
T688	Holly	10	20	Maturing		C			2.4
T689	Oak	20	73*	Mature		B	Leaning stem, declining health		8.8
T690	Acacia	20	20	Maturing		C	Tall thin form, severely imbalanced		2.4
T692	Oak	30	70	Mature		B+	Some storm damage		8.4
T694	Horse chestnut	25	65*	Mature		A+			7.8
T695	Oak	25	90*	Mature		B+	Outside the site boundary and agreed for removal as part of an extant S278 consent		10.8

Appendix 2: Tree schedule and explanatory notes

Tree No	Species	Height (m)	Diameter (cm) @ 1.5m	Maturity	Low Branches	Category	Notes	Tree Works	RPA radius (m)
T696	Ash	18	30	Maturing		C	Severely imbalanced, ash dieback		3.6
T697	Oak	25	82*	Maturing		B+	Outside the site boundary and agreed for removal as part of an extant S278 consent		9.8
T698	Ash	15	20	Maturing		C	Severely imbalanced		2.4
T699	Oak	25	82*	Mature		B+	Some defects in crown		9.8
T700	Yew	10	50	Maturing		C	Partially suppressed		6.0
T701	Oak	20	50*	Maturing		C	Imbalanced crown, suppressed by adjacent tree		6.0
T702	Oak	15	40	Maturing		C	Severely suppressed		4.8
T703	Oak	30	109*	Mature		A+			13.1
T704	Ash	14	15	Young		C			1.8
T706	Oak	23	50	Maturing		C	Severely imbalanced		6.0
T707	Beech	12	15	Maturing		C	Severely imbalanced		1.8
T708	Oak	25	63*	Mature		B+			7.6
T710	Oak	25	55	Maturing		C	Severely imbalanced		6.6
T711	Oak	25	55	Maturing		C			6.6
T713	Yew	18	66*	Maturing	W 2m	B+	Partially suppressed		7.9
T716	Hawthorn	5	20	Maturing		C			2.4

Appendix 2: Tree schedule and explanatory notes

Explanatory Notes

- **Abbreviations:**

G: Group
T: Tree

- **Botanical tree names:**

Acacia	: <i>Robinia pseudoacacia</i>
Ash	: <i>Fraxinus excelsior</i>
Atlantic cedar	: <i>Cedrus libani atlantica</i>
Bay	: <i>Laurus nobilis</i>
Beech	: <i>Fagus sylvatica</i>
Birch	: <i>Betula pendula</i>
Camelia sp	: <i>Camelia</i> sp
Catalpa	: <i>Catalpa bignonioides</i>
Cherry	: <i>Prunus</i> sp
Coast redwood	: <i>Sequoia sempervirens</i>
Crab	: <i>Malus</i> sp
Deodar cedar	: <i>Cedrus deodara</i>
Field maple	: <i>Acer campestre</i>
Goat willow	: <i>Salix caprea</i>
Hawthorn	: <i>Crataegus monogyna</i>
Hazel	: <i>Corylus avellana</i>
Holly	: <i>Ilex aquifolium</i>
Horse chestnut	: <i>Aesculus hippocastanum</i>
Irish yew	: <i>Taxus baccata</i> 'Fastigiata'
Laurel	: <i>Prunus laurocerasus</i>
Lawson cypress	: <i>Chamaecyparis lawsoniana</i>
Leyland cypress	: <i>X Cuprocyparis leylandii</i>
Lime	: <i>Tilia</i> sp
Magnolia grandiflora	: <i>Magnolia grandiflora</i>
Mountain redwood	: <i>Sequoiadendron giganteum</i>
Oak	: <i>Quercus robur</i>
Persian ironwood	: <i>Parrotia persica</i>
Pittosporum	: <i>Pittosporum</i> sp
Plum	: <i>Prunus</i> sp
Portugal laurel	: <i>Prunus lusitanica</i>
Rowan	: <i>Sorbus aucuparia</i>
Scots pine	: <i>Pinus sylvestris</i>
Sweet chestnut	: <i>Castanea sativa</i>
Sycamore	: <i>Acer pseudoplatanus</i>
Weeping willow	: <i>Salix x chrysocoma</i>
Yew	: <i>Taxus baccata</i>

- **BS 5837 (2012) compliance:** All data has been collected based on the recommendations set out in subsection 4.4 of BS 5837.
- **Tree checks and site limitations:** Each tree was subjected to a quick visual check level of inspection. Where there is restricted access to the base of a tree, its attributes are assessed from the nearest point of access. Climbing inspections are not carried out during this level of inspection and, if heavy ivy is present, tree condition is assessed from what can be seen from the ground. A separate note is recorded if further investigation may be required to clarify its status.
- **Crown spreads:** Crown radial spreads were estimated to the nearest metre and represent our assessment of the viable crown dimensions that would be retainable after normal management. For clarification, the viable crown spread is the size of the main body of the crown, and not necessarily the furthest extent of odd branches that extend out beyond this core of the crown.
- **Dimensions:** All dimensions are estimated unless otherwise indicated with an asterisk (*) after the figure.

Appendix 2: Tree schedule and explanatory notes

- **Species:** Species identification is based on visual observations. Where there is some doubt over tree identity, sp is noted after the genus name to indicate that the species cannot be reliably identified at the time of the survey. Where there is more than one species in a group, only the most frequent are noted and not all the species present may be listed.
- **Height:** Height is estimated to provide a broad indication of the size of the tree.
- **Trunk diameter:** Trunk diameter is estimated or measured (with a diameter tape), at the discretion of the consultant. Estimates may be made where access is restricted, direct measurement is prevented because of ivy on the trunk, or the tree is assessed as low quality. The point of measurement and the adjustments for stem variations are as advised in Figure C1 of BS 5837. Individual diameters for multiple stems are recorded in the notes, with the calculated cumulative diameter recorded in the diameter column.
- **Maturity:** In planning context, maturity provides a simplistic indication of a tree's ability to cope with change and its potential for further growth. For the purposes of this report, young indicates a potential to significantly increase in size and a high ability to cope with change, maturing indicates some potential to increase in size and a medium ability to cope with change, and mature indicates little potential to increase in size and limited ability to cope with change.
- **Low branches:** Any low branches that would not be feasible for removal during normal management and should be considered as a design constraint are noted here and explained in the notes.
- **Category:** Our assessment automatically considered tree physiological/structural condition (BS 5837, 4.4.2.5h), and so these are not listed separately in the schedule. Additionally, the category accounts for the remaining contribution (BS 5837, 4.4.2.5i) as greater than 40 years for A trees, greater than 20 years for B trees, at least 10 years for C trees and less than 10 years for U trees, so this is also not listed separately in the schedule. Category A, B and C trees are automatically listed as sub-category 1 unless otherwise stated.
- **Notes:** Only relevant features relating to physiological or structural condition and low branches that may help clarify the categorisation are recorded. If there are no notes, then the presumption should be that no relevant features were observed.
- **RPAs:** The RPAs were calculated as recommended in BS 5837, and the nominal RPA radius for each tree listed, irrespective of any modifying factors. Where appropriate, RPAs for trees on the site may have been adjusted as recommended in BS 5837 and illustrated on the plan.
- **Future tree safety inspections:** Due to the time that may elapse between the original survey and the start of development, all trees should be re-inspected as part of the standard risk management process before any works start on site. Our assessment of the trees was carried out on the basis that a re-inspection would be carried out within a year of the assessment visit and our advice on tree condition must be reviewed annually from the date of that visit.

Appendix 3: QR Codes for SGNs (Scan with reader to download)

		
<i>SGN 1 Monitoring tree protection</i>	<i>SGN 2 Fencing protected trees</i>	<i>SGN 3 Ground protection</i>
		
<i>SGN 4 Pollution control</i>	<i>SGN 5 Site cranes & piling rigs</i>	<i>SGN 6 Height restrictions</i>
		
<i>SGN 7 Excavating in RPAs</i>	<i>SGN 8 Removing surfacing and structures in RPAs</i>	<i>SGN 9 Installing/upgrading surfacing in RPAs</i>
		
<i>SGN 10 Installing structures in RPAs</i>	<i>SGN 11 Installing services in RPAs</i>	<i>SGN 12 Landscaping in RPAs</i>



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Tree No	Species	Category	Tree Works	RPA radius (m)
All retained trees			Carry out safety check and lift over site to 3-4 m as necessary	
T391	Magnolia	B+		5.8
T392	Oak	A+		13.8
T393	Birch	C		4.5
T395	Birch	C		3.5
T396	Ash	C		4.3
T397	Beech	A+		4.8
T398	Birch	C		2.9
T400	Oak	A+		15.0
T401	Goat willow	C		2.5
T402	Yew	B		4.8
T403	Birch	C		3.8
T404	Yew	C		1.6
T405	Goat willow	U		4.4
T406	Portuguese laurel	C		3.0
T407	Portuguese laurel	C		6.0
T408	Oak	C		3.5
T409	Portuguese laurel	C		3.6
T410	Portuguese laurel	C		3.0
T411	Ash	C		8.5
T412	Ash	C	Fell for development	5.8
T413	Portuguese laurel	C	Fell for development	3.0
T414	Goat willow	C	Fell for development	4.8
T415	Goat willow	C	Fell for development	3.0
T416	Ash	C	Fell for development	3.0
T417	Ash	C	Fell for development	3.0
T418	Ash	C	Fell for development	3.6
T419	Ash	C	Fell for development	3.0
T420	Ash	C	Fell for development	6.0
T421	Oak	C	Fell for development	6.0
T422	Ash	C	Fell for development	6.0
T423	Portuguese laurel	C	Fell for management	6.0
T424	Ash	C		5.4
T425	Oak	B+		5.4
T426	Ash	C		4.8
T427	Beech	C		9.6
T428	Scots pine	C		8.6
T430	Coast redwood	A+		15.0
T431	Holly	B	Fell for development	5.8
T432	Laurel	C	Fell for management	5.8
T433	Portuguese laurel	C	Fell for development	5.8
T434	Oak	B	Fell for development	8.4
T435	Laurel	C	Fell for development	6.0
T436	Laurel	C	Fell for development	6.0
T437	Oak	B	Fell for development	8.4
T438	Laurel	C	Fell for development	6.0
T439	Oak	B	Fell for development	6.0
T440	Ash	C	Fell for development	6.0
T441	Horse chestnut	C	Fell for development	2.4
T442	Ash	C	Fell for development	2.4
T443	Cherry	B	Fell for development	8.4
T444	Birch	C	Fell for development	2.4
T445	Cherry	C	Fell for development	2.4
T446	Ash	C		3.6
T447	Ash	C		3.6
T448	Ash	C		3.6
T449	Ash	C		3.6
T450	Ash	C		3.6
T451	Ash	C		3.6
T452	Ash	C		3.6
T453	Holly	B+		3.0
T454	Cherry	C		1.8

