

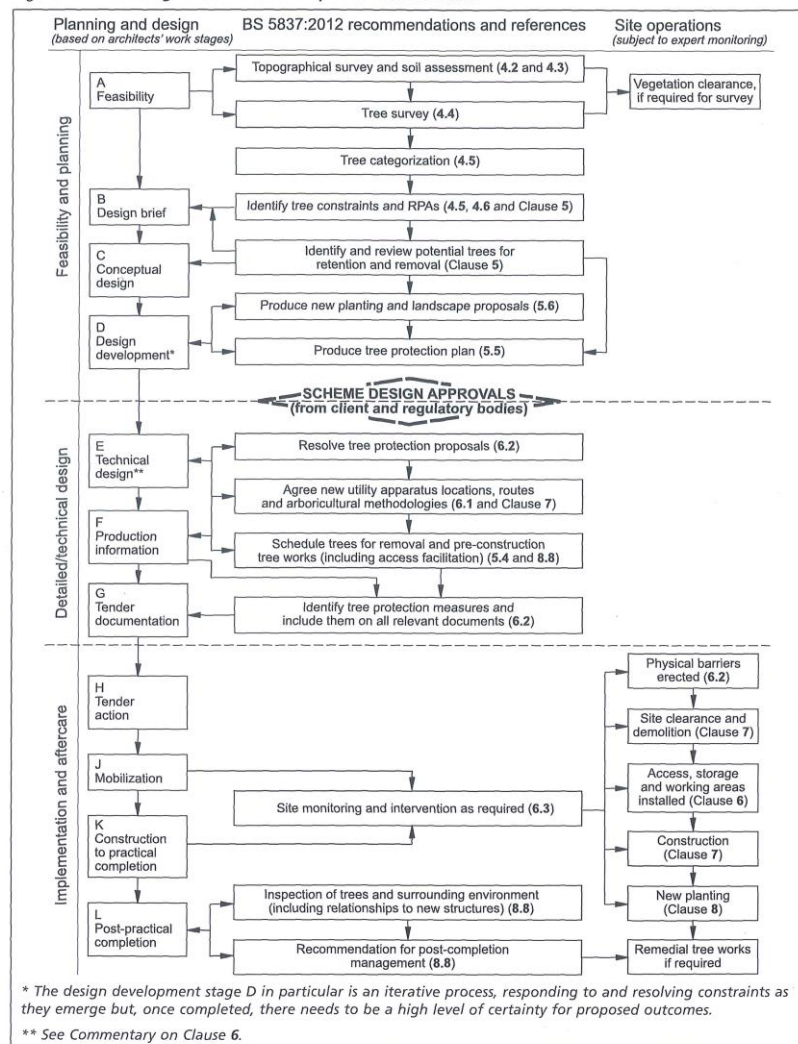


BH 1

Tree Survey Schedule

with Figure 1 Flow Diagram & Tree Survey Notes

Figure 1 The design and construction process and tree care



TREE SURVEY NOTES

These Tree Survey Notes have been prepared in accordance with the recommendations of **British Standard 5837:2012** and they define the criteria for pre –development tree surveys.

- Each tree/group/hedge/shelterbelt/woodland has been allocated a unique number (**No.**), where specifically requested and appropriate fees are agreed small durable numbered metal tags can be applied to each tree/group surveyed.
- The tree species (**Species**) is provided in both English and Latin name formats.
- Height assessments (**Ht**) are estimated in metres. This will be adequate for the majority of cases, but where accurate heights become a critical issue it may be necessary to return to site, as a separately commissioned exercise, to collect accurate measurements with the aid of optical instruments.
- Trunk/stem diameters (**Diam**) are measured in millimetres at 1.5m above ground level – where the tree is inaccessible the diameter is estimated as indicated by suffix #
- Radial crown spread assessments (**Brch Sprd**) are estimated in metres from the centre of the trunk/group to each of the four primary points of the compass (**N**-north; **E**-east; **S**-south and **W**-west) in order to achieve a representation of the crown shape which will be shown on the accompanying tree survey plan. These provide a general guide as to the main bulk outline of a tree/groups crown but are not tape measured dimensions. These would only be undertaken as part of a separately commissioned exercise, where precise dimensions are critical to the project at hand.
- Both the canopy ground clearance (**GC**) and the height & compass direction of the lowest major branch (**LMB**) are estimated and shown in metres
- An assessment of a tree/groups 'life stage' (**LS**) is made in terms of its site specific maturity as part of the surrounding landscape, taking into account its overall shape and form in that setting, and is recorded thus :-
Y - Young tree/group; **SM** - Semi-Mature tree/group; **EM** - Early-Mature tree/group;
M – Mature tree/group; **OM** - Over – mature tree/group
- Data on the structural condition (**Condition Comments**) of the tree/group is provided to give its visual appearance and any significant health and safety issues.
- Details of any recommended tree works required at the time of survey is given under the heading – **Preliminary Management Recommendations**.
- An estimate of a tree/groups remaining contribution in years (**RC**) is made and is recorded thus :-
0-5; 5-10; 10-20; 20-30; 30-40 or **>40** years.
- The category grading (**Cat**) for each tree/group is assessed according to the criteria provided within **BS5837:2012**. The assessment is made of the tree/group in its current condition and within the

environment encountered bearing in mind its suitability for retention as part of any future proposed development; although the exact layout detail of any specific scheme will not be known at the time of surveying. The trees have been classified into one of four categories and colour coded as BS5837 recommends :- **U** (dark red); **A** (light green); **B** (mid-blue) and **C** (grey). Please note that suffixed numerical sub-categories are also applied for guidance only and do not carry any cumulative or increased value for the tree/group. This colour coding scheme will be applied to all drawings provided.

