

Tree survey to BS 5837 (2012): with constraints and impacts

Cautley House, 95 Seabrook Road, Hythe CT21 5QP

Summary

This report arises from a proposal to demolish and rebuild the vacant Cautley House. It is required to validate Y17/0624/SH.

The site is not in a Conservation area, while three mature Corsican pines (G10) adjacent to the site on the west side are protected by Tree preservation order. These trees lean more or less strongly to the east (presumably owing to exposure to westerly winds), overtopping the site by up to 11m.

One tree at the site is to be lost (T7 Bay laurel), which has low retention value and does not represent a significant constraint to the proposal.

The main concern is the take-up of the bitmac surface of the existing vehicular access within the Root protection areas (RPAs) of the TPO trees at the west end of the site (the access is to be moved further to the east). I specify precautions to minimize root damage during this operation, and note that the take-up, and the reinstatement of the ground to garden, will benefit the TPO trees in the long run.

Other precautions specified include tree protection fencing to exclude site traffic from the vicinity of the west-boundary vegetation.

I conclude with a Schedule of tree works, divided into those works required to implement the proposed development and those recommended for maintenance purposes.

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Client: Cautley Properties, Longview, Berwick Lane, Lymyne, Hythe,
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Planning application:
Y17/0624/SH.

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1. Objectives

To survey the trees on, and within influencing distance of, Cautley House.
To describe the tree-related constraints to the proposed development.
To discuss these constraints and to make recommendations as appropriate.

2. Preamble

There are several stages in the procedure recommended in BS 5837 (2012): *Trees in relation to design, demolition and construction – Recommendations*.

1. *Tree Survey and assessment of trees' conservation value.*
2. *Tree Constraints Plan.*
3. *Arboricultural Impacts.*
4. *Tree Protection Plan.*
5. *Arboricultural Method Statement.*

Any constraints to development identified in (2) are discussed in relation to the context in (3) to arrive at practical recommendations. Where appropriate, specific measures to avoid damage to trees during site works are set out in (4) and (5).

Trees were surveyed according to the precepts and procedures of Lonsdale (2006) and Mattheck & Breloer (1998).

The technical terms I use in this report are italicized in the text and defined in the glossary (Appendix I).

3. Scope

I visited the site on 21 June 2017 and inspected the trees and other vegetation with the aid of a *sounding mallet* and binoculars.

Measurements were by tape for (i) horizontal distance and (ii) tree diameter, and by inclinometer as appropriate for (iii) tree height.

4. Abbreviations and units

Dimensions are in metres (m) or centimetres, area is in square metres (m²). Trunk diameter was measured or estimated 1.5m above the ground unless otherwise stated.

SDC	Shepway District Council
G	Group
RPA	<i>Root protection area</i> (see glossary)
T	Tree

5. Plans and design

The topographical survey is Topographical survey, Dwg. 1, dated March 2015, by J.C. White Geomatics.

The existing layout is *Existing site plan*, Dwg. 14.008/002, dated May 2017, by Guy Hollaway Architects.

The proposed design is *Proposed site plan*, Dwg. 14.008/010, dated May 2017, by Guy Hollaway Architects.

The *Tree position and constraints plan* (attached as the separate document 170606 PLAN Cautley House Hythe) and the *Tree protection plan* in the text are derivatives of this plan.