Tree No	Species	Category	Tree Works	RPA radius (m)
T455	Hornbeam	C		3.0
T456	Ash	C		1.8
T457	Ash	C		2.4
T458	Birch	C		3.0
T459	Birch	C		3.6
T460	Birch	C		2.4
T461	Birch	C		3.6
T462	Yew	A+		14.4
T463	Acacia	C	Fell for development	3.6
T464	Hornbeam	C	Fell for development	2.4
T465	Ash	C		2.4
T466	Birch	C		3.0
T467	Birch	C		3.0
T468	Yew	A+		12.8
T469	Acacia	B		5.0
T470	Birch	C		3.0
T471	Birch	C		3.0
T472	Beech	C		2.0
T473	Cherry	C		2.4
T474	Ash	C		1.8
T475	Birch	C		3.0
T476	Acacia	C	Fell for development	3.6
T477	Birch	C	Fell for development	2.4
T478	Birch	C		3.0
T479	Acacia	C	Fell for development	4.2
T480	Ash	C	Fell for development	4.7
T481	Ash	C	Fell for development	2.4
T482	Sweet chestnut	B		3.6
T483	Cherry	B	Fell for development	3.2
T484	Cherry	B	Fell for development	3.2
T485	Cherry	C	Fell for development	3.6
T486	Sweet chestnut	B		3.6
T487	Ash	C	Fell for development	1.8
T488	Ash	C	Fell for development	2.9
T489	Weeping willow	C	Fell for development	5.3
T490	Birch	C	Fell for development	2.9
T491	Crab	C	Fell for development	4.8
T492	Weeping willow	C	Fell for development	6.6
T493	Oak	A+		10.6
T494	Oak	B+		8.8
T495	Holly	C		2.4
T496	Oak	A+		11.4
T497	Plum	C		1.8
T498	Holly	C		4.2
T499	Beech	C		2.4
T500	Beech	B+		8.2
T501	Oak	C		2.4
T502	Oak	B+		9.1
T503	Oak	B+		6.0
T504	Oak	B+		6.4
T505	Oak	B+		6.4
T506	Oak	B+		8.4
T507	Oak	B+		1.7
T508	Oak	B+		5.4
T509	Oak	B+		7.2
T510	Oak	B+		7.8
T511	Oak	B+		24.8
T512	Holly	C		3.0
T513	Beech	B		2.6
T514	Oak	B+		8.0
T515	Yew	B+		7.2
T516	Oak	B+		10.0
T517	Beech	C		3.6

Tree No	Species	Category	Tree Works	RPA radius (m)
T518	Sycamore	C		2.4
T519	Beech	C		3.2
T520	Yew	C		5.4
T521	Yew	C		6.6
T522	Beech	A+		7.8
T523	Beech	C		3.6
T524	Sycamore	C		3.0
T525	Beech	C		3.0
T526	Beech	C		3.6
T527	Beech	C		8.0
T528	Yew	B+		1.8
T529	Yew	B+		9.0
T530	Sycamore	C	Fell for development	4.9
T531	Sycamore	C	Fell for development	3.0
T532	Pittosporum	C	Fell for development	4.8
T533	Bay	C		5.5
T534	Bay	C		2.4
T535	Bay	C		3.4
T536	Yew	A+		13.2
T537	Sycamore	B+		9.1
T538	Birch	C		3.6
T539	Sycamore	C		3.6
T540	Yew	C		8.0
T541	Yew	C		8.0
T542	Sycamore	C	Fell for development	9.4
T543	Sycamore	C	Fell for development	9.4
T544	Sycamore	C	Fell for development	9.4
T545	Sycamore	C	Fell for development	9.4
T546	Sycamore	C	Fell for development	9.4
T547	Sycamore	C	Fell for development	9.4
T548	Sycamore	C	Fell for development	9.4
T549	Sycamore	C	Fell for development	9.4
T550	Sycamore	C	Fell for development	9.4
T551	Sycamore	C	Fell for development	9.4
T552	Sycamore	C	Fell for development	9.4
T553	Sycamore	C	Fell for development	9.4
T554	Sycamore	C	Fell for development	9.4
T555	Sycamore	C	Fell for development	9.4
T556	Sycamore	C	Fell for development	9.4
T557	Sycamore	C	Fell for development	9.4
T558	Sycamore	C	Fell for development	9.4
T559	Sycamore	C	Fell for development	9.4
T560	Sycamore	C	Fell for development	9.4
T561	Sycamore	C	Fell for development	9.4
T562	Sycamore	C	Fell for development	9.4
T563	Sycamore	C	Fell for development	9.4
T564	Sycamore	C	Fell for development	9.4
T565	Sycamore	C	Fell for development	9.4
T566	Sycamore	C	Fell for development	9.4
T567	Sycamore	C	Fell for development	9.4
T568	Sycamore	C	Fell for development	9.4
T569	Sycamore	C	Fell for development	9.4
T570	Sycamore	C	Fell for development	9.4
T571	Sycamore	C	Fell for development	9.4
T572	Sycamore	C	Fell for development	9.4
T573	Sycamore	C	Fell for development	9.4
T574	Sycamore	C	Fell for development	9.4
T575	Sycamore	C	Fell for development	9.4
T576	Sycamore	C	Fell for development	9.4
T577	Sycamore	C	Fell for development	9.4
T578	Sycamore	C	Fell for development	9.4
T579	Sycamore	C	Fell for development	9.4
T580	Sycamore	C	Fell for development	9.4
T581	Sycamore	C	Fell for development	9.4
T582	Sycamore	C	Fell for development	9.4
T583	Sycamore	C	Fell for development	9.4
T584	Sycamore	C	Fell for development	9.4

Tree No	Species	Category	Tree Works	RPA radius (m)
T585	Yew	B+		9.2
T586	Cherry	C		2.4
T587	Sycamore	C		2.4
T588	Oak	C		1.8
T589	Cherry	C		3.0
T590	Lime	B+		8.4
T591	Birch	C		2.4
T592	Birch	C		3.8
T593	Oak	C		3.6
T594	Yew	B+		6.0
T595	Beech	C		1.8
T596	Ash	C		1.8
T597	Ash	C		3.0
T598	Birch	C		2.4
T599	Oak	B+		6.4
T600	Holly	C		3.6
T601	Holly	C		3.6
T602	Birch	C		3.6
T603	Oak	B+		7.0
T604	Portuguese laurel	C		3.6
T605	Holly	C		2.4
T606	Holly	C		3.0
T607	Holly	C		3.0
T608	Hornbeam	C		2.4
T609	Rowan	C		1.8
T610	Sycamore	A+		6.0
T611	Lime	C		4.4
T612	Sycamore	C	Fell for development	1.8
T613	Birch	C	Fell for development	3.0
T614	Birch	C	Fell for development	3.0
T615	Birch	C	Fell for development	2.4
T616	Birch	C	Fell for development	2.4
T617	Birch	C	Fell for development	2.4
T618	Birch	C	Fell for development	2.4
T619	Birch	C	Fell for development	2.4
T620	Birch	C	Fell for development	2.4
T621	Birch	C	Fell for development	2.4
T622	Birch	C	Fell for development	2.4
T623	Birch	C	Fell for development	2.4
T624	Birch	C	Fell for development	2.4
T625	Birch	C	Fell for development	2.4
T626	Birch	C	Fell for development	2.4
T627	Birch	C	Fell for development	2.4
T628	Birch	C	Fell for development	2.4
T629	Birch	C	Fell for development	2.4
T630	Birch	C	Fell for development	2.4
T631	Birch	C	Fell for development	2.4
T632	Birch	C	Fell for development	2.4
T633	Birch	C	Fell for development	2.4
T634	Birch	C	Fell for development	2.4
T635	Birch	C	Fell for development	2.4
T636	Birch	C	Fell for development	2.4
T637	Birch	C	Fell for development	2.4
T638	Birch	C	Fell for development	2.4
T639	Birch	C	Fell for development	2.4
T640	Birch	C	Fell for development	2.4
T641	Birch	C	Fell for development	2.4
T642	Birch	C	Fell for development	2.4
T643	Birch	C	Fell for development	2.4
T644	Birch	C	Fell for development	2.4
T645	Birch	C	Fell for development	2.4
T646	Birch	C	Fell for development	2.4
T647	Birch	C	Fell for development	2.4
T648	Birch	C	Fell for development	2.4
T649	Birch	C	Fell for development	2.4
T650	Birch	C	Fell for development	2.4
T651	Birch	C	Fell for development	2.4
T652	Birch	C	Fell for development	2.4
T653	Birch	C	Fell for development	2.4
T654	Birch	C	Fell for development	2.4

Species	Category	Tree Works	RPA radius (m)
Sycamore	C	Fell for development	1.8
Holly	C	Fell for development	1.8
Sycamore	C	Fell for development	4.2
Camellia sp	C	Fell for development	3.4
Holly	C		1.2
Hazel	C	Fell for development	1.2
Hazel	C	Fell for development	1.9
Birch	B		5.2
Coast redwood	A+		15.0
Holly	C		4.8
Holly	C	Fell for development	3.0
Hazel	C	Fell for development	1.8
Sycamore	C	Fell for development	3.6
Sycamore	C	Fell for development	4.2
Lawson cypress	C	Fell for development	3.0
Hazel	C	Fell for development	1.5
Sycamore	C	Fell for development	4.2
Lawson cypress	C	Fell for development	5.4
Sycamore	C		3.0
Oak	A+		13.8
Cherry	C		1.4
Coast redwood	A+		16.3
Ash	C		6.7
Beech	B		6.5
Cherry	B		3.4
Ash	C		2.8
Yew	C		3.8
Decidur cedar	B+		10.8
Yew	C		3.6
Holly	C		2.4
Oak	B		8.8
Acacia	C		2.4
Oak	B+		8.4
Horse chestnut	A+		7.8
Oak	B+		10.8
Ash	C		3.8
Oak	B+		9.8
Ash	C		2.4
Oak	B+		9.8
Yew	C		6.0
Oak	C		6.0
Oak	C		4.8
Oak	A+		13.1
Ash	C		1.8
Oak	C		6.0
Beech	C		1.8
Oak	B+		7.8
Oak	C		6.6
Oak	C		6.6
Yew	B+		7.9
Hawthorn	C		2.4

Manual for managing trees on development sites



Introduction and index

This manual is a compilation of individual Site Guidance Notes (SGNs) created to help manage trees effectively on development sites. Each SGN deals with a specific issue that can arise during development and is structured into three main sections; a concise summary at the beginning in the form of a bulleted list for operatives carrying out the work; further explanations and photographic examples to supplement the bulleted list; and, a summary of the published technical reference guidance.

This general guidance is intended to supplement, not substitute, detailed specifications for work, providing a broad overview of key considerations to be applied to any work near retained trees.

This document is only a summary of its subject matter. You should not rely on this general guidance in isolation, and you should always seek detailed advice from an appropriate expert in relation to specific circumstances before any action is taken or refrained from.

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Monitoring tree protection

SGN



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Summary guidance for site operatives

Monitoring tree protection

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Carry out supervision under the normal site risk assessment procedures and comply with the wider site safety rules.

Monitoring framework

- Appoint a supervising arboriculturist to monitor tree protection.
- The supervising arboriculturist, a developer's representative, and a local planning authority (LPA) representative, will attend a pre-commencement meeting before construction work starts.
- The supervising arboriculturist will visit to check the tree protection.
- Additionally, the supervising arboriculturist will visit, as necessary, to advise on emerging tree protection issues.
- Circulate written records of monitoring to relevant parties.

Important reminders

- The locations of fencing and ground protection, and precautionary areas, will not be altered without prior approval of the supervising arboriculturist.
- Fencing and ground protection will not be removed at the end of construction without prior approval of the supervising arboriculturist.

