

APPENDIX U
ARBORICULTURAL
REPORT

Southmoor Asset
Improvement Options
Appraisal and Business Case

Outline Arboricultural Impact Assessment Report

Environment Agency

Project Number: 60538789

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Quality information

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01	26.09.17	Updated to reflect amended Site layout	Adam King	Adam King	Associate

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Table of Contents

1.	Introduction.....	5
1.1	Background.....	5
1.2	Statutory and Non Statutory Designations.....	5
1.3	Methodology.....	5
2.	General Arboricultural Principles.....	6
2.1	General Principles.....	6
2.2	Below ground constraints.....	6
2.3	Soils.....	7
2.4	Above ground constraints.....	7
2.5	Trees and Risk in the Context of Development.....	7
2.6	Trees and Wildlife.....	7
2.7	Tree Works.....	7
3.	The Site.....	9
4.	The Trees.....	9
5.	Proposed Development.....	9
6.	Outline Arboricultural Impact Assessment.....	9
6.1	Purpose.....	9
6.2	Tree Works.....	10
6.3	Inundation of Seawater Close to Retained Trees.....	10
6.4	Installation of Soil Bund.....	10
6.5	Improvements to Footpath.....	11
6.6	Tree Protection.....	11
6.7	Site Organisation, Storage and Use of Materials, Plant and Machinery.....	11
7.	Conclusions.....	12
	References.....	13
	Appendix A Tree Constraints Plan.....	14
	Appendix B Tree Survey Schedule.....	15
	Key to Abbreviations Used in the Survey.....	18
	Appendix C Site Photography.....	19
	Appendix D Tree Protection Plan.....	21
	Appendix E Outline Tree Protection Measures.....	22
	7.1 Outline Tree Protection Measures.....	22
	7.2 Ground Protection.....	23
	7.3 Storage, use and mixing of materials.....	24
	Appendix F Example All Weather Signage.....	25

1. Introduction

1.1 Background

AECOM has been instructed by the Environment Agency ('The Applicant') to carry out an Outline Arboricultural Impact Assessment of the development proposals at Southmoor (hereafter referred to as 'the Site' and 'Proposed Development') in support of a planning application. This report identifies the likely direct and indirect impacts of the Proposed Development along with suitable mitigation measures, as appropriate. The Tree Protection Plan (included within Appendix D) identifies how retained trees are to be successfully protected.

1.2 Statutory and Non Statutory Designations

AECOM checked the Havant Borough Council website¹ and the following trees were confirmed as being subject to Tree Preservation Order No 1538.

- Area TPO in centre of Site (north to south, G2B and G8 AECOM Survey)
- Group TPO (G2 hazel) to north (not surveyed)
- 4 individual TPOs;
 - T4- Salix spp. (not surveyed);
 - T5- Salix spp. (not surveyed);
 - T6- Quercus robur (T10 of AECOM Survey); and
 - T7- Quercus robur (T11 of AECOM Survey).

Full planning consent is an exemption from the need to apply for consent for works to trees protected by a Tree Preservation Order, the need to give notice of the intention to undertake works within a Conservation Area and the need to apply for a Felling Licence with the Forestry Commission (to fell more than 5m³ per calendar quarter). Prior to any tree works the status of trees to be removed or pruned must be verified with the LPA and the Forestry Commission as appropriate.

1.3 Methodology

The tree survey has been based on Ordnance Survey Base Mapping and trees have been plotted indicatively with reference to GPS positions, site features and publically available aerial photography. As such all positions must be considered to be indicative only and the relative distances of features must be measured out on Site.

The survey was otherwise conducted in accordance with the requirements of *BS5837:2012 Trees in relation to design, demolition and construction – Recommendations (BS5837)*.

The initial fieldwork was undertaken in June 2017, during which dimensional data and observational information were collected. A diameter tape measure was used to measure stem diameters where feasible.

The fieldwork informing this report has comprised a preliminary, non-intrusive, visual survey undertaken from ground level with the specific intention of evaluating the quality and benefits of trees on Site.

Where further inspection is deemed appropriate to ascertain the condition of the tree or other arboreal features, this has been identified within the preliminary management recommendations. Average dimensions or dimensional ranges have occasionally been used, where appropriate, to best describe features.

A Tree Survey Plan showing the position of trees and the spatial constraints associated with them is included as Appendix A of this report, which corresponds with the Tree Survey Schedule presented in Appendix B.

The tree categorisation process recommended by BS5837:2012 is summarised in the table below and corresponds with the tree canopy outline shown on the tree constraint plan included as Appendix A and the information in the Tree Survey Schedule included as Appendix B.