Table 1 – Cascade chart for tree quality assessment

Category and definition	Criteria			Colour on plan
Trees unsuitable for retention				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years.	- Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (i.e. where, for whatever reason the loss of companion shelter cannot be mitigated by pruning) - Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline - Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve.			Dark Red
Trees to be considered for retention				
	Criteria – Subcategories			
	1	2	3	
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual, or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and /or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	Light Green
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in the category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	Mid Blue
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value, and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	Grey



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TREE SURVEY SCHEDULE

Client : Terra Firma Consultancy

Site Location : Land off Horndean Road, Emsworth

Surveyor : Bernie Harverson M.Arb.

Date Surveyed : 31st July 2013

Tree No.	Species	Ht m	Diam mm	Brch Sprd m	GC m	LMB m	LS	Condition Comments	Preliminary Management Recommendations	Rem Con yrs	Cat
Hedge 1	Hawthorn <i>Crataegus monogyna</i>	2 to 2.5	Av 60	N1 E1 S1 W1	0	0 nesw	EM	Good shape and form – flail maintained	No works required at this time	>40	A2
Hedge 2	Hawthorn <i>Crataegus monogyna</i>	1	Av 30	N0.5 E0.5 S0.5 W0.5	0	0 nesw	SM	Low boundary hedge-formal clipped form-brambles growing through it-densely in places	No works required at this time	>40	B2
1	Pedunculate Oak <i>Quercus robur</i>	18	1200	N8 E10 S12 W8	3	3 nesw	M	Ivy smothering base and trunk-small and large diameter deadwood and stubs-good shape and form	No works required at this time	>40	A1
Copse 1	Oak (<i>Quercus</i>) Elm (<i>Ulmus</i>) Hawthorn (<i>Crataegus</i>) Grey Willow (<i>Salix</i>) Holly (<i>Ilex</i>) Apple (<i>Malus</i>)	6 to 12	100 to 350 x 3	N4 E4 S4 W4	0	0 nesw	Y to EM	Band of trees and under storey surrounding a pond-large Willows around perimeter are 350 x 3 size	No works required at this time	>40	A2
2	Pedunculate Oak <i>Quercus robur</i>	15	950	N7 E5 S12 W8	4	2.5 nesw	M	Ivy smothering base and trunk-suppressed east side-crown weighted to the south with arching lean in that direction-cavities on south side but no depth or active decay	No works required at this time	>40	B1
3	Pedunculate Oak <i>Quercus robur</i>	13	950	N6 E6 S10 W6	4	4 nesw	M	Ivy smothering base, trunk and through crown-dieback-becoming stag headed-small and large diameter deadwood and stubs-decay and cavities in old pruning wounds-a habitat tree	Sever ivy	30-40	B1 / C1
4	Pedunculate Oak <i>Quercus robur</i>	16	800	N10 E8 S10 W12	2.5	2.5w	EM	Ivy smothering base ,trunk and through crown-small and large diameter deadwood-fair shape and form	No works required at this time	>40	A1
5	Pedunculate Oak <i>Quercus robur</i>	8	370	N3 E3 S3 W3	4	4 nesw	Y	Ivy smothering base, trunk and through crown and dominating tree-crown lifted to 4m	No works required at this time	>40	B1

6	Pedunculate Oak <i>Quercus robur</i>	6	180	N3 E3 S1.5 W1.5	1.5	1.5n	Y	Flat pruned on east and west sides	No works required at this time	>40	B1
7	Hawthorn <i>Crataegus monogyna</i>	4	150 x 4	N2 E1.5 S2 W1	1	1w	EM	Die back-small diameter deadwood-flat pruned on west side	No works required at this time	10-20	C1
8	Pedunculate Oak <i>Quercus robur</i>	12	950	N8 E8 S8 W8	3	3s	M	Small and large diameter deadwood and stubs-some very large open jagged wounds-crown lifted over field-previously heavily topped-decay and cavities in old pruning wounds-woodpecker holes noted	No works required at this time	>40	B1
Group 1	Bay Laurel (<i>Laurus</i>)	3	250 x 2	N3 E0 S3 W0.5	0	0 nesw	SM	Pruned flat to the wall of the building-trimmed as a tailored hedge	No works required at this time	20-30	C2
Group 2	Elderberry (<i>Sambucus</i>) Wych Elm (<i>Ulmus</i>) Hawthorn (<i>Crataegus</i>) Plum (<i>Prunus</i>) Ivy	4 to 6	Av 300 #	N3 E3 S3 W3	0	0 nesw	Y to SM	Ivy smothering base, trunk and through crown-linear belt of merged crown trees	No works required at this time	20-30	C2
Group 3	Horse Chestnuts (<i>Aesculus</i>) & Common Alder (<i>Alnus</i>)	14 to 18	Largest HChest 600 400 #	N8 E- S- W-	4	3 nesw	EM to M	Unable to access as trees are off site-crown shape dictated by group pressure-merged crowns-large diameter deadwood and stubs-linear boundary belt of trees	No works required at this time	>40	A2 / B2
Hedge 3	Hawthorn <i>Crataegus monogyna</i> (+other species mix)	1.2 to 1.5	Av 60	N0.3 E- S0.3 W-	0	0 nesw	EM	Ragged hedge with gaps – has recently been cut back on north side	No works required at this time	20-30	C2
9	Hybrid Black Poplar <i>Populus euroamericana</i>	25	1000 #	N15 E15 S12 W8	4	4 nesw	M	Unable to access tree is off site-small and large diameter deadwood and stubs-significant hollowing and decay with weak point of attachment for the three primary spires which make up the crown-high potential for structural collapse	Advise owner to pollard or fell	0-5	U
Group 4	Horse Chestnuts (<i>Aesculus</i>) x 5 Hybrid Poplar (<i>Populus</i>) x 1 Alder (<i>Alnus</i>) x 1	12 to 16	Av 450 350 #	N6 E- S- W-	4	3 nesw	SM to EM	Unable to access-off site trees-crown shape dictated by group pressure-merged crowns-small and large diameter deadwood and stubs-crown lifted to 4m over field-decay and cavities in old pruning wounds-linear boundary screen of trees-leaf miner prevalent throughout-bacterial canker also noted	No works required at this time	20-30	C2
10	Pedunculate Oak <i>Quercus robur</i>	8	900	N4 E3 S5 W3	1.5	2 nesw	M	Ivy smothering base and trunk-hollow-decay-decay in cavities-has suffered crown collapse in the past and is now a “totem pole” with regrowth arising from it	No works required at this time	10-20	C1