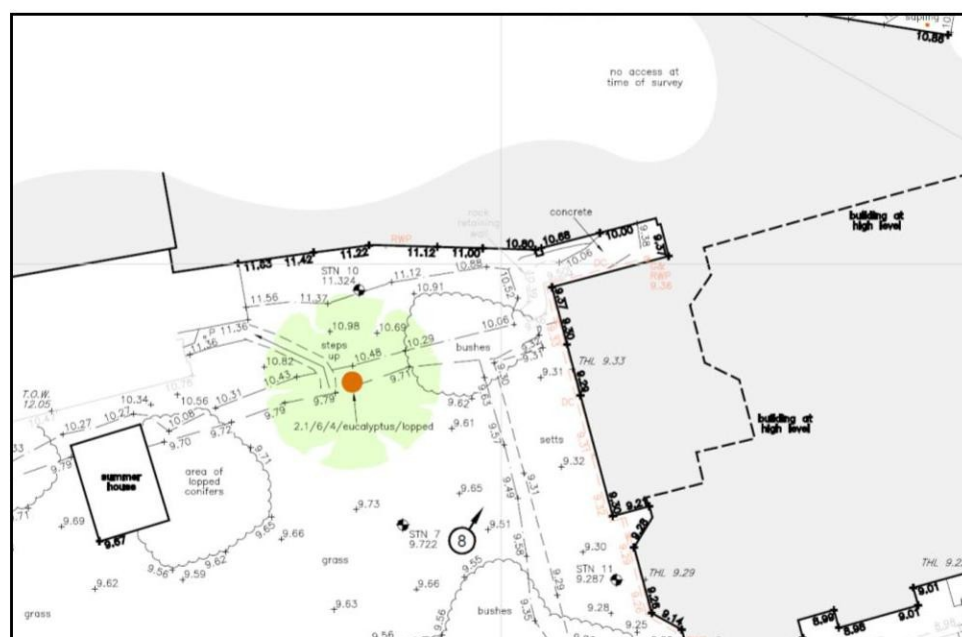
5.1. Note on plans

The *Existing site plan* is based on Ordnance Survey mapping. I noted two additional details:

(i) Outbuildings extend from 'Athenree', the neighbouring dwelling to the north and west of Cautley House, to Cautley House itself. The outbuildings are continuous, connecting with each other and with the two main buildings.

(ii) The boundary between the two properties was unsurveyed in the topographical survey and is unclear on the ground. (I understand from Mr Goulding that it is, however, agreed with the neighbour.) The change in level approaches to within about 1m of Cautley House.

The change in level is the feature one can navigate by when approaching from the south, as shown on the extract from the topographical survey below.



The coloured tree shown in the plan above is T7 Bay laurel.

6. Planning and wildlife constraints

6.1. Planning constraints

This report supports Planning Application Y17/0624/SH.

I accessed the online mapping service of SDC on 22 June 2017 at:

<http://www.shepway.gov.uk/mapserver2016/fusion/templates/mapguide/maroon/index.html?ApplicationDefinition=Library://sdc-exp.ApplicationDefinition>

The site is not in a Conservation area and no tree at the site is protected by TPO.

However, three off-site Corsican pines, adjacent or close to the west boundary, are protected as T1 of TPO 4 (2017) and G1 of TPO 5 (2017). Two of these trees lean strongly to the east, overtopping the site by up to 11m.

Works proposed to trees at the site can normally be enacted without prior reference to SDC. However, trees are material considerations in the planning system whether protected or not.

The protected trees must not be damaged and I note that, in this context, the threshold of damage has been interpreted to be low (Stileman & Sampson, 2012).

6.2. Wildlife constraints

Native wildlife is protected primarily under *The Wildlife and Countryside Act 1981* (as amended). The level of protection varies with species. Note that protection may include reckless as well as intentional harm, so that ignorance resulting in injury to some protected species is not a defence.

Animal species with a high level of protection include the *hazel dormouse* and all species of *bats*, while the *slow-worm* is protected under the 1981 Act from intentional killing or injury.

No native bird may be disturbed at its nest, which means that works to trees or other vegetation that contain nests should not be undertaken during the *nesting season*.

7. Site description

The site rises from Seabrook Road and is vacant. The vegetation has been unmanaged for some time and is largely overgrown and intergrown with bramble.

The southerly aspect of the site makes it dry and hot in summer and it is close enough to the coast to be subject to saline winds from time to time. It is not favourable for tree growth. The TPO pines are Mediterranean species and are relatively well adapted.

7.1. Geology and soil

According to the Geology of Britain viewer, the site is very close to the boundary between the Weald clay, on the south side of Seabrook Road, and the overlying Atherfield clay on the north side. Both are *shrinkable*. No superficial deposits are recorded at the site, but 'storm beach deposits' overlie the Weald clay south of Seabrook Road.