Explanatory notes and examples

Monitoring tree protection

Purpose

SGN 1 describes the practical requirements for monitoring tree protection throughout the construction process, based on the recommendations in *BS 5837* (6.1, 6.2, and 6.3).



General principles and clarifications

A pre-commencement meeting will be held on site before any of the site clearance and construction work begins. This would normally be attended by the site manager, the supervising arboriculturist, and a LPA representative. If a LPA representative cannot attend, the supervising arboriculturist will inform the LPA in writing of the details of the meeting.

All tree protection measures described in the arboricultural method statement will be

fully discussed so that their implementation and sequencing are understood by all the parties. This will include agreeing the form and location of the most appropriate combination of fencing and ground protection to be used as barriers for the construction exclusion zone.

Any agreed clarifications or modifications to the consented details will be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection will be agreed and finalised, which will then form

Explanatory notes and examples

Monitoring tree protection

the basis of any supervision arrangements between the supervising arboriculturist and the developer.

Once the site is active, the supervising arboriculturist will visit at an interval agreed at the pre-commencement site meeting. This would normally be every two to four weeks for general supervision, but could be at a longer interval, if agreed between the parties. The supervision arrangement will be sufficiently flexible to allow the supervision of all sensitive works as they occur. The supervising arboriculturist's initial role is to liaise with the developer and the LPA to ensure that protective

measures are fit for purpose and in place before any works start on site. Once the site is working, that role will switch to monitoring compliance with arboricultural planning conditions and advising on any tree problems that arise or modifications that become necessary.

No agreed protective fencing or ground protection will be altered or removed without prior approval of the supervising arboriculturist. This particularly applies to removal at the end of the construction activity and the final landscaping because there is a high risk of inadvertent harm to trees during these finishing stages.



Technical references

Monitoring tree protection

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clauses 6.1 (Arboricultural method statement), 6.2 (Barriers and ground protection), and 6.3 (Site monitoring), recommend:

- 6.1.1 Adopt a precautionary approach towards tree protection and describe operations within RPAs in an arboricultural method statement to demonstrate that there is a minimal risk of adverse impact on trees.
- 6.1.2 The arboricultural method statement should include an auditable system of arboricultural site monitoring, including a schedule of specific site events requiring input or supervision.
- 6.2.1.3 The protected area is sacrosanct. Fencing and ground protection should not be removed or altered unless agreed by the supervising arboriculturist.
- 6.3 There should be an auditable system of site monitoring for trees to be retained, which should extend to arboricultural supervision whenever construction activity could affect RPAs.

Fencing protected trees

SGN

2



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Summary guidance for site operatives

Fencing protected trees

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).

Important reminders

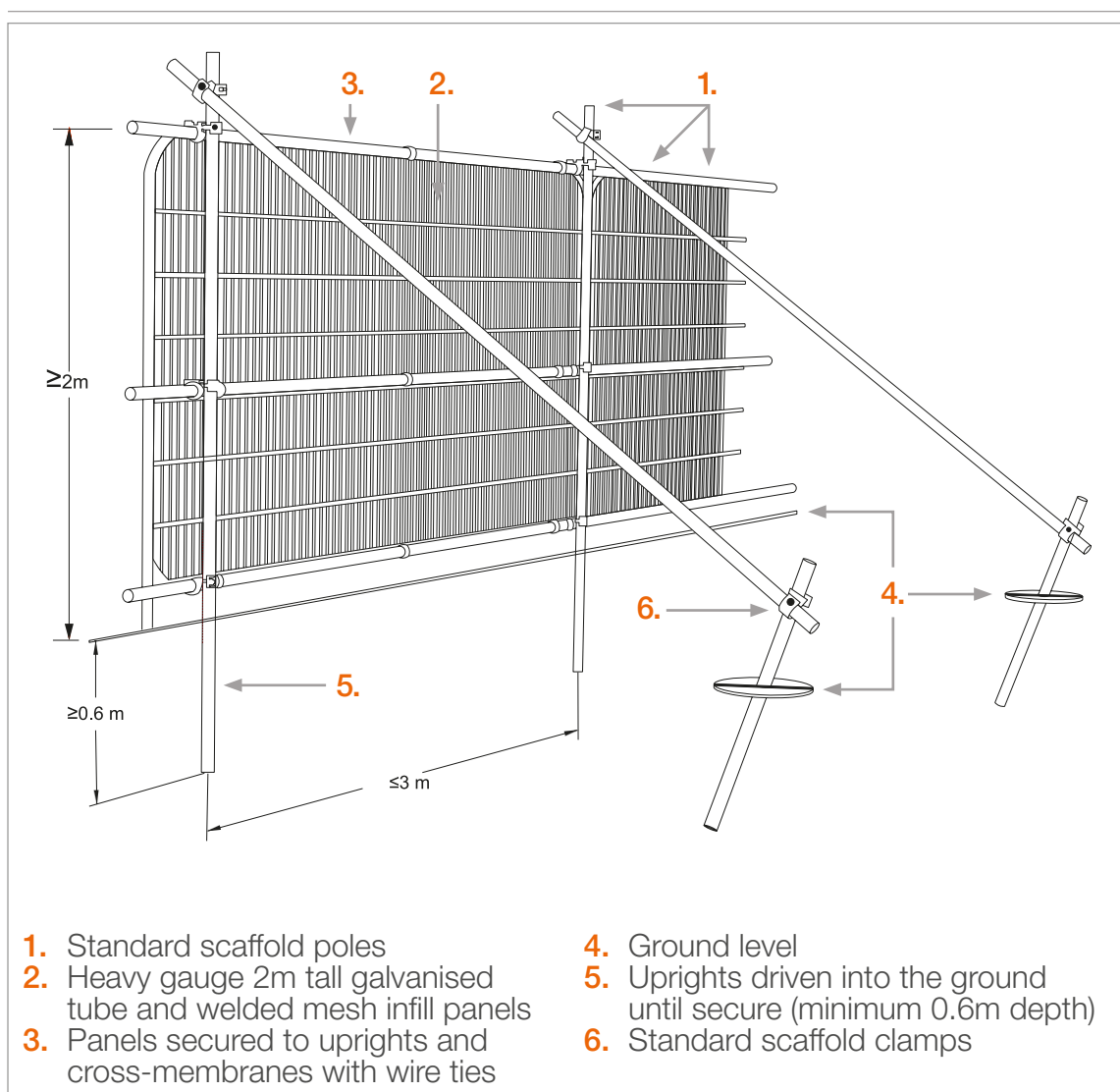
- Fencing will be fit for purpose, i.e. prevent unauthorised incursions and activities within RPAs.
- Fencing will be installed at the locations shown on the tree protection plan.
- Fencing locations will not be altered without prior approval of the supervising arboriculturist.
- Fencing will not be removed at the end of the construction activity without prior approval of the supervising arboriculturist.

Explanatory notes and examples

Fencing protected trees

Purpose

SGN 2 describes where the temporary protective fencing will be installed, what form it can take and how long it should remain in place to effectively protect the RPAs of trees to be retained, based on the recommendations in *BS 5837* (6.2 and 7.3).



SNG 2-01

Protective fencing recommendations taken from figure 2 of *BS 5837*.

Explanatory notes and examples

Fencing protected trees

General principles and clarifications

The fencing will be installed at the locations shown on the tree protection plan and agreed by the local planning authority before any construction activity starts on site. It will remain in place until there is no risk of harm from the development activity.

No fencing will be moved from its agreed location, removed, or temporarily dismantled, without consulting the supervising arboriculturist. Furthermore, the condition of the fencing will be regularly monitored by the supervising arboriculturist to ensure it remains fit for purpose, i.e. sufficient to prevent unauthorised access or activities within the RPAs of retained trees.

The minimum specification for the fencing will be as shown in figure 2 of *BS 5837*, or an equivalent design that effectively restricts access to the RPAs it protects. The precise form of the fencing can vary, provided it is fit for purpose. More specifically, behind the fencing, there will be no unauthorised vehicular access; no repeated pedestrian access; no fires; no storage of excavated debris, building materials, chemicals, or fuels; no mixing of cement; no service installation or excavation; no raising or lowering of soil levels; and no excessive cultivation for landscape planting.

Any variations to these restrictions will be agreed by the supervising arboriculturist.



SGN 2-02

Heras fencing wired to scaffold braced posts is a robust and effective interpretation of the BS specification.

Explanatory notes and examples

Fencing protected trees



SGN 2-03

Board specification on secure wooden posts is a suitable alternative to the standard braced scaffold design.



SGN 2-04

Boards following the line of existing hard standing, enclosing the vulnerable RPA within the fencing.



SGN 2-05

An alternative to dug supports is concrete blocks set outside the RPA.

Explanatory notes and examples

Fencing protected trees



SGN 2-06

Improvised use of drainage pipe wrapped around the trunk can provide an added layer of protection beneath a layer of plywood.



SGN 2-07

Boards attached to a supporting framework surrounding the trunk reduces the risk of accidental impact.



SGN 2-08

A wood frame around the trunk can be used to support a plywood surround.

Explanatory notes and examples

Fencing protected trees



SGN 2-09

An innovative use of plywood and accommodation cabins to protect the trunk and roots of this retained tree.



SGN 2-10

Scaffold and boards can be installed around trees that have to be retained within working areas.

Explanatory notes and examples

Fencing protected trees



SGN 2-11

Boxing in trunks provides effective protection, even in the tightest of situations, along with the retention of existing hard surfacing to protect the RPA.



SGN 2-12

If street trees could be harmed during development, they should also be protected even though they may be off site.



SGN 2-13

BS 5837 recommends warning signs are attached to fencing as a reminder of the restrictions within the RPA.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations: Clauses 6.2 (Barriers and ground protection) and 7.3 (Tree protection during development) recommend:

- 6.2.1.1 All retained trees should be protected by fencing and ground protection before any demolition, development, or soil stripping starts.
- 6.2.1.3 The protected area is sacrosanct. Fencing and ground protection should not be removed or altered unless agreed by the supervising arboriculturist.
- 6.2.1.5 The supervising arboriculturist should confirm that the tree protection has been installed as agreed before any significant site work starts.
- 6.2.2.1 The tree protection should be fit for purpose, i.e. preventing inappropriate work in the RPAs of retained trees, and be maintained to remain rigid and complete.
- 7.3.2 Where structures are to be removed from RPAs, fencing and ground protection should be installed up to the edge of the structure to protect the underlying soil.

Ground protection

SGN

3



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Summary guidance for site operatives

Ground protection

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).

Important reminders

- Ground protection will be fit for purpose, i.e. prevent damage to the underlying soil and roots in RPAs.
- Ground protection will be installed at the locations shown on the tree protection plan.
- Ground protection locations will not be altered without prior approval of the supervising arboriculturist.
- Where feasible, retain existing hard standing to act as ground protection.
- Ground protection will not be removed at the end of construction without prior approval of the supervising arboriculturist.

Purpose

SGN 3 describes where ground protection will be installed, what form it can take, and how long it should remain in place to effectively protect trees to be retained, based on the recommendations in *BS 5837 (6.2 and 7.3)*.



General principles and clarifications

Ground protection is an effective means of preventing damage to the RPAs of retained trees during development activity. In practice, a range of approaches can be used, including retaining existing hard surfacing or structures that already protect the soil, installing new materials, or a combination of both. Whatever the chosen option, the result will be that the underlying soil (rooting environment) remains undisturbed and retains the capacity to support existing and new roots.