11	Pedunculate Oak <i>Quercus robur</i>	13	900	N6 E11 S11 W5	1.5	3 nesw	M	Large diameter deadwood and stubs-storm damage-fair shape and form	No works required at this time	>40	A1 / B1
12	Pedunculate Oak <i>Quercus robur</i>	12	1200	N8 E8 S8 W8	4	4 nesw	M	Low crown density-low vigour and vitality-significant dieback-large diameter deadwood and stubs throughout-stag headed-significant amount of <i>Ganoderma</i> fungal brackets all around base of tree	Fell and grub out	5-10	U
13	Pedunculate Oak <i>Quercus robur</i>	12	1100	N7 E10 S10 W7	3	4 nesw	M	Stubs and storm damage-crown lifted-large diameter branch removed from east side-previously heavily topped-decay and cavities in old pruning wounds-small leaf size and lower crown density than T11(possibly hybridised with Turkey Oak)	No works required at this time	>40	B1 / C1
14	Pedunculate Oak <i>Quercus robur</i>	9	800	N8 E10 S6 W4	3	3 nesw	M	Ivy smothering base and trunk-small and large diameter deadwood and stubs-contains some very large dead branches	Remove major deadwood only for safety reasons	>40	B1
Group 5	Pedunculate Oak (<i>Quercus</i>) x 3	14 to 16	600 #	N- E- S- W8	4	3 nesw	EM	Unable to access-off site trees-small and large diameter deadwood and stubs-small leaf size(possibly hybridised with Turkey Oak)	No works required at this time	>40	A2
15	Pedunculate Oak <i>Quercus robur</i>	13	500 #	N11 E8 S11 W7	4	3s	EM	Unable to access as tree is in a ditch-base smothered with ivy-large diameter deadwood and stubs-decay in old pruning wounds-has shed one of its main leaders which remains lodged in the lower crown	Tidy storm damage, broken branches and hangers	>40	B1
16	Pedunculate Oak <i>Quercus robur</i>	10	500 #	N8 E6 S10 W6	3	3s	EM	Unable to access as tree is in a ditch-ivy smothering base, trunk and through crown	Sever ivy	>40	B1
Group 6	Field Maples (<i>Acer</i>) x 3 Pedunculate Oak (<i>Quercus</i>) x 1	9	200 350 #	N5 E2 S7 W2	3	3 nesw	Y	Unable to access –trees in a ditch-crown shape dictated by group pressure-merged crowns	No works required at this time	20-30	C2
17	Pedunculate Oak <i>Quercus robur</i>	15	750 #	N12 E9 S10 W8	3	3s	M	Unable to access-tree is in a ditch-ivy smothering base, trunk and dominating crown-large diameter deadwood and stubs-storm damage ,broken branches and hangers	Sever ivy-remove major deadwood only for safety reasons	>40	A1
18	Pedunculate Oak <i>Quercus robur</i>	8	300 #	N6 E4 S6 W5	3	2.5s	Y	Unable to access-tree is in a ditch-bifurcated 1.8m above ground level –tight forks with included bark-pronounced ridges on either side	No works required at this time	>40	B1

19	Pedunculate Oak <i>Quercus robur</i>	9	450 #	N5 E6 S7 W8	2	2w	SM	Unable to access-tree is in a ditch	No works required at this time	>40	B1
20	Pedunculate Oak <i>Quercus robur</i>	5	250 #	N3 E3 S3 W3	2	2 nesw	Y	Unable to access-tree is in a ditch	No works required at this time	>40	B1
21	Pedunculate Oak <i>Quercus robur</i>	11	650 #	N6 E8 S10 W8	4	3e	M	Unable to access-tree is in a ditch-crown lifted on field side to the north	No works required at this time	>40	B1



BH 2

Tree Root Protection Area Schedule

+ BS5837 RPA Calculation Methodology

4.6 Root Protection Area (RPA)

4.6.1 For single stem trees, the RPA should be calculated as an area equivalent to a circle with a radius 12 times the stem diameter measured at a height of 1.5m from ground level.

For trees with more than one stem, one of two calculation methods should be used as illustrated and explained below.

a) For trees with 2 to 5 stems, the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{stem diameter } 1)^2 + (\text{stem diameter } 2)^2 \dots \text{up to } + (\text{stem diameter } 5)^2}$$

In words - measure the diameter of each of the stems – square each one and add it to the next - finally assess the square root of the combined total to derive one measurement which you look up in Table D.1 to find the radial RPA and area measurement equivalent to the area of a circle with that radius - in case you have to apply a polygon protection zone [see at 4.6.2 below].

The calculated RPA for each tree is to be capped at 707 m²

b) For trees with more than five stems the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{mean stem diameter})^2 \times \text{the total number of stems}}$$

In words – measure all of the stem diameters – add them all together and divide by the total number of stems (= mean stem diameter) – then square this figure – then multiply that figure by the total number of stems and then finally assess the square root of that figure to derive one measurement which you look up in Table D.1 to find the radial RPA and area measurement equivalent to the area of a circle with that radius - in case you have to apply a polygon protection zone [see at 4.6.2 below].

4.6.2 The RPA for each tree should initially be plotted as a circle centred on the accurate position of the trunk of the tree. Where pre-existing site conditions or other factors indicate that rooting has occurred asymmetrically, a polygon of equivalent area to the circle should be plotted instead of the circle. Modifications to the shape of the RPA should reflect a soundly based arboricultural assessment of likely root distribution.