On shrinkable soil, trees may be within influencing distance of the proposed development according to guidance in NHBC (2009). This would suggest implications for foundation or other design to avoid the risk of *structural movement*.

8. Introduction to tree survey

This section consists of four parts:

- (i) The *Scheme for conservation value*, reproduced from BS 5837 (2012).
- (ii) *Notes* give further details of the survey method.
- (iii) The *Tree survey schedule* describes the trees surveyed in numbered sequence, classifies them according to conservation value and gives their RPA radius.
- (iv) The trees' positions are shown on the *Tree position and constraints plan*.

Parts (i) to (iii) are given in Appendix III. Part (iv) is attached as the separate document *170606 PLAN Cautley House*.

Tree works are recommended in two categories, arising from the proposed development (see Section 9 *Tree constraints and impacts*) and for maintenance purposes (see *Tree survey schedule*). They are consolidated in Section 11 *Schedule of tree works*.

The tree survey included an assessment of tree risk for on-site trees.

8.1. Perspective on conservation value

All of the trees and shrubs at the site have low retention value or are undersize in terms of BS 5837 (2012). The only significant trees are the three TPO trees in the neighbouring property to the west.

9. Tree constraints and impacts

9.1. Loss of trees

Tree	Reason
T7 (C) Bay laurel	Within footprint of proposed north retaining wall.

Reminder: Tree works are also recommended for maintenance purposes (justified in the Tree survey schedule).

Both categories of tree works are consolidated in Section 11 Schedule of tree works.

Impact

As a constraint to the proposed development, the loss of T7 (C) Bay laurel is inconsequential.

9.2. Encroachment into Root protection areas

Tree	RPA	Encroachment by area (%)	Reason:
G10 (TPO) Corsican pine	53	14%	Existing access and proposed reinstatement of existing access
		Minimal	Extension of boundary wall in vicinity of G10

At its closest the existing access is 2.6m from the nearest (southernmost) tree of G10.

Impact

The RPA encroachment is marginal for encroaching into the *root plate* of the nearest (southernmost) tree of G10, so the proposed reinstatement works could cause serious damage (that could render the tree unstable) if not carried out with appropriate precautions (see Section 10).

10. Tree protection and methods

I recommend the following sequence:

- (i) Tree works
- (ii) Tree protection fencing
- (iii) All construction works (using the existing access as desired)
- (iv) Removal of the hard surface within the RPA of G10
- (v) Reinstatement to soft landscaping

10.1. Tree works

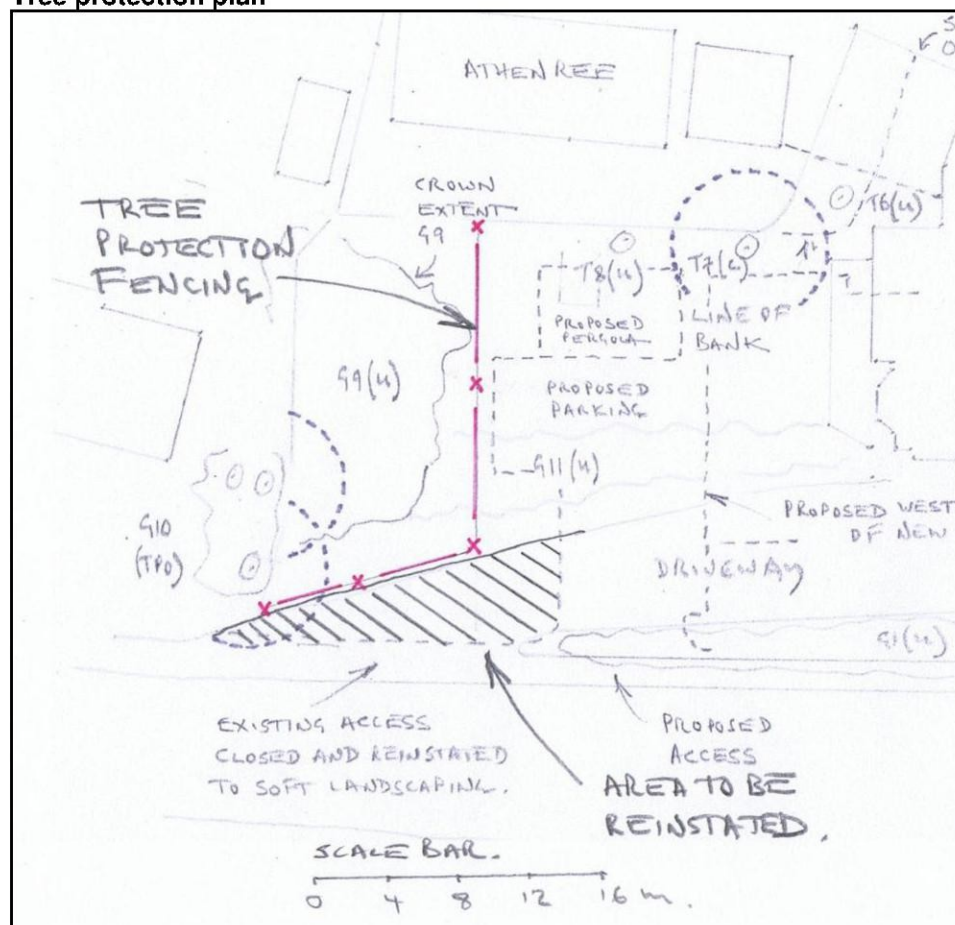
See Section 11, Schedule of works.