¹ <http://maps.havant.gov.uk/havant.aspx>

Table 1: BS5837:2012 Tree Categorisation process

Category	Definition
A	High quality, minimum of 40+ years remaining contribution
B	Moderate quality, minimum of 20+ years remaining contribution
C	Low quality, minimum of 10+ years remaining contribution
U	Unsuitable for retention, <10 years remaining contribution
1	Arboricultural value
2	Landscape value
3	Conservation or cultural value

2. General Arboricultural Principles

2.1 General Principles

Trees are dynamic living organisms which provide essential benefits to society and the wider environment. Any Proposed Development with the potential to impact on trees must take into consideration the value of trees on Site; the impact of any proposed activity along with any potential future conflicts on the Site. Suitable measures to safeguard retained trees or mitigate the loss of trees (to be removed) will need to be fully considered and may be subject to a condition of planning consent.

Tree branches and roots frequently grow across Site boundaries and off Site trees can pose a significant constraint, and should be carefully considered when assessing the developable space within a Site.

2.2 Below ground constraints

Below ground tree roots and the soil environment in which they grow need to be protected if the tree is to be retained. Trees grow in association with fungi and other soil organisms which are of key importance to tree health. Roots are essential for anchorage, the uptake of water and nutrients, and the storage of energy (carbohydrates) for the future growth and function of the tree.

Roots can be damaged by physical severance or wounding (e.g. following excavation of the soil) which can lead to the development of decay and a decline in vitality and/or instability. Raising the soil level can bury tree roots at a depth where suitable conditions for growth are less available. Toxic materials discharged into the soil (such as cement based aggregates, fuel and chemicals) can lead to root death and dysfunction. Soils can be compacted to levels inhospitable to tree growth with even a single pass of machinery, regular pedestrian traffic or the storage of plant and materials. Relieving compaction can be problematic and may require costly remedial works. Changes in drainage/water levels can also have significant long term impacts for tree health.

The effects of these incursions may take many years to manifest, with a resulting decline in amenity value and potentially the death or failure of the tree. It should be noted that older trees are particularly sensitive to damage and changes in conditions.

The Root Protection Area (RPA) is a notional area considered to be the minimum zone that must be protected to avoid any adverse impacts on retained trees. This area is deemed to be particularly important for tree stability, growth, function and health. However, roots may extend far greater distances, with the distribution of the root system relating directly to the availability of suitable conditions for growth (namely oxygen, water and nutrients). It is generally accepted that tree roots are predominantly located in the upper 1000mm of soil; however, roots may develop at deeper levels where conditions allow.

RPAs are calculated as per BS5837: 2012 Annexe C, D and Section 4.6 in the BS 5837 2012 Document.

The RPA of the existing tree stock is an important material consideration when considering Site constraints and planning development activities. The RPA of significant trees on Site is shown on the Tree Constraint Plans included as Appendix A.

The default position must be that all development, including any associated services will occur outside the RPAs of retained trees. Where this is unavoidable, it may be appropriate to use special measures to install structures, services or surfacing within RPAs which allow the protection of roots and soil structure which are essential for tree growth and keep any incursion to a minimum.

Further steps to improve or increase the useable rooting area available to the tree may also be required.

2.3 Soils

On shrinkable clay soil, tree growth can lead to the differential movement of structures as moisture is removed from the soil during the growing season. Soils must be carefully assessed and any foundations must be installed following the recommendations of National House Building Council (NHBC) Standards *Chapter 4.2: Building Near Trees* (2008) to avoid potential future damage. Where trees which predate existing structures are to be removed, this can result in heave as the soils are re-wet.

The advice of a suitably qualified engineer must be obtained to inform any potential issue of heave. Specific advice in relation to this issue is beyond the scope of this report.

2.4 Above ground constraints

Tree stems and branches can restrict available space on Site. Damage or wounding (including excessive pruning) can significantly reduce the amenity contribution of the tree and may lead to the development of dysfunction and decay, with significant long term implications for tree health. The future impact of existing trees should be carefully considered, including individual species characteristics (such as potential future size, fruit fall, shade etc.) and how the tree will interact with any proposed development and future land use. Annual tree growth can lead to direct damage if stems/branches (or roots) come into physical contact with structures and this must also be taken into consideration.

2.5 Trees and Risk in the Context of Development

Tree owners/managers have a legal duty to prevent foreseeable harm. It is generally accepted that this duty can be fulfilled by undertaking proactive inspections of significant trees to identify obvious defects and by taking appropriate remedial action or gaining further advice as appropriate.

AECOM can provide surveys and advice in relation to tree risk management if required. Further guidance is available from the National Tree Safety Group².