4.6.3 Any deviation in the RPA from the original circular plot should take account of the following factors whilst still providing adequate protection for the root system:

- the morphology and disposition of the roots, when influenced by past or existing site conditions (e.g. the presence of roads, structures and underground apparatus);
- topography and drainage;
- the soil type and structure;
- the likely tolerance of the tree to root disturbance or damage, based on factors such as species, age, condition and past management.

Root Protection Area – Table D1

The RPA's given in Table D.1 should be used for single stem trees and the equivalent resultant combined stem diameter for multi-stemmed trees

Stem Diam. mm	Circle Rad. m	Area m ²	Stem Diam. mm	Circle Rad. m	Area m ²	Stem Diam. mm	Circle Rad. m	Area m ²	Stem Diam. mm	Circle Rad. m	Area m ²	Stem Diam. mm	Circle Rad. m	Area m ²
75	0.9	3	310	3.7	43	545	6.5	134	780	9.4	275	1015	12.2	466
80	1.0	3	315	3.8	45	550	6.6	137	785	9.4	279	1020	12.2	471
85	1.0	3	320	3.8	46	555	6.7	139	790	9.5	282	1025	12.3	475
90	1.1	4	325	3.9	48	560	6.7	142	795	9.5	286	1030	12.4	480
95	1.1	4	330	4.0	49	565	6.8	144	800	9.6	290	1035	12.4	485
100	1.2	5	335	4.0	51	570	6.8	147	805	9.7	293	1040	12.5	490
105	1.3	5	340	4.1	52	575	6.9	150	810	9.7	297	1045	12.5	494
110	1.3	5	345	4.1	54	580	7.0	152	815	9.8	301	1050	12.6	499
115	1.4	6	350	4.2	55	585	7.0	155	820	9.8	304	1055	12.7	504
120	1.4	7	355	4.3	57	590	7.1	157	825	9.9	308	1060	12.7	508
125	1.5	7	360	4.3	59	595	7.1	160	830	10.0	312	1065	12.8	513
130	1.6	8	365	4.4	60	600	7.2	163	835	10.0	315	1070	12.8	518
135	1.6	8	370	4.4	62	605	7.3	166	840	10.1	319	1075	12.9	523
140	1.7	9	375	4.5	64	610	7.3	168	845	10.1	323	1080	13.0	528
145	1.7	10	380	4.6	65	615	7.4	171	850	10.2	327	1085	13.0	533
150	1.8	10	385	4.6	67	620	7.4	174	855	10.3	331	1090	13.1	538
155	1.9	11	390	4.7	69	625	7.5	177	860	10.3	335	1095	13.1	542
160	1.9	12	395	4.7	71	630	7.6	180	865	10.4	339	1100	13.2	547
165	2.0	12	400	4.8	72	635	7.6	182	870	10.4	342	1105	13.3	552
170	2.0	13	405	4.9	74	640	7.7	185	875	10.5	346	1110	13.3	557
175	2.1	14	410	4.9	76	645	7.7	188	880	10.6	350	1115	13.4	562
180	2.2	15	415	5.0	78	650	7.8	191	885	10.6	354	1120	13.4	568
185	2.2	16	420	5.0	80	655	7.9	194	890	10.7	358	1125	13.5	573
190	2.3	16	425	5.1	82	660	7.9	197	895	10.7	362	1130	13.6	578
195	2.3	17	430	5.2	84	665	8.0	200	900	10.8	366	1135	13.6	583
200	2.4	18	435	5.2	86	670	8.0	203	905	10.9	371	1140	13.7	588
205	2.5	19	440	5.3	88	675	8.1	206	910	10.9	375	1145	13.7	593
210	2.5	20	445	5.3	90	680	8.2	209	915	11.0	379	1150	13.8	598
215	2.6	21	450	5.4	92	685	8.2	212	920	11.0	383	1155	13.9	604
220	2.6	22	455	5.5	94	690	8.3	215	925	11.1	387	1160	13.9	609
225	2.7	23	460	5.5	96	695	8.3	219	930	11.2	391	1165	14.0	614
230	2.8	24	465	5.6	98	700	8.4	222	935	11.2	396	1170	14.0	619
235	2.8	25	470	5.6	100	705	8.5	225	940	11.3	400	1175	14.1	625
240	2.9	26	475	5.7	102	710	8.5	228	945	11.3	404	1180	14.2	630
245	2.9	27	480	5.8	104	715	8.6	231	950	11.4	408	1185	14.2	635
250	3.0	28	485	5.8	106	720	8.6	235	955	11.5	413	1190	14.3	641
255	3.1	29	490	5.9	109	725	8.7	238	960	11.5	417	1195	14.3	646
260	3.1	31	495	5.9	111	730	8.8	241	965	11.6	421	1200	14.4	652
265	3.2	32	500	6.0	113	735	8.8	244	970	11.6	426	1205	14.5	657
270	3.2	33	505	6.1	115	740	8.9	248	975	11.7	430	1210	14.5	662
275	3.3	34	510	6.1	118	745	9.0	251	980	11.8	435	1215	14.6	668
280	3.4	35	515	6.2	120	750	9.0	255	985	11.8	439	1220	14.6	673
285	3.4	37	520	6.2	122	755	9.1	258	990	11.9	443	1225	14.7	679
290	3.5	38	525	6.3	125	760	9.1	261	995	11.9	448	1230	14.8	685
295	3.5	39	530	6.4	127	765	9.2	265	1000	12.0	452	1235	14.8	690
300	3.6	41	535	6.4	130	770	9.2	268	1005	12.1	457	1240	14.9	696
305	3.7	42	540	6.5	132	775	9.3	272	1010	12.1	462	1245	14.9	701
												1250	15.0	707



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ROOT PROTECTION ZONE/AREA SCHEDULE