10.2. Tree protection fencing

The default specification is shown in Appendix II. Note that, if this specification (Heras fencing) is used, the panels must be clamped together and side-strutted to give some permanence and impact resistance.

The fencing is to be installed at the edge of the crowns of G9 (rather than being governed by G9's RPA). See Protection plan below.

Tree protection plan



For scale see scale bar

10.3. Removal of hard surface within the RPA of G10

The RPA is an arbitrary guideline. It would be helpful if the following recommendations are applied to the whole of the shaded area ('Area to be reinstated') on the Protection plan.

Machine use

The wearing course of the existing bitmac surface is to be removed from within the RPA of G10 by disc-cutter, jack-hammer and small machine working by *pull-back*. The machine driver is to have an assistant drawing attention to any woody roots (for instance between the wearing course and the bedding course) *before* they are pulled up by the machine, as this is likely to cause longitudinal shattering of the root. The assistant is to hand-dig round such roots.

Treatment of roots

Any broken roots exposed in the excavation are to be severed cleanly with secateurs or a pruning saw. Cross-cut roots or broken roots of whatever size are not to be allowed to dry out. If necessary they should be covered with damp hessian or a membrane.

Treatment of sub-base

The exposed sub-base will be more or less compacted, and will have a greater or lesser root occupancy.

The sub-base is to be loosened with hand-tools without causing root damage to the extent possible. As much of the loosened sub-base as possible is to be removed by hand, conserving the roots to the extent possible.

10.4. Reinstatement to soft landscaping

The subsoil, below the surface removed in 10.3, will lack biological activity. I recommend (but do not prescribe) that a 10cm layer of *topsoil* (excluding Grade III) be laid on the newly unsurfaced area to promote the growth of the proposed soft landscaping (as indicated in the Design & Access Statement).

10.5. Miscellaneous

1. If any roots greater than 25mm diameter have to be severed within 3m of the trees of G10, the Shepway D.C. tree officer or other arboriculturist is to be notified and given the opportunity to assess the damage and to make recommendations as appropriate.

2. G10 is described in detail in the *Tree survey schedule*. Note that two trees may have elevated tree risk owing to their strong lean into the site. The proposed design is advantageous to the extent that, post-development, occupancy of the area into which the trees might fall is expected to be much lower than it would be in the present design, effectively moderating tree risk.

11. Schedule of tree works

Works to comply with BS 3998 (2010)

Works arising from the proposed development

T7 Bay laurel

Fell and grind or grub out stump.

Reason: Incompatible with proposed development.

G10 Corsican pines

Raise crown of southernmost tree to height 4m over west roadside entrance, retaining the limbs arising from the main stem at height 3-4m.

Reason: Access facilitation during site works.