The tree survey carried out as the basis of this report is primarily for planning purposes, focusing on the quality and benefits of the trees and is not specifically designed to assess the safety of trees on Site. However, when obvious issues have been identified recommendations have been included in the Tree Survey Schedule.

The Construction (Design and Management) Regulations (2015) states that developers and contractors have responsibilities for health and safety as a result of their actions. Should trees be left in an unstable or hazardous condition the Health and Safety Executive (HSE) could seek to prosecute those responsible along with the potential for further Civil claims for damages.

2.6 Trees and Wildlife

Full consideration must be given to the presence of species protected under the Wildlife and Countryside Act (1981 - as amended), the Countryside Rights of Way Act (2000) and the Habitat Regulations (2010). In particular the presence of bats and nesting birds. It is recommended that wherever possible, significant tree/hedge works take place outside of the typical bird nesting season of March to September.

2.7 Tree Works

Any tree surgery recommendations contained within this report are to be undertaken in accordance with BS3998: 2010 Tree work – Recommendations (BS3998) by suitably qualified and insured contractors. Significant pruning works are best undertaken when trees are dormant or outside periods of high functional activity to reduce the overall impact on energy available to the tree for growth and processes.

² National Tree Safety Group (NTSG), 2011. Common sense risk management of trees. Forestry Commission.

In general the optimum period for works is between November to February and July to August (subject to the presence of protected species) when the tree is less active and better placed to respond to wounding and a reduction in leaf area.

3. The Site

The Site is located at the coastal location to the west of Langstone in Havant, Hampshire. The Site is defined by Southmoor Lane to the west, the southern edge of Brockhampton Industrial Estate to the north, the tidal channel of a small watercourse to the east, and the shoreline of Langstone Harbour to the south.

The Site is divided into two distinct areas, the smaller western area of land comprises rough grassland, and the eastern area is more diverse, comprising remnant salt marsh with channels, pools, marshy areas and more diverse vegetation. These fields are divided by a broadleaf tree belt (G2B and G8) and enclosed to the north and west by scrubby hedgerows and tree groups.

4. The Trees

The trees surveyed are all deciduous and range in age from young to over-mature. Scrubby hedgerows are located to the north, east, west and the central belt. The central belt begins as overgrown blackthorn hedgerow (G2B) from the south and extends to the north becoming more wooded (G8) and greater in age and species variety. The highest value trees observed were located within and just north of G8 and were over-mature common oak (*Quercus robur*). For further details of the trees surveyed please see the Tree Survey Schedule included as Appendix B. Site photography can be located to the rear of this report at Appendix C.

5. Proposed Development

The Proposed Development aims to improve the standard of long-term flood protection at Langstone and to create new intertidal habitat (Environment Agency, 2008³), through the managed realignment of the coastal defence.

A flood embankment will be created to maintain the standards of protection against flooding to at least 1 in 200 chance of flooding in any given year. A deliberate breach of the existing seawall will be undertaken allowing a new intertidal area to form seaward of the proposed defences.

The embankment will be constructed using local materials and will be finished with topsoil and a coastal grassland seed mix. The height of the embankment will vary across the site from around 2m to less than 0.1m, with a slope gradient of approximately 1 in 3.

The excavation works for the borrow pits will further enhance the environment through the creation of freshwater ponds and scrapes.

Appropriate access routes for heavy plant machinery and vehicles will be determined and agreed with Havant Borough Council.

The existing footpath which runs north to south through groups G2B and G8 is to be widened and surfaced/resurfaced to account for the likely increased pedestrian traffic as it becomes part of the diverted route of the Coast Path.

The position of the proposed new embankment and the likely extent of saltwater inundation is shown as an overlay on the Tree Protection Plan included as Appendix D.

6. Outline Arboricultural Impact Assessment

6.1 Purpose

This outline impact assessment sets out the likely principal direct and indirect impacts of the Proposed Development on the trees on or immediately adjacent to the Site and suitable mitigation measures to allow for the successful retention of significant trees or to compensate for trees to be removed, where appropriate.

A brief summary of trees to be removed, tree works and incursions related to the Proposed Development are detailed within the table below.