Client : Terra Firma Consultancy

Site Location : Land off Horndean Road, Emsworth

Tree No.	Tree Species	Cat	Diam mm	BS5837:2012 Table1 Radial Protection Zone m	BS5837:2012 Table D1 Polygon Area m ²	Is An Offset Required To Cater For Existing Rooting Pattern Restrictions
Hedge 1	Hawthorn <i>Crataegus monogyna</i>	A2	Av 60	0.7	2	NO – fairly free rooting to all directions
Hedge 2	Hawthorn <i>Crataegus monogyna</i>	B2	Av 30	0.4	1	NO – fairly free rooting to all directions
1	Pedunculate Oak <i>Quercus robur</i>	A1	1200	14.4	652	NO – fairly free rooting to all directions
Copse 1	Oak (<i>Quercus</i>) Elm (<i>Ulmus</i>) Hawthorn (<i>Crataegus</i>) Grey Willow (<i>Salix</i>) Holly (<i>Ilex</i>) Apple (<i>Malus</i>)	A2	100 to 350 x 3	1.2 7.3	5 166	NO – fairly free rooting to all directions
2	Pedunculate Oak <i>Quercus robur</i>	B1	950	11.4	408	NO – fairly free rooting to all directions
3	Pedunculate Oak <i>Quercus robur</i>	B1 / C1	950	11.4	408	NO – fairly free rooting to all directions
4	Pedunculate Oak <i>Quercus robur</i>	A1	800	9.6	290	NO – fairly free rooting to all directions
5	Pedunculate Oak <i>Quercus robur</i>	B1	370	4.4	62	NO – fairly free rooting to all directions
6	Pedunculate Oak <i>Quercus robur</i>	B1	180	2.2	15	NO – fairly free rooting to all directions
7	Hawthorn <i>Crataegus monogyna</i>	C1	150 x 4	3.6	41	NO – fairly free rooting to all directions
8	Pedunculate Oak <i>Quercus robur</i>	B1	950	11.4	408	NO – fairly free rooting to all directions

Group 1	Bay Laurel (<i>Laurus</i>)	C2	250 x 2	4.2	57	YES – the house wall will deflect rooting out into the field
Group 2	Elderberry (<i>Sambucus</i>) Wych Elm (<i>Ulmus</i>) Hawthorn (<i>Crataegus</i>) Plum (<i>Prunus</i>) Ivy (<i>Hedera</i>)	C2	Av 300 #	3.6	41	NO – fairly free rooting to all directions
Group 3	Horse Chestnuts (<i>Aesculus</i>) & Common Alder (<i>Alnus</i>)	A2 / B2	Largest H.Chest 600 400 #	8.7	235	NO – fairly free rooting to all directions
Hedge 3	Hawthorn <i>Crataegus monogyna</i> (+other species mix)	C2	Av 60	0.7	2	NO – fairly free rooting to all directions
9	Hybrid Black Poplar <i>Populus euroamericana</i>	U	1000 #	n/a	n/a	NO – this tree should be removed for sound arboricultural management reasons regardless of any redevelopment proposals
Group 4	Horse Chestnuts (<i>Aesculus</i>) x 5 Hybrid Poplar (<i>Populus</i>) x 1 Alder (<i>Alnus</i>) x 1	C2	Av 450 350 #	6.8	147	NO – fairly free rooting to all directions
10	Pedunculate Oak <i>Quercus robur</i>	C1	900	10.8	366	YES – the deep culvert will tend to promote more rooting in other directions away from it
11	Pedunculate Oak <i>Quercus robur</i>	A1 / B1	900	10.8	366	YES – the deep culvert will tend to promote more rooting in other directions away from it
12	Pedunculate Oak <i>Quercus robur</i>	U	1200	n/a	n/a	NO – this tree would be removed for sound arboricultural management reasons regardless of any redevelopment proposals
13	Pedunculate Oak <i>Quercus robur</i>	B1 / C1	1100	13.2	547	YES – the deep culvert will tend to promote more rooting in other directions away from it
14	Pedunculate Oak <i>Quercus robur</i>	B1	800	9.6	290	YES – the deep culvert will tend to promote more rooting in other directions away from it
Group 5	Pedunculate Oak (<i>Quercus</i>) x 3	A2	600 #	7.2	163	YES – the deep culvert will tend to promote more rooting in other directions away from it

15	Pedunculate Oak <i>Quercus robur</i>	B1	500 #	6.0	113	YES – the deep culvert will tend to promote more rooting in other directions away from it
16	Pedunculate Oak <i>Quercus robur</i>	B1	500 #	6.0	113	YES – the deep culvert will tend to promote more rooting in other directions away from it
Group 6	Field Maples (<i>Acer</i>) x 3 Pedunculate Oak (<i>Quercus</i>) x 1	C2	200 350 #	2.4 4.2	18 55	YES – the deep culvert will tend to promote more rooting in other directions away from it
17	Pedunculate Oak <i>Quercus robur</i>	A1	750 #	9.0	255	YES – the deep culvert will tend to promote more rooting in other directions away from it
18	Pedunculate Oak <i>Quercus robur</i>	B1	300 #	3.6	41	YES – the deep culvert will tend to promote more rooting in other directions away from it
19	Pedunculate Oak <i>Quercus robur</i>	B1	450 #	5.4	92	YES – the deep culvert will tend to promote more rooting in other directions away from it
20	Pedunculate Oak <i>Quercus robur</i>	B1	250 #	3.0	28	YES – the deep culvert will tend to promote more rooting in other directions away from it
21	Pedunculate Oak <i>Quercus robur</i>	B1	650 #	7.8	191	YES – the deep culvert will tend to promote more rooting in other directions away from it



BH 3

Tree Survey BJH 01 & Root Constraints Plan BJH 02

[TO BE SUBMITTED SEPARATELY AS AN AUTOCAD DRAWING
BY TERRA FIRMA CONSULTANCY]