Works recommended for maintenance purposes

T3 Fig	)
T4 Stags-horn Sumak	)
T5 Elder	) <i>Fell and grind or grub out stumps.</i>
T6 Stags-horn Sumak	)
T8 Cypress	)
G11	)

(Note: Works to the shrubberies of G1 and G2 are discretionary.)

12. References

B.S. 5837 (2012). *Trees in relation to design, demolition and construction – Recommendations*. British Standards Institution, London.

Johns, J.W., Yost, J.M., Nicolle, D., Igic, B. & Ritter, M.K. (2017). Worldwide hemisphere-dependent lean in Cook pines. *Ecology*. doi: 10/1002/ecy.1850

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Stileman, P. & Sampson, G. (2012). Defining ‘damage’. *The Arb Magazine* (Newsletter of the Arboricultural Association) **159**: 39–40. Winter 2012.

13. Copyright and limitations

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APPENDIX I: DEFINITION OF TERMS USED IN THIS REPORT

Arboricultural supervision: The attendance of an arboriculturist on a construction site during works that pose a risk to nearby trees, for instance works within a root protection area. The purpose is to ensure compliance with agreed methods, minimize and evaluate actual root damage (if any) and recommend further action as appropriate. The monitoring of measures specified in the tree protection plan (such as the erection of fencing) may also be required.

Bats: All bats are European protected species, so that it is an offence to kill or injure a bat, whether deliberately or recklessly, to damage or destroy a roost site even if it is unoccupied, or to disturb a bat while it is occupying a roost.

Potential roost sites in trees include: voids created by woodpeckers and decay; fissures and crevices caused by injury or structural failure, including open or partly closed cracks and storm damage; loose dead bark separated from the underlying wood; and the pockets created by the intertwining stems of rank ivy (if greater in diameter than about 40mm). These features are associated with large and *veteran* trees but also occur in smaller and younger trees.

Before carrying out any tree work it is good practice to assess the trees concerned for their potential to contain bat roosts. If there is potential, a bat survey by a licensed surveyor should be carried out.

Coppice: The shoots arising from the stump of a tree, which give rise to a second- (or subsequent) generation multi-stem tree.

Deadwood: In the growth and development of a tree, branches compete with each other (especially if the crown is dense) and weaker branches are eventually suppressed and die. The deadwood may then be liable to fall.

Geology of Britain viewer: An online service of the British Geological Survey. The solid geology and superficial sediments, at 1:50,000 or smaller scales, can be viewed for any postcode or map reference in the UK. <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Hazel dormouse: The hazel dormouse is a nocturnal and arboreal mouse-like mammal about 15cm long counting the slightly bushy tail. It is found in open woodland with a dense understorey and untrimmed hedges. The dormouse is omnivorous and has many food sources, but hazel (*Corylus avellana*) nuts are favoured prior to hibernation. See Natural England Species information note SIN005 *Dormouse*: *European protected species*.

Lean: Inclined from the vertical, as in the trunks of some trees. A lean increases the loading at the base of the tree, especially if the crown is unbalanced in the same direction.

A lean may be due to competition from nearby trees, root plate displacement or sculpting by wind.

A progressive increase in lean is likely to elevate tree risk (depending on the rate of increase). It may be inferred from periodic measurements, the effect on a fixed object such as a fence in contact with the trunk, or evidence of root plate instability.

Most trees do not lean, despite asymmetry in the reception of sunlight (in non-equatorial latitudes) and wind loading (if the wind has a prevailing direction). The Cook pine (*Araucaria columnaris*) is an exception, leaning south in the northern hemisphere and north in the southern hemisphere, and the further from the equator the greater the lean (Johns *et al.*, 2017).

Maturity: The stages in the life cycle of a tree. Young or juvenile trees have not yet reached $\frac{1}{3}$ of their expected mature height. Early-mature trees are between $\frac{1}{3}$ and $\frac{2}{3}$ of expected mature height. Mature trees are close to their full height and crown size, these dimensions being determined by the context, while main-stem diameter continues to increase relatively rapidly. In late-mature trees main-stem diameter (which by now is large) increases slowly, accumulated *deadwood* and defects in the aerial part are likely to be evident if the tree is unmanaged, and some crown separation is increasingly likely. Senescent trees are in a decline associated with lessening crown volume, so that the crown becomes sparse or dies back, developing relatively large-diameter deadwood.