Ground protection will be installed at the locations shown on the tree protection plan and agreed by the local planning authority before any construction activity starts on site. It will remain in place until there is no risk of harm from the development activity. No ground protection will have its location changed or be removed without consulting the supervising arboriculturist. Furthermore, the condition of the ground protection will be regularly monitored to ensure it remains fit for purpose, i.e. sufficient to prevent damage to the RPAs of retained trees.

Explanatory notes and examples

Ground protection



SGN 3-01

Metal plates and heavy plywood cover this entire area while the piles are being installed and the building is constructed above the RPA.



SGN 3-02

Heavy-duty plywood set onto a compressible woodchip layer and pinned into position is suitable to spread the loading from pedestrian access.



SGN 3-03

ArborRaft is very effective on flat areas to spread load and reduce compaction. Its main benefits over other cellular products are that there is no need to fill it with stone, which saves costs, and it is reusable. The UK supplier is Wrekin Products: wrekinproducts.com

Explanatory notes and examples

Ground protection



SGN 3-04

Plywood fixed to a wood frame is another effective method of protecting soil from pedestrian compaction.



SGN 3-05

A scaffold framework attached to the main scaffold fencing can be used to support either scaffold planks or plywood to create an elevated platform with a gap beneath.



SGN 3-06

Cellular products are a very effective means of providing ground protection where heavy vehicle use is expected. Here, it is being used to temporarily widen an existing road, to be removed once the construction is finished.

Explanatory notes and examples

Ground protection



SGN 3-07

Custom designed sectional metal tracks can be joined to support very heavy traffic use through sensitive areas.



SGN 3-08

Ground protection must be used where repeated pedestrian traffic could cause compaction in sensitive RPAs. It can be as simple as plywood, pinned to the ground, or custom designed plates that interlock to spread the load.



SGN 3-09

A combination of retaining existing surfacing and using temporary construction cabin accommodation can be a very effective means of preventing damage to sensitive areas.

Explanatory notes and examples

Ground protection



SGN 3-10

Steel plates can be an effective way of temporarily reinforcing weak surfacing over a construction access during the development activity.



SGN 3-11

A temporary concrete slab cast directly over existing low load bearing surfacing is an effective way of ensuring that the soil beneath is protected from compaction during development. This is removed once the heavy use is finished.



SGN 3-12

Temporary concrete slabs on slopes are an effective way of preventing soil damage during the transport of materials on and off site.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations: Clauses 6.2 (Barriers and ground protection) and 7.3 (Tree protection during development) recommends:

- 6.2.1.1 All retained trees should be protected by fencing and ground protection before any demolition, development, or soil stripping starts.
- 6.2.1.3 The protected area is sacrosanct. Fencing and ground protection should not be removed or altered unless agreed by the supervising arboriculturist.
- 6.2.1.5 The supervising arboriculturist should confirm that the tree protection has been installed as agreed before any significant site work starts.
- 6.2.3.1 Where deemed appropriate by the project arboriculturist, protective fencing can be set back and the RPA protected with ground protection. Where feasible, existing hard surfacing scheduled for removal should be retained to act as temporary ground protection during construction.
- 6.2.3.2 If the set-back exposes unmade ground, new temporary ground protection should be installed as part of the tree protection measures before site works start.
- 6.2.3.3 New temporary ground protection should support all anticipated loading and prevent compaction in the RPA.
- 6.2.3.4 The location and design of ground protection should be shown on the tree protection plan and detailed within the arboricultural method statement.

- 6.2.3.5 The objective of ground protection is to avoid soil compaction and prevent adverse impacts on tree root function.
- 7.3.2 Where structures are to be removed from RPAs, fencing and ground protection should be installed up to the edge of the structure to protect the underlying soil.
- 7.3.3 All demolition plant should either operate outside the RPA, or run on ground protection installed before demolition starts.

Pollution control

SGN

4

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Summary guidance for site operatives

Pollution control

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Manage pollution control under the normal site risk assessment procedures and comply with the wider site safety rules.
- Where a significant risk of root protection area (RPA) contamination is identified, put pollution control measures in place to manage that risk.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).

Important reminders

- Make provision for emergency spillage clean-up.
- Mix cement and wash vehicles as far away from RPAs as possible.
- Use bunding and impermeable membranes to prevent liquid contaminants reaching RPAs.
- Use impermeable membranes to prevent leachates from poured concrete contaminating RPAs.
- Keep pollution control measures in place until there is no significant risk of RPA contamination.

Explanatory notes and examples

Pollution control

Purpose

SGN 4 describes why pollution control is necessary, what form it will take, and how long it will remain in place to effectively protect retained trees, based on the recommendations in *BS 5837 (5.5, 6.2.4, 7.4, 7.5, and A.2)*.

General principles and clarifications

Pollution control is intended to prevent pollutants contaminating RPAs and it will be necessary wherever risk assessment identifies a significant risk of harm arising from this cause. Spilt solid or liquid chemicals that reach RPAs can kill existing roots and may prevent new roots growing, so provision will be made to minimise the risk of soil contamination within the normal risk management protocols for the site. If identified as necessary in the risk assessment process, pollution control measures will include physical means of containing spillages and procedures for clearing them up if they occur.

All cement mixing and vehicle washing points will be located outside RPAs, with provision to contain any spillages. Where the contours of the site create a risk of polluted water or toxic liquids running into RPAs, a precautionary measure of bunding or a frame, sealed with heavy-duty plastic sheeting sufficient to prevent contamination, will be used to contain accidental spillages. Where wet concrete is poured within RPAs, an impermeable liner will be used to prevent contamination of the soil from any leachate. Pollution control measures will remain in place until there is no significant risk of RPA contamination.

Explanatory notes and examples

Pollution control



SGN 4-01

The storage of fuels or any toxic chemicals is not permitted in RPAs.



SGN 4-02

Where fuel or other chemicals are stored on site, risk assessment will be carried out to identify if emergency spillage kits are needed to restrict the environmental impact of accidents.



SGN 4-03

Soil bunding or a supporting framework covered in heavy-duty plastic sheeting will be installed where there is a risk of spillages contaminating RPAs. This specifically applies to cement mixing areas and vehicle washing facilities.

Explanatory notes and examples

Pollution control



SGN 4-04

Cement washings are toxic to plants and must be contained in a way that prevents contamination of adjacent RPAs.



SGN 4-05

The leachate from poured wet concrete is toxic to plants and must be prevented from contaminating RPAs by using an impermeable membrane to stop any leakage into the soil.



SGN 4-06

When pouring wet concrete in RPAs, methods must be used to prevent spillage and contamination beyond the installation.

Explanatory notes and examples

Pollution control

**SGN 4-07**

Impermeable liners must be used to prevent contamination of the RPA from the leachate that originates from poured concrete.

**SGN 4-08**

Even small chemical spillages can harm trees, so provision must be made to capture all leakages at the point of storage.

Technical reference

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clauses 5.5 (Tree protection plan), 6.2.4 (Additional precautions outside the exclusion zone), 7.4 (Permanent hard surfacing within the RPA), 7.5 (Special engineering for foundations within the RPA), and A.2 (Avoiding damage to trees), recommend:

- 5.5.6 To avoid contamination from pollutants, account should be taken of the effects of slope on the movement of potentially harmful liquid spillages towards RPAs.
- 6.2.4.3 Materials that could harm trees should be stored and handled well away from RPAs.
- 7.4.4.5 Concrete should not be poured within RPAs unless an impermeable liner has been installed to prevent contamination by the highly alkaline leachate.
- 7.5.5 Pile type should be selected to minimise the potentially toxic effects of uncured concrete, e.g. sleeved bored pile or screw pile.
- A.2.1 Care should be taken to avoid accumulating adverse impacts on retained trees from materials such as uncured concrete, diesel oil, and vehicle washings.

Site cranes and piling rigs

SGN

5



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Summary guidance for site operatives

Site cranes and piling rigs

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.

Other relevant SGNs

- Monitor works in root protection areas (RPAs) by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).

Important reminders

- Programme fixed site cranes to automatically avoid contact with retained trees or instruct operatives to do so manually.
- Use a banksman to ensure that mobile cranes and piling rigs moving around the site do not hit retained trees.
- Where necessary, create working space during demolition by facilitation access pruning and tying back branches, as specified by the supervising arboriculturist.

Explanatory notes and examples

Site cranes and piling rigs

Purpose

SGN 5 describes the precautions that will be taken to prevent damage to branches during the installation, use, and removal of fixed and mobile site cranes, and mobile piling rigs, near retained trees, based on the recommendations in *BS 5837* (5.5, 6.2.4, 7.3, and 7.5).



General principles and clarifications

Site cranes can be permanently fixed on site for the duration of the development activity or temporarily brought on to site for specific lifting tasks. Both fixed position and mobile cranes can damage branches and trunks by physically hitting them with the machine and the loads being moved.

Where possible, permanent site cranes will be automatically programmed to avoid retained trees. If programming is not possible, operatives will be trained to avoid retained trees through

the normal site risk management procedures. Mobile cranes and piling rigs will normally be kept away from protected trees by fencing.

However, if low branches extend over the fencing, damage to the tree will be avoided by either facilitation pruning or manually tying them clear of the work area, as specified by the supervising arboriculturist. All movement of mobile plant near trees with branches that extend beyond the fencing will be overseen by a banksman to ensure that there is no contact.

Explanatory notes and examples

Site cranes and piling rigs



SGN 5-01

Where possible, fixed-position cranes should be programmed to automatically avoid retained trees. If that is not possible, operatives should be trained to avoid retained trees as part of the normal site risk management procedures.



SGN 5-02

Access for any plant near trees will be restricted by protective fencing. However, where branches extend over fencing and there is a risk of damage from mobile cranes, operatives should be briefed to avoid them and be guided around the site by a banksman.



SGN 5-03

Loads can be lifted around the site over and around trees, but operatives should be briefed to avoid contact with tree crowns.

Explanatory notes and examples

Site cranes and piling rigs



SGN 5-04

Care should be taken to avoid damaging retained trees during the installation and dismantling of fixed-position site cranes.



SGN 5-05

Tall piling rigs have the potential to damage branches up to 20m off the ground and so protective fencing should be used to prevent this where such rigs are used.



SGN 5-06

Facilitation pruning to reduce the length of branches extending over fencing or tying long branches back are ways to prevent damage by piling rigs.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clauses 5.5 (Tree protection plan), 6.2.4 (Additional precautions outside the exclusion zone), 7.3 (Tree protection during demolition), and 7.5 (Special engineering for foundations within the RPA), recommend:

- 5.5.6 To avoid damage to retained tree crowns, working space for cranes, plant, scaffolding and access should be allowed for.
- 6.2.4.1 Planning of site operations should account for wide loads, tall loads and plant with booms, jibs and counterweights (including drilling rigs) to prevent them hitting retained trees. Adequate clearance from trees should be maintained by using a banksman when using plant near trees.
- 7.3.1 If necessary, access facilitation pruning or temporarily tying branches back should be carried out to provide working space during demolition. A pruning or tying specification should be prepared by an arboriculturist.
- 7.5.5 Where piles are to be installed in RPAs, the smallest practical pile diameter should be used because it reduces the size of the rig.