BH 4

Tree Retentions & Removals Plan BJH 03
and Tree Protection Plan BJH 04

[TO BE SUBMITTED SEPARATELY AS AUTOCAD DRAWINGS
BY TERRA FIRMA CONSULTANCY]

Figure 2 Default specification for protective barrier

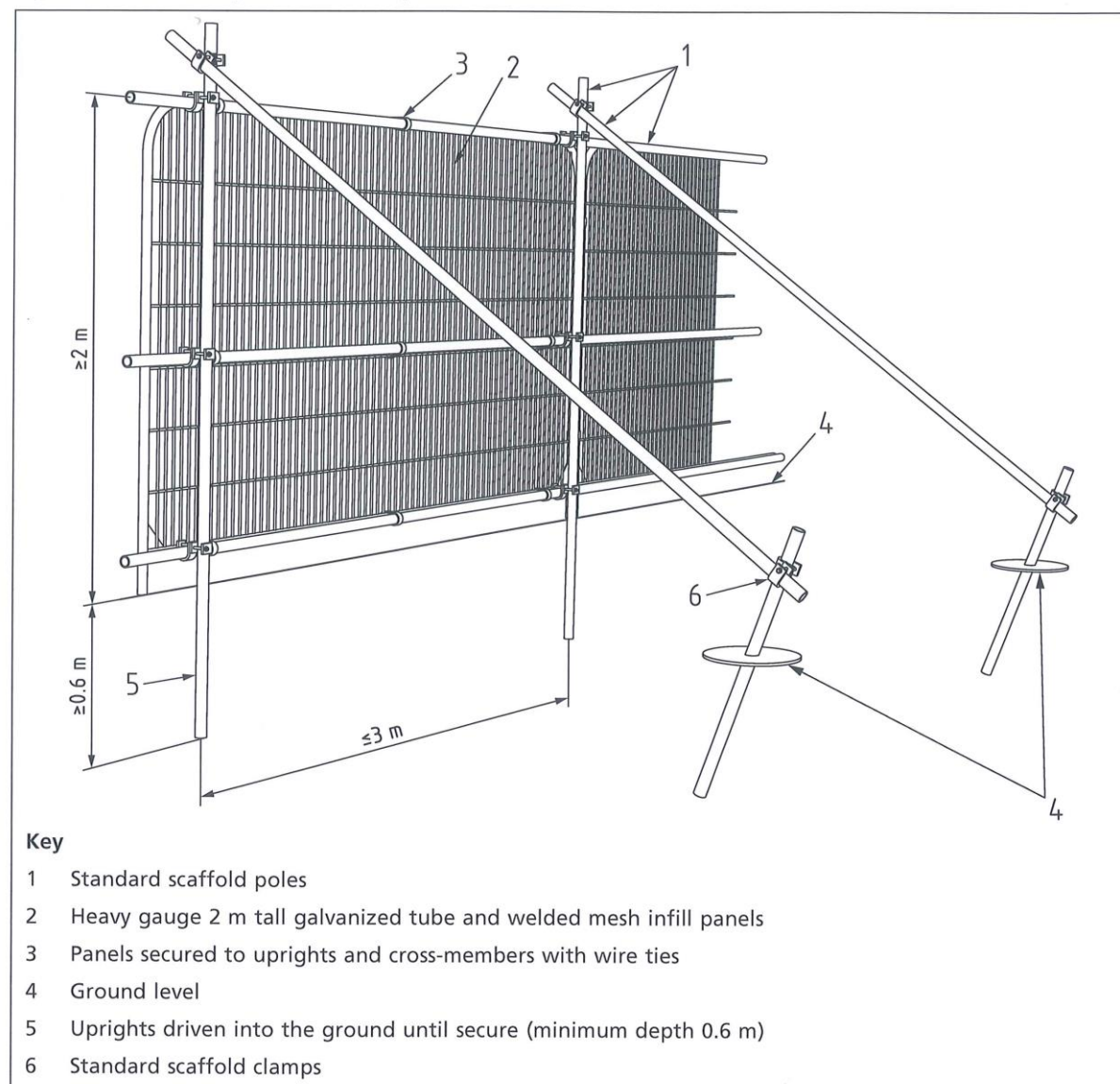
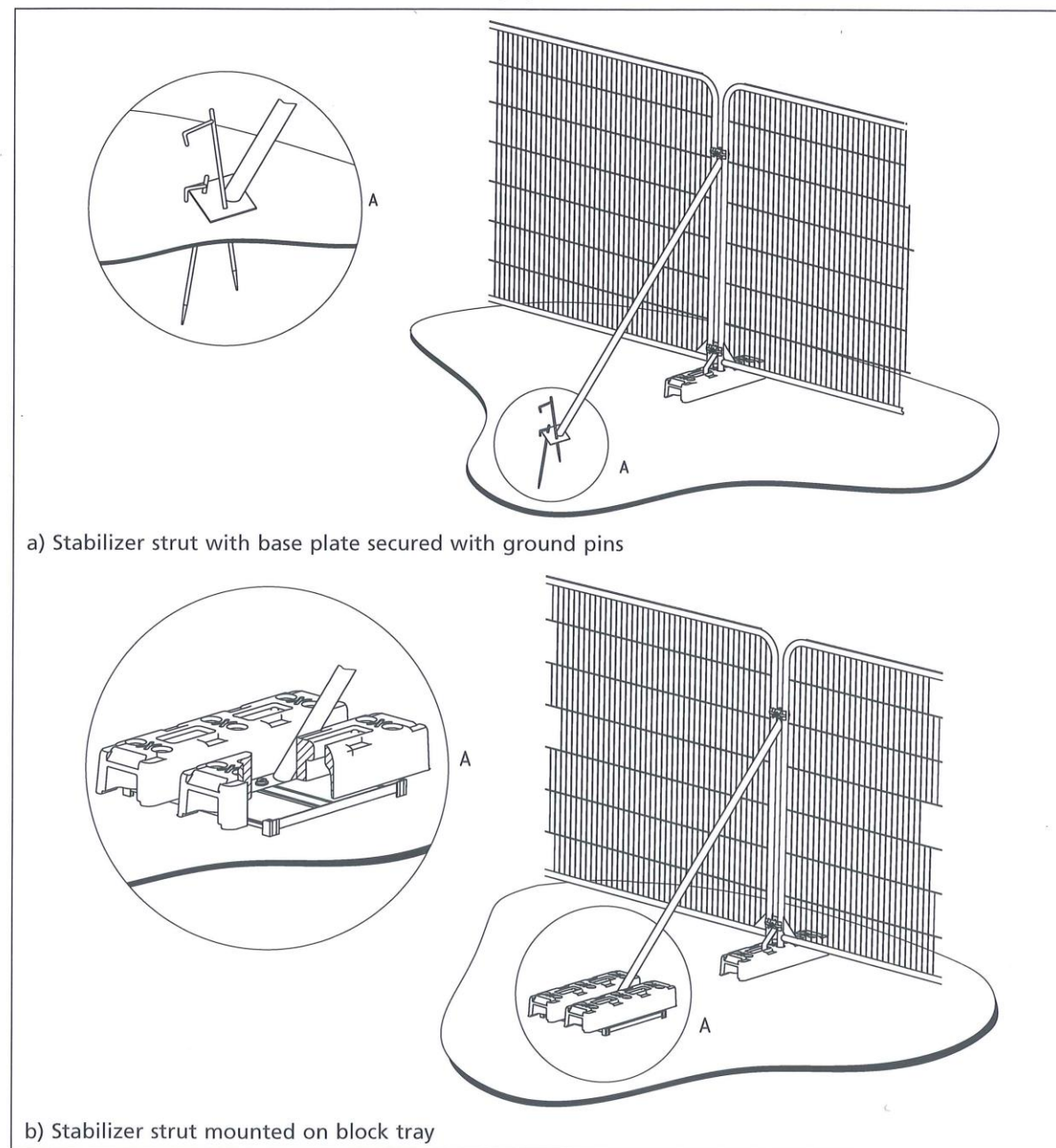