Nesting season: Conventionally from 1 March to 31 July, although subject to variation from year to year depending on the weather.

Pull back: The removal of a hard surface by a machine working backwards, pulling the broken pieces onto the remaining surface and avoiding any traffic on the newly exposed soil that would otherwise cause soil compaction or soil poaching.

Root plate: That part of the root system (excluding the small outermost roots) needed to keep a tree windfirm. The area occupied by the root plate is estimated in a standing tree from the diameter of the main stem (according to data in Mattheck & Breloer, 1994).

Root plate instability: A partial failure of the root plate. It may rock in a high wind (wind rock), when cracks in the soil open and close at the point of fracture between the root plate and the surrounding soil.

Other discontinuities in the soil surface (including local subsidence) suggesting gross movement or the breakage of some the roots may be evident, or the flexure of the root buttresses (especially on the windward side) may lead to a small gap between them and the surrounding soil.

Root protection area (RPA): The circular area around the base of a tree, expressed in m², that contains sufficient rooting volume to ensure the future well-being of the tree in the event of nearby soil disturbance (as on a development site). RPA radius is the radius of the circle.

Sculpted (by wind): The change in shape of a tree's aerial part owing to exposure to a prevailing wind, giving the crown less drag and tending to limit tree height. In severe cases the crown becomes strongly unbalanced towards the leeward side, and in extreme cases the tree is so stunted as to have a misshapen shrub form.

Groups of trees, particularly on exposed sites, have crowns collectively sculpted to give an aerodynamic whole (companion shelter).

Shrinkable soil: Soils that shrink on drying (and swell on re-wetting) are shrinkable. Several kinds of stiff clay have high shrinkability.

Slow-worm: A legless lizard up to about 0.5m long resembling a small snake. Slow-worms are native to Europe and western Asia and are found throughout Britain. They are not venomous but bite their prey. They prefer to hide under various objects warmed by the sun rather than to bask in the open.

Sounding mallet: A mallet for tapping at a woody stem which might be defective, particularly the base of a tree trunk. The sound helps to reveal the presence of internal defects..

Structural movement: A shift in a structure, typically causing cracks in the event of differential movement.

Sucker: A shoot arising adventitiously from the roots of a tree, often in response to pruning, damage, decline in the crown or felling. Suckers tend to be vigorous, sometimes forming a jungle if unchecked and reducing the vigour of the crown if the parent tree is still standing. Suckers may be unwanted or may be a way to regenerate a felled tree or a tree whose aerial part has been killed, as in elm killed by Dutch elm disease.

Topsoil: The uppermost layer of soil, approximately equivalent to the 'A' soil horizon.

Traded topsoil is classified according to the scheme in BS 3882 (2015) into:

- (i) Premium grade, having loamy soil texture, good soil structure and high intrinsic soil fertility.
- (ii) General purpose grade, suitable for many purposes.
- (iii) Economy grade, which may include subsoil or other mineral materials suitable for plant growth such as greensand (a parent material) or river silt.

The Standard also specifies requirements for specialist topsoils that are infertile, acidic or calcareous.

Topsoil moved into heaps during construction works may be compacted, waterlogged or otherwise poorly aerated, and soil structure, soil animals and soil organic matter are quickly lost. To help prevent damage uncompacted topsoil is spread widely, covered to exclude water or sown with a grass or legume. See soil compaction, soil aeration.

Tree risk: The risk that a tree causes damage or injury if it (or part of it) suffers structural failure. Tree risk is a composite of several variables. A hazard has the capacity to cause harm, which may be more or less serious depending on the magnitude of the hazard (for instance the weight of a branch and the height from which it would fall). Probability is the chance that a hazard eventuates, and is influenced by the loading at potential points of structural failure, the nature of any structural defects, the extent and effectiveness of any compensatory growth, and site factors. A target is anything within range of a hazard, *ie.* within the target area, that could suffer injury or damage if the hazard eventuated. Tree risk comprises (hazard magnitude × probability × target value × occupancy).