Height restrictions

SGN

6



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Summary guidance for site operatives

Height restrictions

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.

Other relevant SGNs

- Monitor works in root protection areas (RPAs) by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).

Important reminders

- Restrict the height of vehicles entering controlled areas using a height bar above the entrance.

Purpose

SGN 6 describes the precautions that will be taken to prevent damage to branches of retained trees from high vehicles, based on the recommendations in *BS 5837* (5.5, 6.2.4, 7.3, and 7.5).

General principles and clarifications

Access will be limited at the entrance point to routes with low branches using a height restriction

bar above the entrance, with an implication that materials will be unloaded outside sensitive areas and moved with smaller vehicles.



SGN 6-01

This temporary access through a woodland was height-restricted to preserve low branches that formed important screening of the new building from outside the site.



SGN 6-02

Height restriction bars are commonly used on urban sites to prevent accidental damage to low branches.

Technical references

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. **BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations:** Clauses 5.5 (Tree protection plan), 6.2.4 (Additional precautions outside the exclusion zone), 7.3 (Tree protection during demolition), and 7.5 (Special engineering for foundations within the RPA), recommend:
 - 5.5.6 To avoid damage to retained tree crowns, working space for cranes, plant, scaffolding and access should be allowed for.
 - 6.2.4.1 Planning of site operations should account for wide loads, tall loads and plant with booms, jibs and counterweights (including drilling rigs) to prevent them hitting retained trees. Adequate clearance from trees should be maintained by using a banksman when using plant near trees.
 - 7.3.1 If necessary, access facilitation pruning or temporarily tying branches back should be carried out to provide working space during demolition. A pruning or tying specification should be prepared by an arboriculturist.
 - 7.5.5 Where piles are to be installed in RPAs, the smallest practical pile diameter should be used because it reduces the size of the rig required, which reduces the reliance on ground protection and any access facilitation pruning.

Excavation in root protection areas

SGN



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Summary guidance for site operatives

Excavation in root protection areas

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Additional guidance on excavating to install services is provided in *SGN 11 Installing services in root protection areas*.

Important reminders

- Excavate using specialised compressed air tools or hand tools such as forks and spades, with a preference for air tools.
Note: Do not mechanically excavate.
- If using hand tools, avoid accidental bark damage by using a fork to loosen the soil to help locate any substantial roots.
- Use a smaller tool such as a trowel to clear the soil away from roots without damaging the bark.
- Remove soil/material from the excavation without disturbing the adjacent rooting environment.
- Retain flexible clumps of smaller fibrous roots if they can be displaced temporarily or permanently beyond the excavation without damage.

Summary guidance for site operatives

Excavation in root protection areas

- Cut exposed roots to be removed cleanly 10–20cm behind the final face of the excavation.
- Protect roots temporarily exposed, but to be retained, from direct sunlight, drying out, and extremes of temperature, by appropriate covering such as dampened hessian sacking and/or boards over the hole.
- If necessary, individual roots and clumps of less than 2.5cm width will be cut cleanly without consulting the supervising arboriculturist.
- Retain individual roots and clumps greater than 2.5cm in width where possible and only cut if agreed with the supervising arboriculturist.
- When back-filling, place an inert granular material mixed with top soil or sharp sand around retained roots greater than 2.5cm in width before light compaction.

Explanatory notes and examples

Excavation in root protection areas

Purpose

SGN 7 describes the principles that will be applied to authorised excavation in RPAs, based on the recommendations in *BS 5837* (7.2), and the guidance in *NJUG* (4.1).

General principles and clarifications

Excavation can adversely affect retained trees through direct damage to roots and destructively disturbing the rooting environment. However, some trees can tolerate limited amounts of excavation if the work is carried out carefully and the disturbance is kept to a minimum. The amount of disturbance that an individual tree can tolerate depends on factors such as tree species, health, age, and the growing conditions. These are all matters that will be assessed by an experienced and qualified arboriculturist.

Unless otherwise agreed by the supervising arboriculturist, all excavation will be carried out using hand tools, and the preferred method will be by compressed air soil displacement. If the compressed air option is not available, hand digging will be acceptable. Whatever the method of digging, the priority will be to remove soil without damaging the bark and wood of significant woody roots. If individual roots or clumps are discovered, those less than 2.5cm width can be cut

cleanly without consultation with the supervising arboriculturist. Individual roots and clumps greater than 2.5cm width will be retained where possible and only cut after agreement by the supervising arboriculturist.

All soil removal must be done with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of smaller fibrous roots should be retained if they can be displaced temporarily or permanently beyond the excavation without damage. If hand digging, a fork should be used to loosen the soil and help locate any substantial roots. Once roots have been located, the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots to be removed should be cut cleanly with a sharp saw or secateurs 10–20cm behind the final face of the excavation. Roots temporarily exposed, but to be retained, will be protected from direct sunlight, drying out and extremes of temperature by appropriate covering such as dampened hessian sacking.

Explanatory notes and examples

Excavation in root protection areas



SGN 7-01

Conventional trench installation of services damages tree roots and is not permitted in RPAs.



SGN 7-02

All excavation in RPAs should be with hand-held tools. Where possible, there will be a preference to use air tools because they are very effective at exposing roots and services with minimal damage.



SGN 7-03

Air tools are particularly useful where roots are very dense.

Explanatory notes and examples

Excavation in root protection areas



SGN 7-04

Conventional hand tools such as spades and forks should be used where surfacing is so hard and compacted that it is not possible to use air tools.



SGN 7-05

These cobbles and the sub-surface were so compacted that hand tools had to be used to loosen and then remove the material around the roots before replacing with a more favourable rooting medium.



SGN 7-06

Individual roots and clumps greater than 2.5cm in width should be retained undamaged, unless cutting is authorised by the supervision arboriculturist.

Explanatory notes and examples

Excavation in root protection areas



SGN 7-07

Once roots have been located with a fork, a smaller tool such as a trowel should be used to clear soil from around the root to avoid damaging bark and wood.



SGN 7-08

Exposed roots to be retained should be protected from light, drying out, and extremes of temperature, by covering with hessian sacking and/or boards until they can be covered back with soil.



SGN 7-09

Where roots to be retained will be exposed for longer than a few hours and there is a risk of drying out, the hessian covering should be kept damp by watering.

Explanatory notes and examples

Excavation in root protection areas



SGN 7-10

Where roots have to be removed, they should be cut cleanly beyond the face of the excavation with secateurs or a saw.



SGN 7-11

Where large amounts of soil are excavated to expose roots, it should be temporarily stored on heavy duty plywood boards, or similar, to prevent ground compaction to the RPA beneath.



SGN 7-12

Excavation by machines is not permitted in RPAs.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clause 7.2 (Avoiding physical damage to the roots during demolition or construction) recommends:

- 7.2.1 Other than for piling, existing ground levels in RPAs should not be disturbed. However, limited manual excavation might be acceptable if it is done carefully, using hand-held tools and preferably by compressed air soil displacement, subject to justification.
- 7.2.2 Exposed roots should be protected to prevent desiccation and temperature changes, and the excavation backfilled as soon as possible after the protection has been removed.
- 7.2.3 Individual roots and clumps of less than 25mm width can be pruned without further consultation, if necessary, making a clean cut. Roots and clumps greater than 25mm in width should only be cut if agreed by the supervising arboriculturist.
- 7.2.4 Backfill around retained roots should be with topsoil or uncompacted sharp sand, or other loose inert granular fill.

2. National Joint Utilities Group (NJUG) *Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2: Section 4.1 (How to avoid damage to trees – Below ground)* advises:

- “4.1.3 Realignment: Whenever possible apparatus should always be diverted or re-aligned outside the Prohibited or Precautionary Zones. Under no circumstances can machinery be used to excavate open trenches within the Prohibited Zone. Where works are required for the laying or maintenance of any apparatus within the Prohibited or Precautionary Zones there are various techniques available to minimise damage.

Acceptable techniques in order of preference are;

a) Trenchless: Wherever possible trenchless techniques should be used. The launch and reception pits should be located outside the Prohibited or Precautionary Zones. In order to avoid damage to roots by percussive boring techniques it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the equipment with materials other than water (e.g. oil, bentonite, etc.) must not be used when working within the Prohibited Zone. Lubricating materials other than water may be used within the Precautionary Zone following consultation and by agreement.

b) Broken Trench – Hand-dug: This technique combines hand dug trench sections with trenchless techniques if excavation is unavoidable. Excavation should be limited to where there is clear access around and below the roots. The trench is excavated by hand with precautions taken as for continuous trenching as in (c) 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 and outside of the Prohibited Zone.

c) Continuous Trench – Hand-dug: The use of this method must be considered only as a last resort if works are to be undertaken by agreement within the Prohibited Zone. The objective being to retain as many undamaged roots as possible.”

Removing surfacing and structures in root protection areas

SGN



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Summary guidance for site operatives

Removing surfacing and structures in root protection areas

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Minimise excavation into original undisturbed soil (See *SGN 7 Excavation in root protection areas*).

Important reminders

- Manually break up and remove debris from the RPA using appropriate tools, e.g. pneumatic breaker, crow bar, sledgehammer, pick, mattock, shovel, spade, trowel, fork, and wheelbarrow. Have secateurs and a handsaw available to cut exposed roots to be removed.
- Remove debris from the RPA without disturbing the adjacent rooting environment, e.g. lifting out with a machine located outside the RPA or manually carry out over ground protection.
- Where appropriate, use machines with a long reach if they can work from outside RPAs, or from protected areas within RPAs without encroaching onto unprotected soil.
- Where appropriate, leave below ground structures in place if their removal will cause excessive RPA disturbance.

Purpose

SGN 8 describes the practical requirements for removing surfacing and structures in RPAs, based on the recommendations in *BS 5837 (7.3)*.

General principles and clarifications

For the purposes of this guidance, the following broad definitions apply:

- **Surfacing:** Any hard surfacing used as a vehicular road, parking, or pedestrian path, including tarmac, solid stone, crushed stone, compacted aggregate, concrete, and timber decking. This does not include compacted soil with no hard covering.
- **Structures:** Any man-made structure above or below ground including service pipes, walls, gate piers, buildings, and foundations. Typically, this would include drainage structures, car-ports, bin stores, and concrete slabs supporting buildings.

In principle, roots frequently grow adjacent to and beneath existing surfacing and structures, so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and/or the

compaction of soil around them from the weight of machinery or repeated pedestrian passage. This is not generally a problem while surfacing and structures remain in place because they spread the load on the soil beneath and further protective measures are not normally necessary. However, once that protection is removed and the soil below is exposed, the potential for damage to roots becomes an issue.

Careful consideration should be given to retaining structures and surfacing in place, if that will result in less disturbance to retained roots. For example, if a new wall needs to be constructed on the footprint of an existing wall, it might be better to retain the original footing and build on that, rather than remove it and install a new footing.

In summary, there should be no vehicular or repeated pedestrian access unless existing ground protection is retained or new protective measures are installed. All exposed RPAs must be protected until there is no further risk of damage.

Explanatory notes and examples

Removing surfacing and structures in root protection areas



SGN 8-01

Machines with a long reach can be used to lift out heavy surfacing and structures if the machine sits outside the RPA and the exposed surface is protected before there is any further access.