Figure 3 Examples of above-ground stabilizing systems

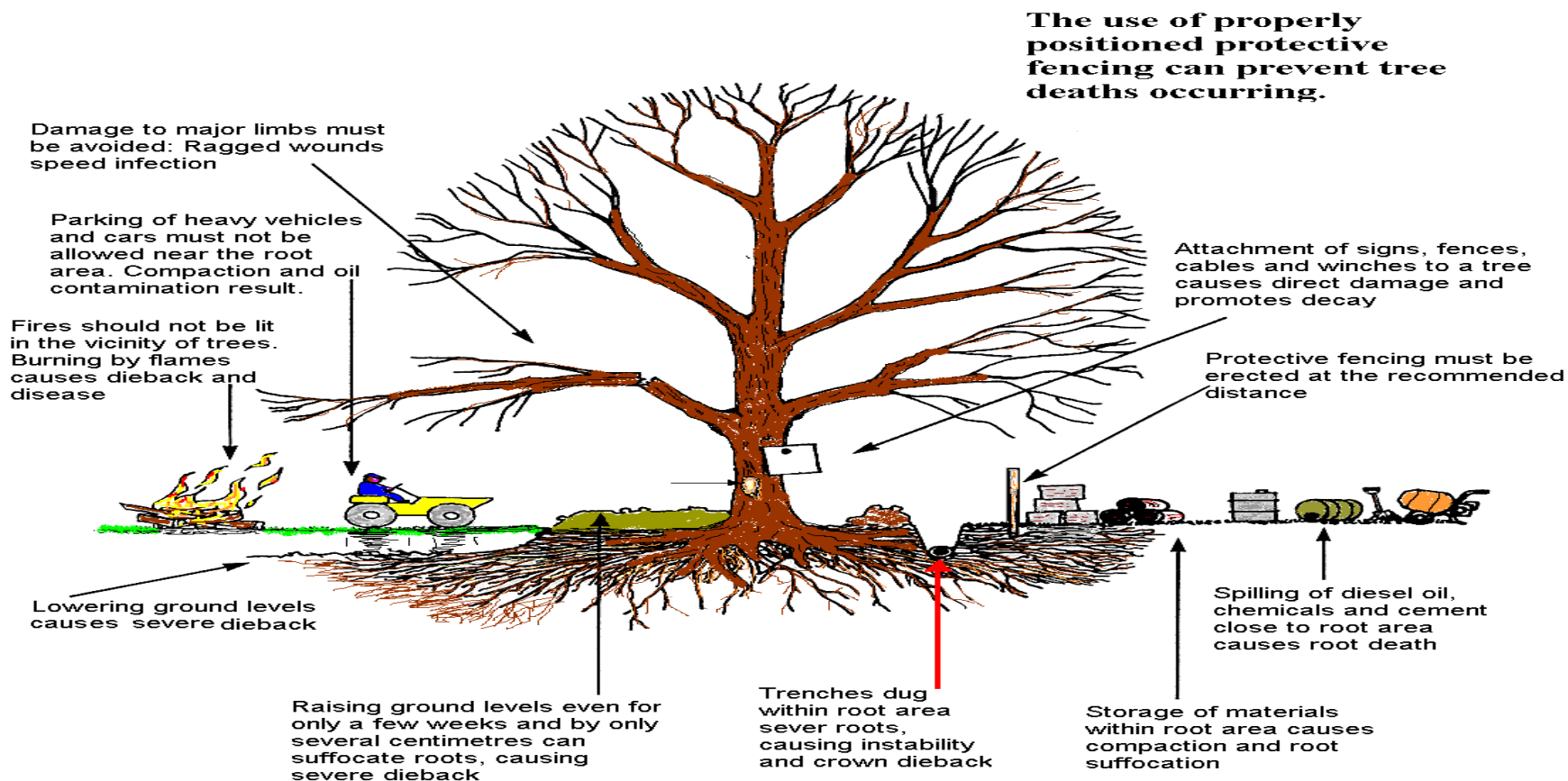


TREE PROTECTION AREA

KEEP OUT

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

Common causes of Tree Death



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





BH 5

Tree Works Schedule

TREE WORK SPECIFICATION

Client : Terra Firma Consultancy

Site Location : Land off Horndean Road, Emsworth

- Where whole branches are to be removed final cuts close to the trunk or branch union are to be made as shown in Figure 2 of BS3998:2010 and all shortened branches are to be cut at the correct angle (see also BS3998:2010) and adjacent to a live bud or lateral.
- Attention is drawn to the fact that some mature trees could provide suitable habitat for bird nesting (ivy and cavities) and bat roosting (ivy, branch cracks and cavities) and this might at certain times of year influence and possibly restrict the form of management which can be applied. Given the legal constraints imposed by the Habitat Regulations and the Wildlife and Countryside Act and the fact that it is a criminal offence to disturb or destroy nest sites, this may necessitate expert ecological advice being sought before proceeding with these recommendations. As a minimum requirement it will be necessary for the appointed Tree Contractor to climb the trees and verify that there are no birds nesting or bats present in splits; holes and cavities prior to commencement of works.

No	Species	Tree Works Recommended
Hedge 1	Hawthorn <i>Crataegus monogyna</i>	Continue to maintain as a flailed hedge but no works required at this time
Hedge 2	Hawthorn <i>Crataegus monogyna</i>	Continue to maintain as a flailed hedge but no works required at this time
1	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
Copse 1	Oak (<i>Quercus</i>) Elm (<i>Ulmus</i>) Grey Willow (<i>Salix</i>) Hawthorn (<i>Crataegus</i>) Holly (<i>Ilex</i>) Apple (<i>Malus</i>)	- Thin out and clear the swathe of vegetation shown on the Landscape Master Plan in order to lay to grass sward and construct a viewing deck over the Pond. - The remainder of the understorey vegetation in and around the retained trees requires no works at this time.
2	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
3	Pedunculate Oak <i>Quercus robur</i>	Sever the ivy at ground level - as it is smothering the crown
4	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
5	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
6	Pedunculate Oak <i>Quercus robur</i>	No works required at this time

7	Hawthorn <i>Crataegus monogyna</i>	No works required at this time
8	Pedunculate Oak <i>Quercus robur</i>	Tidy up the jagged stubs and remove any major pieces of dead wood
Group 1	Bay Laurel (<i>Laurus</i>)	Prune to improve shape and form collectively
Group 2	Elderberry (<i>Sambucus</i>) Wych Elm (<i>Ulmus</i>) Hawthorn (<i>Crataegus</i>) Plum (<i>Prunus</i>) Ivy (<i>Hedera</i>)	Thin out the weaker stems to allow others to develop more fully
Group 3	Horse Chestnuts (<i>Aesculus</i>) & Common Alder (<i>Alnus</i>)	Off site trees - no works required at this time
Hedge 3	Hawthorn <i>Crataegus monogyna</i> (+other species mix)	Off site trees - no works required at this time
9	Hybrid Black Poplar <i>Populus euroamericana</i>	Off site tree in a dangerous condition BUT this is not under my clients control - although it may be wise to have the attenuated branch overhang reduced back for safety reasons prior to constructing houses on this site as this tree species is noted to be very brittle.
Group 4	Horse Chestnuts (<i>Aesculus</i>) x 5 Hybrid Poplar (<i>Populus</i>) x 1 Alder (<i>Alnus</i>) x 1	Off site trees - no works required at this time