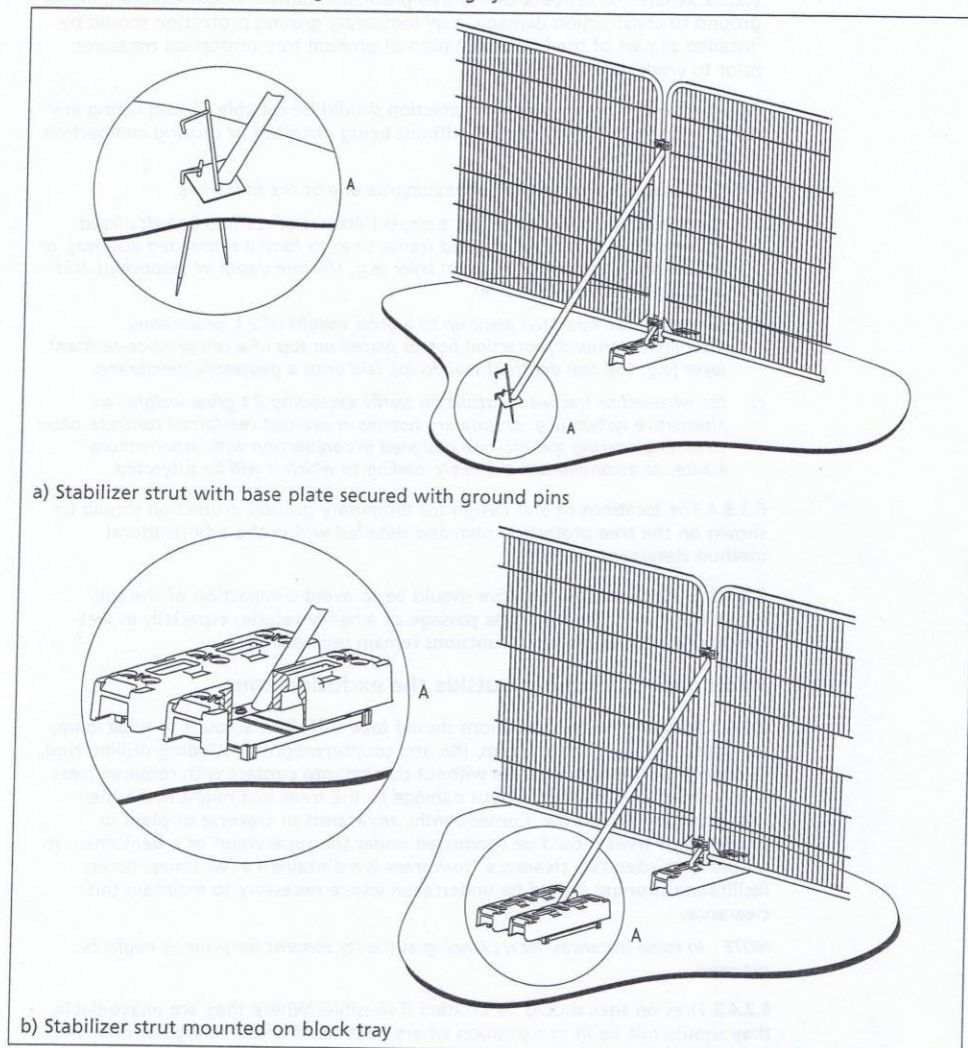
Wildlife and Countryside Act 1981: The main Act giving protection to wildlife and supplemented by other Acts including the Countryside and Rights of Way Act 2000. The Act makes it an offence to kill or injure any wild bird (excluding game birds), damage or destroy the nest of any wild bird while being built or in use, or take eggs.

APPENDIX II: SPECIFICATION FOR TREE PROTECTION FENCING

BRITISH STANDARD

BS 5837:2012

Figure 3 Examples of above-ground stabilizing systems



6.2.3 Ground protection during demolition and construction

6.2.3.1 Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier. In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed during demolition. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate.

APPENDIX III: TREE SURVEY

(i) Scheme for retention value: Extract from BS 5837 (2012)

A: High quality and value, anticipated retention span at least 40 years.