SGN 8-02

Careful lifting of cemented-in sets round this tree allowed them to be re-laid on a permeable sand base, improving the water input into the soil around the trunk.



SGN 8-03

These trees had impermeable surfacing right up to their trunks, which had to be removed by hand before installing new structures.

Explanatory notes and examples

Removing surfacing and structures in root protection areas



SGN 8-04

This old concrete footing close to a large mature tree was retained, thus avoiding excessive disturbance of roots below it.



SGN 8-05

The RPAs for the retained trees around the boundary are protected by a combination of fencing and ground protection.



SGN 8-06

If structures are firmly incorporated into roots, it may be best to leave them in place rather than attempt to remove them and irreversibly damage the tree.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clause 7.3 (Tree protection during demolition) recommends:

- 7.3.2 RPAs up to the edge of structures to be removed should be protected.
- 7.3.3 Demolition plant should either operate outside the RPA or run on ground protection installed before work starts.
- 7.3.4 Demolition of buildings near retained trees should be done inwards within the footprint of the existing building.
- 7.3.5 Where possible, and after consultation with the supervising arboriculturist, it is preferable to leave redundant structures in RPAs to avoid damage to tree roots.
- 7.3.6 Existing surfacing should be removed with care and any machine should work backwards over the area to prevent damage to any exposed RPA. It is preferable to leave any existing sub-base in situ if new surfacing is to be laid.

Installing/upgrading surfacing in root protection areas

SGN



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Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in root protection areas (RPAs) by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Follow the guidance in *SGN 4 Pollution control*, if concrete is poured within or near RPAs.
- Minimise excavation into original undisturbed soil (See *SGN 7 Excavation in root protection areas*).
- Follow the guidance in *SGN 8 Removing surfacing and structures in root protection areas*, if existing surfacing is to be removed before installing new surfacing.
- Follow the guidance in *SGN 10 Installing structures in root protection areas*, if the surfacing is to be installed on supports, i.e. piles, pads, or posts.

Important reminders

- For ground without existing surfacing, remove any loose material at the soil surface by hand and do not excavate into existing soil levels unless approved by the supervising arboriculturist.

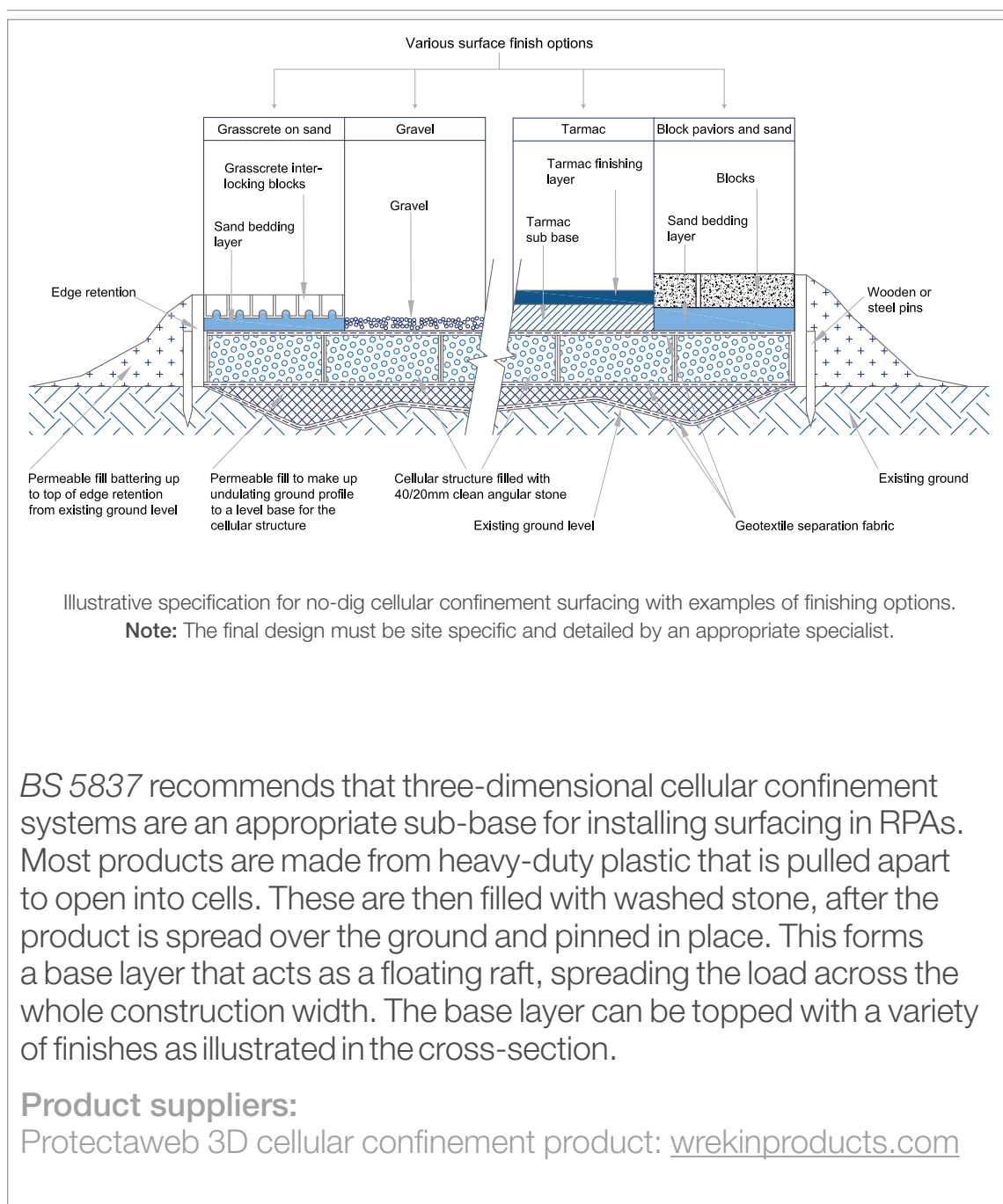
Summary guidance for site operatives

Installing/ upgrading surfacing in root protection areas

- For ground with a vegetation layer, excavations may be appropriate to remove the turf layer and surface vegetation, but this must be agreed by the supervising arboriculturist.
- All new surfacing must be set back from trunks and buttress roots by at least 50cm, unless otherwise agreed by the supervising arboriculturist.
- Fill low points on undulating surfaces to an even level with any high points using an agreed granular material such as sand or stone.
- Do not mechanically compact new fill or existing soil.
- If a three-dimensional cellular confinement system is used, install it according to the manufacturer's technical specification.
Note: The cellular fill will be washed angular stone with no fines, as specified by the manufacturer.

Purpose

SGN 9 describes the practical requirements for installing new surfacing and upgrading existing surfacing in RPAs, based on the recommendations in *BS 5837* (7.4).



General principles and clarifications

Conventional surfacing installation based on excavating and compacting a supporting sub-base is unacceptable in RPAs because it can damage roots and the rooting environment. This harm is caused by killing roots, compacting soil structure, and impeding water/gaseous exchange through the soil. Adverse impact on trees will be reduced by minimising the extent of these changes in RPAs.

New surfacing solutions

Important elements of an effective design include protecting roots and the rooting environment during installation, a load spreading capability to prevent localised compaction, and providing adequate permeability for water and gasses to support living roots. The main approaches are:

- three-dimensional cellular confinement systems filled with washed stone laid directly onto the soil surface;
- concrete slabs cast directly onto the soil surface; and,
- surfacing supported above the soil surface on top of piles, pads, or posts.

The specific design of the chosen approach is an engineering issue that will take account of the bearing capacity of the soil, the intended loading, and the frequency of loading. The detail of product and specification are technical matters to be provided by an appropriate specialist.

Dealing with undulating surfaces and establishing a tolerable level of excavation

The precise location and depth of roots within the soil is unpredictable and will often only be known when careful digging starts on site. Ideally, all new surfacing in RPAs will be no-dig, i.e. requiring no excavation, but this can sometimes be difficult on undulating surfaces. New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base will not be compacted as would happen in conventional surface installation. Some limited excavation can be necessary to achieve this and need not be damaging if carried out carefully and large roots are not cut. Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of

an established turf layer up to 5cm from the surface is unlikely to be damaging to trees. However, this may not be possible where there is no grass because tree roots may grow right up to the soil surface. In some situations, it may be possible to dig to a greater depth, depending on local conditions, but this will be assessed by the supervising arboriculturist if excavation deeper than 5cm is anticipated.

On undulating surfaces, finished gradients and levels will be planned with sufficient flexibility to allow on-site adjustment if excavation of any high points reveals large unexpected roots near the surface. If the roots are less than 2.5cm in diameter, they can be cut and the base for the surfacing formed with the preferred minimal excavation of up to 5cm. However, if roots over 2.5cm in diameter are exposed, cutting them may be too damaging and further excavation may not be possible. If that is the case, the surrounding levels will be adjusted to take account of these high points by filling with suitable material. If this is not practical, the situation will be discussed with the supervising arboriculturist before a final decision is made.

Edge retention

Conventional kerb edge retention set in concrete-filled excavated trenches can cause damage to roots and will be avoided. Edge retention in RPAs will be designed to avoid any significant excavation into existing soil levels, with several approaches that are fit for this purpose. For block pavements, the use of pre-formed edging secured by metal pins is effective and can be reinforced by concrete supports if there is no excavation into the soil. Railway sleepers pinned in place or wooden boards offer alternative options, depending on the expected loading of the surfacing. If the edge retention needs to be battered down to lower surrounding ground levels, a permeable soil fill will be used, as agreed with the supervising arboriculturist.

Footpaths and surfacing without a load-spreading base layer

In some situations, limited-width floating concrete rafts constructed directly onto the soil surface may be acceptable for both pedestrian and vehicular access, but the design will not include any strip-dug supports. If concrete is poured directly, precautions

Explanatory notes and examples

Installing/ upgrading surfacing in root protection areas

must be taken to ensure that no toxic fluids can contaminate the adjacent soil, e.g. confining the concrete in an impermeable liner. Alternatively, elevated paths supported on low impact frames or post supports allow a decking surface to cross sensitive areas. Where paths are installed very close to trunks, provision will be made for distortion from future root growth through using flexible components for the supporting frame and surfacing.

Specific considerations for upgrading existing surfacing

When upgrading existing surfacing, the preferred option will be to leave it in place and install the new surfacing on top of it. If the retained surfacing is

impermeable, it may improve conditions for tree roots if it is punctured before the new surfacing is laid, but this is detail to be agreed with the supervising arboriculturist. If the existing surfacing is to be removed, it will be excavated down to the soil level beneath following the guidance set out in *SGN 8 Removing surfacing and structures in root protection areas*. The new surfacing will then be installed on this surface, as described above.

New surfacing near trunks

All new surfacing should be set back from trunks and buttress roots by at least 50cm to allow space for future growth and minimise the risk of distortion.

Explanatory notes and examples

Installing/
upgrading
surfacing in root
protection areas



SGN 9-01

The flat-packed three-dimensional cells are pulled apart, spread across the area to be surfaced, and pinned in place ready for the washed angular stone fill (with no fines).



SGN 9-02

The stone-filled cells spread the load of traffic to prevent localised compaction. The permeable geotextile membrane on the ground allows the movement of water and gasses, but prevents the migration of stone into the soil profile.