10	Pedunculate Oak <i>Quercus robur</i>	- Fell to ground level in a controlled manner to facilitate development works - Grub out the stump to allow the new headwall to be constructed.
11	Pedunculate Oak <i>Quercus robur</i>	Remove any major dead wood and tidy up storm damaged limbs and jagged wounds
12	Pedunculate Oak <i>Quercus robur</i>	Cut up and clear the fallen tree and grub out the stump (if this has not already been carried out).
13	Pedunculate Oak <i>Quercus robur</i>	Remove any major dead wood and tidy up storm damaged limbs and jagged wounds
14	Pedunculate Oak <i>Quercus robur</i>	Remove any major dead wood and tidy up storm damaged limbs and jagged wounds
Group 5	Pedunculate Oak (<i>Quercus</i>) x 3	Off site trees - no works required at this time

15	Pedunculate Oak <i>Quercus robur</i>	Remove any major dead wood and tidy up storm damaged limbs and jagged wounds
16	Pedunculate Oak <i>Quercus robur</i>	Sever the ivy at ground level
Group 6	Field Maples (<i>Acer</i>) x 3 Pedunculate Oak (<i>Quercus</i>) x 1	No works required at this time
17	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
18	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
19	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
20	Pedunculate Oak <i>Quercus robur</i>	No works required at this time
21	Pedunculate Oak <i>Quercus robur</i>	No works required at this time



BH 6

NJUG 10 Extract

NJUG 10 - NATIONAL JOINT UTILITIES GROUP**2. HOW ROOTS ARE DAMAGED**

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

The root system

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

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

Types of damage

2.4 Root systems can be damaged by:-

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

2.5 If roots are damaged:-

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

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

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

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

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

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

HOW TO AVOID DAMAGE TO TREES

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

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

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

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

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

Acceptable techniques in order of preference are:-

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

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

4.5 Trenchless

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

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

4.6 Broken Trench

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

4.7 Continuous Trench

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

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

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

4.8 Backfilling

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

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

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

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

4.10 Special Considerations when planning service routes

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

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

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

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



BH 7

Qualifications & Experience

QUALIFICATIONS AND EXPERIENCE

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

Bernie Harverson M.Arb.

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