1. Arboricultural value 2. Landscape value 3. Cultural/conservation value

B: Moderate quality and value, anticipated retention span at least 20 years.

1. Arboricultural value 2. Landscape value 3. Cultural/conservation value

C: Low quality and value, anticipated retention span at least 10 years. Not to be retained where they represent a significant constraint to the development.

U: Undersize (below 15cm diameter) or valueless (any existing value lost within 10 years).

(ii) Notes

Note 1: The scheme above is a guide. Conservation value relies on subjective assessments which are often debatable and context-dependent; see text.

Note 2: 'Crown radius' noted in the *Tree Survey Schedule* is the horizontal distance the crown extends from the trunk of the tree or, where stated, across the boundary into the site.

Note 3: A notional RPA is an estimate based on experience (in the absence of satisfactory guidance), as for a hedge or recently coppiced tree.

Note 4: Trunk diameter was measured 1.5m above the ground unless otherwise stated.

Note 5: Any collective or variable measurement is summarized as the maximum. For example, the maximum main-stem diameter of the multi-stem T3 is 5cm ('MS to 5').

(iii) Tree Survey Schedule – Cautley House, 95 Seabrook Road, Hythe, Kent CT21 5QP. Surveyed June 2017.

Tree/ Group	Species	Diam (cm)	Ht. (m)	Crown radius (m)	Head- room (m)	Value	RPA radius (m)	Comments
G1	Mixed ornamental shrubs, dwarf conifers		1-3			U		Roadside boundary screen. Unattractive.
G2	Ornamental shrub		1-2			U		Screen at boundary with Cliff Road. Sparse, gappy, low vigour.
T3	Fig (<i>Ficus carica</i>)	MS to 5 c. 30 GL	6	5	0	U		Early-mature (see <i>maturity</i>). Very close to existing building, widely spreading, intergrown with elder on north side. The original aim may have been to train the tree against the building (inferred from old pruning cuts).
T4	Stagshorn sumac (<i>Rhus typhina</i>)	MS jungle to 10 GL	3	2	0.5	U		Early-mature. Spreading by <i>suckers</i> , most rapidly to the east. Group of stems about 4m across at ground level.
T5	Elder (<i>Sambucus nigra</i>)	MS to 6 c. 15 GL	4	2	0	U		OFF-SITE. Early-mature. Growing at base of boundary wall on Cliff Road side, evidently self-sown.
T6	Stagshorn sumac	5,6,9	5	4	2	U		OWNERSHIP UNCERTAIN. On bank about 1m from the corner of the existing building. Tending to spread from suckers.
T7	Bay laurel (<i>Laurus nobilis</i>)	MS to 20 c. 40 GL	7	4	0.5	C	4.0	Early-mature. Crown globular.
T8	Leyland cypress (<i>× Cupressocyparis leylandii</i>). Cultivar with yellow foliage	MS to 15	3	5 into site	0	U		Early-mature. Repeatedly cut back to give shrub-like form. Dominating summerhouse.
G9	Mixed shrubs and small trees	to 30 GL	5	jungle	0	U		Honey locust (<i>Gleditsia</i> spp.) (?), Lawson cypress, Elder, <i>Griselinia</i> spp., intergrown with bramble and extremely dense.
G10	Corsican pine (<i>Pinus nigra</i> var. <i>maritima</i>)	to 34	9-12	to 11 into site	6-9	TPO	4.1	OFF-SITE. Three trees, late-mature, flat-topped, strongly sculpted by westerly and southerly winds (see <i>sculpted by wind</i>). In consequence two trees <i>lean</i> strongly to the east (ie. into the site), the furthest from the road leans towards the north. Headroom 2-5m over west roadside entrance to the site. Not possible to see whether the strong lean is associated with <i>root plate instability</i> . If so, or if the lean is progressive, <i>tree risk</i> is elevated.
G11	Ornamentals		4					Row of untended shrubs with some elder.

T=tree; G=group; Diam=main-stem diameter; Ht=height; MS=multi-stem; GL=ground level; RPA=root protection area.