Explanatory notes and examples

Installing/upgrading surfacing in root protection areas



SGN 9-03

Although *BS 5837* recommends a minimum distance of 50cm between new surfacing and buttress roots, there may be scope for flexibility in this separation for mature trees with little potential for future growth, if agreed by the supervising arboriculturist.



SGN 9-04

A conventional concrete haunching can be used to retain new surfacing if it is not dug into a trench – here it is placed on top of the three-dimensional cellular confinement layer.



SGN 9-05

Preparation of new residential access drive with base formation above original ground level and permeable geotextile layer covering the ground. Wooden boards are pinned in place to create informal rustic surface edging.

Explanatory notes and examples

Installing/ upgrading surfacing in root protection areas



SGN 9-06

The three-dimensional cells have been installed and filled with washed stone, ready for the finished surface to be laid above. The ground beyond the drive edges has been profiled with backfilled topsoil.



SGN 9-07

An alternative to the flexible three-dimensional cells is rigid interlocking plastic cells, again filled with washed stone and retained by pinned wooden edges.



SGN 9-08

Another option for wooden edges at corner points that allows for vehicles to accidentally track over the edge of the formal surfacing.

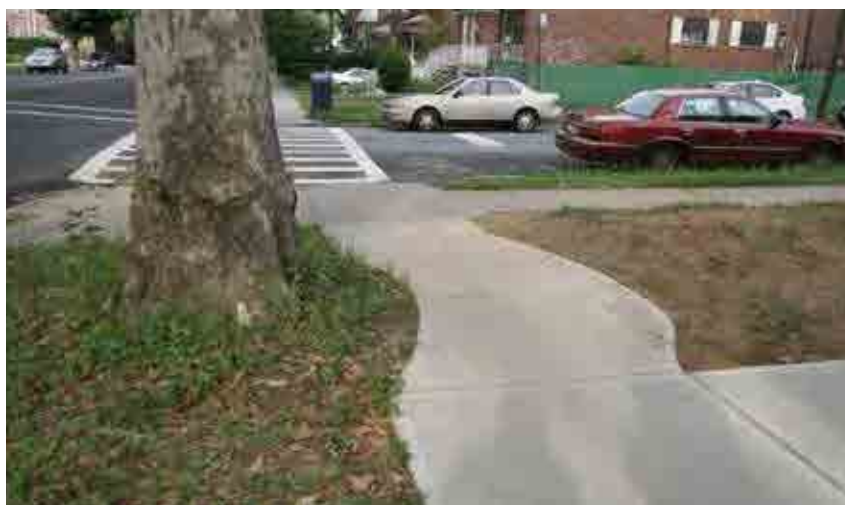
Explanatory notes and examples

Installing/upgrading surfacing in root protection areas



SGN 9-09

This temporary access for heavy construction traffic on the outer edge of a RPA is a concrete slab cast above ground level and will be removed when the project is completed.



SGN 9-10

In some situations, it may be appropriate to cast a free-floating concrete surface directly onto the soil surface provided provision is made to prevent soil contamination while the concrete is being poured.



SGN 9-11

This 12m RPA was covered in tarmac and used as parking. This original surfacing was removed and replaced with a new patio set above the ground level, with provision for water and air input into the covered RPA.

Explanatory notes and examples

Installing/upgrading surfacing in root protection areas



SGN 9-12

Where new surfacing is to be installed over existing, sometimes it may assist the movement of gasses and water if the existing surfacing is punctured.



SGN 9-13

An option for installing surfacing close to mature trees is to use a light metal frame with rubberised surfacing to allow the path to distort without failing as the roots grow.



SGN 9-14

Board walks supported on posts or a light frame are another way of providing pedestrian access across sensitive RPAs. (Photo courtesy of Philip van Wassenauer).

Explanatory notes and examples

Installing/
upgrading
surfacing in root
protection areas

**SGN 9-15**

New surfacing such as decking can be supported above the ground on posts leaving the soil surface beneath undisturbed.

**SGN 9-16**

Although this is only a temporary surface, railway sleepers pinned into the ground can be used to retain the edges of new surfacing.

**SGN 9-17**

Where space is restricted it is possible to use metal edging.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clause 7.4 (Permanent hard surfacing within the RPA) recommends:

- 7.4.2.1 New surface design should not require excavation other than the removal of the turf layer and surface vegetation. The design should be able to bear any anticipated loading, especially if it must carry construction traffic.
- 7.4.2.2 The design should evenly distribute the loading to avoid localised compaction.
- 7.4.2.7 The design should be resistant to or tolerant of deformation by tree roots, and should be set back from the stem and any root buttresses by a minimum of 50cm to allow for growth and movement. Levels can be made up using appropriate inert granular material. **Note:** Piles, pads, elevated beams, and three-dimensional cellular confinement systems, can be used to support surfaces. If excavation is required, the location of roots greater than 2.5cm in diameter should be determined by exploratory investigations and retained if possible.
- 7.4.3 The conventional installation of kerbs, edgings, and haunchings, can damage tree roots and should be avoided either by using alternative methods of edge support or by not using supports at all. **Note:** Examples of suitable edge supports include above-ground peg and board edging, sleepers, gabions, and other non-invasive ground-contact structures.
- 7.4.4.3 Ground levels should not be reduced to establish the new hard surface at the former ground level. Loose debris and turf should be removed carefully and the new surface should sit on top of the original soil.

Removing surfacing and structures in root protection areas

- 7.4.4.4 Fill to raise levels should be a granular material which remains gas- and water-permeable throughout its design life.
- 7.4.4.5 Wet concrete should not be poured in the RPA unless an impermeable liner has been installed to prevent soil contamination from the toxic leachate.

Installing structures in root protection areas

SGN

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Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Reduce the risk of chemical contamination from poured wet concrete (See *SGN 4 Pollution control*).
- Minimise excavation into original undisturbed soil (See *SGN 7 Excavation in root protection areas*).
- Install any surfacing acting as support for light structures directly onto the soil surface with minimal excavation (See *SGN 9 Installing/upgrading surfacing in root protection areas*).

Important reminders

- Hand-dig pile, pad, or post locations down to a depth of 60cm and, if necessary, adjust location to avoid cutting roots greater than 2.5cm diameter.
- No excavation into existing soil levels except where authorised for supports. **Note:** This specifically applies to ground beams sitting above supports.
- Make provision for ventilation and watering beneath substantial structures.

Summary guidance for site operatives

Installing structures in root protection areas

- Where feasible, keep in place existing below ground structures where they can be reused to support new structures, e.g. new walls built on existing wall footings.

Purpose

SGN 10 describes the practical requirements for installing new structures in RPAs, based on the recommendations in *BS 5837 (7.5 and 7.6)*.



General principles and clarifications

Conventional installation of new structures using strip foundations is unacceptable in RPAs because the excavations can damage roots and adversely disturb the soil. Additionally, the covering created by the new structure over the soil can impede water and gaseous exchange. Adverse impact on trees will be reduced by minimising the extent of these changes in RPAs.

The installation of pile, pad, or post supports

Substantial structures such as

heavy walls, garages, and larger buildings, will sit above ground level, supported by piles, pads, or posts, with provision for water and gaseous input into the covered area. The risk of harm through soil compaction during the construction activity will be reduced using ground protection as described in *SGN 3 Ground protection*.

The risk of chemical contamination will be reduced by following the guidance in *SGN 4 Pollution control*. The risk of direct root damage from excavation will be reduced by following the

Installing structures in root protection areas

guidance in *SGN 7 Excavation in root protection areas*. If feasible, careful consideration should be given to retaining existing footings, especially relating to walls. This will allow the installation of new structures without the disturbance required to excavate and install new footings, as explained in *SGN 8 Removing surfacing and structures in root protection areas*.

All support locations will be hand-dug to a depth of 60cm to identify if any roots over 2.5cm diameter are in the way. Sufficient flexibility will be built into the design to allow support locations to be moved to avoid roots over 2.5cm diameter. Additionally, the diameter and the distribution of the supports will be minimised to reduce the risks of disturbance during the installation. The bases of such structures will allow for air and water input

beneath through ventilation and irrigation provision.

The installation of no-dig surfacing supports

An alternative for lighter structures such as small sheds, carports, and bin stores, is to support them on custom designed no-dig surfacing, installed directly onto the soil surface, as described in *SGN 9 Installing/upgrading surfacing in root protection areas*.

Basements

It is also feasible to install subterranean structures (basements) beneath RPAs if the volume of soil forming the RPA can be retained without significant disturbance. The detailed design and specification of all these solutions is an engineering issue, to be informed and guided by tree expertise.



SGN 10-01

Support locations should be hand-dug to a depth of 60cm to see if there are any significant roots in the way, with provision to move the location if roots are found (note the pile in this example was finally installed to avoid the root).

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-02

Ground protection should be used to spread the load of the piling rig once excavation has confirmed that no substantial roots are in the preferred pile location.



SGN 10-03

Piles can also be used to support bridges across sensitive RPAs, but the temporary ground protection must be removed before the main structure is either imported in or cast on site.



SGN 10-04

The RPA for the trees behind the fencing extends across the whole view. The soil surface is protected by heavy duty ground protection to prevent compaction and the poured concrete piles were sleeved to prevent RPA contamination.

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-05

This RPA was protected from compaction from the piling rig by a three-dimensional cellular covering. The cellular covering was cut away from the pile locations, which were then hand-dug down to 60cm to make sure that no roots over 2.5cm were damaged. The piles were a screw type to avoid soil contamination from poured concrete.



SGN 10-06

Small diameter piles (less than 15cm) are an effective means of supporting structures in RPAs with minimal disturbance. The wooden formwork provides the receptacle for the steel reinforcement and the poured concrete that will form the building slab.



SGN 10-07

Where the slabs for larger structures are cast on site, a biodegradable void-former can be used to temporarily support the weight of the liquid concrete until it sets. The void-former can then be wetted and washed away to leave a void, or left to degrade naturally, both of which allow movement of air beneath the slab.

SGN 10

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-08

This garage was supported on piles with a concrete ground slab poured on site using a biodegradable void-former. Note the drainage downpipe feeding into a perforated watering pipe laid below the slab to provide water input into the RPA.



SGN 10-09

It is possible to support very large structures on piles within sensitive RPAs.



SGN 10-10

This building is supported on piles, with ground beams above onto which the floor is laid. The beams are above ground level and the pipes are perforated with a shingle surround to provide water input into the RPA once the structure is completed.

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-11

These carports are formed by wooden posts above a three-dimensional cellular no-dig and load-spreading surface of permeable crushed stone.



SGN 10-12

The workman is standing within the outline of a free standing concrete slab that is to be installed above the existing ground level within an RPA that was previously covered in tarmac as parking.



SGN 10-13

This raised deck extension is supported on wooden posts, hand dug to avoid significant roots.

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-14

The original church wall was displaced towards the pavement and had to be removed for safety reasons. The replacement structure was built on a new concrete reinforced footing installed without cutting any significant roots.



SGN 10-15

This covered bin store was constructed within RPAs by placing block paving on a levelled sand base directly onto the existing ground level, with the posts in hand dug holes to support the roof.



SGN 10-16

This church extension was built on a concrete beam and block floor slab supported on piles located in hand dug holes. Ground protection around the margins protected the RPA of the adjacent tree during construction.

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-17

Where significant roots cannot be cut, a bridging lintel of concrete or steel can be used to support the wall slightly above the roots to be retained.



SGN 10-18

Hand excavation of soil and shrub roots allows preformed steel or concrete lintels to be installed as a solid base for the curved wall construction, raised slightly above ground level, sitting on small diameter piles.



SGN 10-19

The voids beneath the wall and between the piles can be filled with soil/permeable fill leaving no indication that the finished wall is supported above the ground, allowing important tree roots to be retained intact.

Explanatory notes and examples

Installing structures in root protection areas



SGN 10-20

These significant roots crossed a new wall footing and instead of cutting them, they were carefully excavated, wrapped in hessian, and ducted with modified plastic protection to minimise any adverse impact from, toxic leachate from the poured concrete. This allowed them to remain intact and functioning once the wall was completed above.



SGN 10-21

An alternative to modified plastic ducting through concrete footings is to use bricks to create side supports and cover with a steel plate to create a structural surround for the root, which protects the root from the poured concrete.



SGN 10-22

This long root ran partially beneath the location of the new wall. The wall footing was poured on top of this permanent protective duct, allowing the root to be retained without any damage and providing adequate support for the new wall.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clauses 7.5 (Special engineering for foundations within the RPA) and 7.6 (Subterranean construction within the RPA) recommend:

- 7.5.1 Traditional strip footings can result in extensive root loss and should be avoided, but specially engineered structures may be justified if this allows good quality trees to be retained. Foundation designs should consider existing levels, proposed finished levels, and cross-sectional details. Site-specific and specialist advice regarding foundation design should be sought from the project arboriculturist and an engineer.
- 7.5.2 Root damage can be minimised by using piles supporting beams, laid at or above ground level, with site investigation down to a minimum depth of 60cm to determine their optimal location. Alternatively, structures can be cantilevered to avoid roots identified by site investigation.
- 7.5.3 Slabs for minor structure should bear on existing ground level, and should not exceed an area greater than 20% of the existing unsurfaced ground.
- 7.5.4 Slabs for larger structures should be designed with an irrigation system and a ventilated air space between the underside of the slab and the existing soil surface. The design should take account of any effect on the load-bearing properties of underlying soil from the redirected roof run-off and prior approval should be sought from the building control authority.
- 7.5.5 The smallest practical pile diameter should be used to reduce the possibility of striking major tree roots. Small piles also reduce the size of the rig required and can reduce the need for access facilitation pruning. The pile type should be selected to protect RPAs from the potentially toxic effects of uncured

concrete, e.g. sleeved bored pile or screw pile.

- 7.6.1 Where subterranean basements are proposed within RPAs, it is essential to avoid excavating down through rootable soil. It might be technically possible to form the excavation by undermining the soil beneath the RPA.

Installing services in root protection areas

SGN



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Summary guidance for site operatives

Installing services in root protection areas

Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Minimise excavation into original undisturbed soil (See *SGN 7 Excavation in root protection areas*).

Important reminders

- Trenchless installation will be preferred. The fall-back approaches of hand-dug broken trench and then hand-dug continuous trench, will be acceptable if agreed by the supervising arboriculturist.
- For trenchless installation, the starting and finishing pits will be outside RPAs.

Purpose

SGN 11 describes the practical requirements for installing new services within RPAs, based on the recommendations in *BS 5837 (7)* and the guidance in *NJUG (4.1)*.



General principles and clarifications

Excavation to upgrade existing services or install new services in RPAs may damage retained trees. Where possible, all services will be outside RPAs and installation in RPAs will only be chosen as a last resort. If installation within RPAs is being considered, as advised in 4.1.3 of the NJUG guidance, the decision will be made in consultation with the supervising arboriculturist before any work is carried out. If service installation is agreed within RPAs, the NJUG protocol as set out in 4.1.3 of its guidance will be used to decide the most appropriate method.

In summary, this sets out that “Acceptable techniques in order of preference are; a) trenchless, ... b) Broken trench – hand-dug ... c) Continuous trench – hand-dug”. If trenchless methods are to be used, the starting and finishing pits dug at each end of the service run will be outside RPAs. Where a hand-digging option is agreed, any roots discovered during the excavations will be dealt with as described in *SGN 7 Excavation in root protection areas*. Backfilled material around excavated services will not be heavily compacted, observing the specific advice provided in 4.1.5 of the NJUG guidance.

SGN 11

Explanatory notes and examples

Installing services
in root protection
areas



SGN 11-01

Conventional installation of services digging a trench with a machine is not permitted in RPAs.



SGN 11-02

Trenching with machines to install services close to trees can make them unsafe and cause their premature death.



SGN 11-03

Thrust boring is the preferred option for installing service routes through the RPAs of retained trees.

Explanatory notes and examples

Installing services in root protection areas



SGN 11-04

The start and finish pits for thrust boring are substantial and must be outside of RPAs.



SGN 11-05

Alternatives to thrust boring are to hand-dig broken or continuous trenches, so that roots can be retained (with the service ducting threaded beneath). Note the ground protection boards with soil piled on top on the left.



SGN 11-06

Ducting services that have to be threaded through existing roots is good practice because it reduces the need to excavate in the future. Note the hessian protection over roots while they are temporarily exposed to prevent sunscorch and drying.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) *Trees in relation to design, demolition and construction – Recommendations*: Clause 7 (Demolition and construction in proximity to existing trees) recommends:

- 7.1.3 The installation of underground utility apparatus using trenchless technology will be acceptable where entry and retrieval pits can be formed outside the RPA. Even if the utility installation does not require planning permission, the work should still be undertaken in accordance with the guidance in NJUG Volume 4, issue 2.
- 7.7.1 Care should be taken when routeing underground apparatus because the mechanical trenching can sever roots and change the local soil hydrology, both of which can adversely affect tree health. Wherever possible, underground services should be routed outside RPAs. If services are installed within RPAs, it is preferable to use common ducts, with inspection chambers sited outside the RPA.
- 7.7.2 Underground services within the RPAs should be shown on a plan prepared in conjunction with the project arboriculturist. Trenchless insertion methods should be the preferred option, with entry and retrieval pits outside RPAs, but if roots can be retained and protected, excavation using hand-held tools might be acceptable for shallow service runs.

2. National Joint Utilities Group (“NJUG”) *Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees – Issue 2: Section 4.1 (How to avoid damage to trees – Below ground)* advises:

“4.1.3 Realignment: Whenever possible apparatus should always be diverted or re-aligned outside the Prohibited or Precautionary Zones. Under no circumstances can machinery be used to excavate open trenches within the Prohibited Zone. Where works are required for the laying or maintenance of any apparatus within the Prohibited

Installing services in root protection areas

or Precautionary Zones there are various techniques available to minimise damage. Acceptable techniques in order of preference are; a) Trenchless: Wherever possible trenchless techniques should be used. The launch and reception pits should be located outside the Prohibited or Precautionary Zones. In order to avoid damage to roots by percussive boring techniques it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the equipment with materials other than water (e.g. oil, bentonite, etc.) must not be used when working within the Prohibited Zone. Lubricating materials other than water may be used within the Precautionary Zone following consultation and by agreement.

b) Broken Trench – Hand-dug: This technique combines hand-dug trench sections with trenchless techniques if excavation is unavoidable. Excavation should be limited to where there is clear access around and below the roots. The trench is excavated by hand with precautions taken as for continuous trenching as in (c) 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 and outside of the Prohibited Zone. c) Continuous Trench – Hand-dug: The use of this method must be considered only as a last resort if works are to be undertaken by agreement within the Prohibited Zone. The objective being to retain as many undamaged roots as possible.”

Landscaping in root protection areas

SGN

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Administration

- Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.
- Work under the normal site risk assessment procedures and comply with the wider site safety rules.
- Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.

Other relevant SGNs

- Monitor works in RPAs by the supervising arboriculturist (See *SGN 1 Monitoring tree protection*).
- Design access to avoid soil compaction (See *SGN 3 Ground protection*).
- Minimise excavation into original undisturbed soil (See *SGN 7 Excavation in root protection areas*).
- Install hard landscaping according to *SGN 9 Installing/ upgrading surfacing in root protection areas*, and *SGN 10 Installing structures in root protection areas*.

Important reminders

- No heavy mechanical cultivation such as ploughing or rotavation.
- Do not fill above the original ground levels within the RPAs of retained trees until the precise depth of fill has been agreed and authorised by the supervising arboriculturist.
- Never raise soil levels to leave soil touching a trunk that was previously exposed to the air.

Purpose

SGN 12 describes the practical requirements for soft and hard landscaping to avoid damage to retained trees, based on the recommendations in *BS 5837 (8)* and *BS 3998 (6.3)*. It assumes that the design and technical specifications prepared for the site contractors comply with the relevant British Standards, and in particular, *BS 8545 (2014) Trees: from nursery to independence in the landscape – Recommendations*.

Note: Soft landscaping includes the re-profiling of existing soil levels and covering the soil surface with new plants (grass or shrubs) and/or an organic mulch. Any new hard surfacing and structures will be installed as described in *SGN 9 Installing surfacing in root protection areas* and *SGN 10 Installing structures in root protection areas*.



SGN 12-01

The RPA of this tree was not effectively protected during construction and excessive compaction of the soil meant it died soon after this turf covered up the damage.

Explanatory notes and examples

Landscaping in root protection areas



SGN 12-02

Soil should not be heaped against trunks and no level changes should occur within 1m of the trunk unless authorised by the supervising arboriculturist. The raised soil levels against this trunk and across the RPA caused the decline of this tree.



SGN 12-03

Healthy mature trees had adjacent soil levels raised by over a metre in their RPAs because provision was made for load spreading and aeration.



SGN 12-04

This tree had tarmac parking within its RPA that was removed and replaced with an organic mulch near the trunk and limited no-dig surfacing on the outer edges of its RPA.

Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:

1. BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations: Clause 8 (Site works, landscape operations and management) recommends:

- 8.4 Avoid soil compaction around existing trees and in areas where new planting is proposed. Where soil compaction has occurred within RPAs, arboricultural advice should be taken on how to mitigate risk of further damage to roots before carrying out any remedial or other works. Any cultivation within RPAs should be undertaken carefully by hand, but no heavy mechanical cultivation such as ploughing or rotavation should occur. Decompaction measures include forking, spiking, soil augering and tilled radial trenching should be carried out with care to minimise the risk of further damage to roots.

2. BS 3998 (2010) Tree work – Recommendations: Clause 6.3 (Aeration/decompaction) recommends:

- 6.3 Decompaction works should be controlled so that major roots greater than 2.5cm in diameter are not damaged. Avoid extensive cultivation such as ploughing or rotavation in RPAs.

Additional resources

PDF Versions of the Site Guidance Notes

PDF versions of the individual site guidance notes are available for download from scanning the relevant QR codes below.

SGN 1: Monitoring tree protection



SGN 7: Excavation in root protection areas



SGN 2: Fencing protected trees



SGN 8: Removing surfacing and structures in root protection areas



SGN 3: Ground protection



SGN 9: Installing/ upgrading surfacing in root protection areas



SGN 4: Pollution control



SGN 10: Installing structures in root protection areas



SGN 5: Site cranes and piling rigs



SGN 11: Installing services in root protection areas



SGN 6: Height restrictions



SGN 12: Landscaping in root protection areas