³ http://emsworthonline.co.uk/Portchester_Castle_to_Emsworth.pdf

Table 2: Summary of Removals, Incursions and Pruning to Facilitate the Proposed Development

Impact	Category A	Category B	Category C	Category U
Trees to be lost as a result of the Proposed Development	0	G8 (part), T12, G19	G2, G17, G18	0
Total	0	1 individual tree 1 part tree group 1 full tree group	3 full tree groups	0
Trees which may require some incursion into their construction exclusion zone to allow the Proposed Development.	T13, T14, T15	G8	T1, G2B, T5, T6, T7	0
Total	3 individual trees	1 tree group	4 individual trees 1 tree group	0
Trees to be pruned to facilitate the Proposed Development	0	0	0	0
Total	0	0	0	0

6.2 Tree Works:

One moderate quality tree and part of one moderate quality tree group (Category B) are to be removed to facilitate the construction of the proposed bund. Alternative routing of the bund has been explored but is not considered feasible due to the working space requirements of the adjacent gas pipeline. In addition, G2, G17, G18 and G19 are likely to be affected in varying degrees by the ingress of salt water following the breach of the existing sea defences. This equates to three groups of young low quality trees (hawthorn, gorse and blackthorn) and one moderate quality group (G19) of tamarisk. G19 is likely to be most significantly affected and is unlikely to survive in the long term. Trees within groups G2, G17, G18 are likely to be affected in parts and parts of these groups may survive into the future.

No works are to take place without the prior consent of the local authority Tree Officer.

6.3 Inundation of Seawater Close to Retained Trees.

As the proposals are to create a breach in the sea wall the area will be flooded with salt water. Therefore the main area of concern relates to the effects of salinity (primarily salt levels within the soil) on the long-term health and vitality of the trees on Site.

The likely impact of the breach of the existing sea wall has been modelled and is illustrated on the Tree Protection Plan included as Appendix D.

Trees G2, G17, G18 and G19 are likely to be significantly affected by the inundation of salt water which is likely to lead to their decline or death in the future. The majority of trees within the Site are at the outer extent of the area anticipated to be affected by flooding and will therefore not be significantly affected by the inundation of salt water. In addition, the trees are deciduous and are therefore likely to be dormant when flooding is most likely (in the winter months) and subsequent rain water is anticipated to flush the majority of soil salt deposits from the ground in this area. Common oak and blackthorn (the predominant species) are generally considered to have a moderate tolerance of soil salt and these trees have been exposed to historic salt spray and associated raised soil salinity.

6.4 Installation of Soil Bund

The proposed new soil bund will be installed in close proximity to G8 (necessitating the removal of a small section of the north of this group), G9 and T11. In this area the bund will be at its lowest point and is anticipated to be approximately 100-250mm in depth, increasing in height to approximately 2m to the east. Raising soil levels can bury roots at depths where function is impaired. The default position is that ground levels are to remain unchanged within all RPAs. Protective fencing will be positioned to ensure material is not applied within RPAs unless specifically agreed otherwise.

The position of the bund has been adjusted to avoid the RPA and canopy spread associated with the majority of G8, G9 and T11 as fully as possible to allow the retention and protection of these trees. As tree positions are indicative only the extent of the adjacent RPAs and the final position of the bund will need to be measured on Site.

The materials and methodology to construct the bund if it passes close to G21 is to be addressed at the detailed design stage to minimise any negative impacts on trees within this group.

6.5 Improvements to Footpath

The informal footpath which runs north to south through the tree hedgeline (adjacent to T1, G2B, T5, T6, T7, G8, T13, T14 and T15) is to be improved to facilitate increased access following the removal of the existing coastal path. The methodology for the footway construction, is to be developed during the detailed design stage in accordance with arboricultural advice, but where this is to be located within the RPA of retained trees it will need to be installed without excavation either by utilising an existing hard surface or its sub base (where present), or with the use of a proprietary load bearing surface (such as Cellweb, ArborRaft or agreed equivalent). Any edging must be installed without excavation (e.g. peg and board edging pinned in place). The new path will be rolled out with contractors working on the recently installed section. Vegetation is likely to need to be cut back as necessary to provide a reasonable clearance of the path.

6.6 Tree Protection

Retained trees are vulnerable to damage from construction activities which can include physical damage to stems and branches following impacts with plant and machinery. Increasing ground levels can bury roots at depths where function is impaired. Root severance following excavation, root death or dysfunction following damage to soil structure (caused by the movement of people or machinery on unsurfaced ground) or via the spillage of materials toxic to tree health. The default position is that the RPA and canopy spread of trees to be retained will form an effective Construction Exclusion Zone, secured with fencing where no access will be permitted.

Outline tree protection measures are considered in Appendix E of this report.

6.7 Site Organisation, Storage and Use of Materials, Plant and Machinery.

All construction site facilities including site huts, staff and contractor parking and areas for storage will be located outside of the RPA or crown spread of retained trees, including those not specifically covered in this report. Space is likely to be constrained on Site and will need to be carefully considered. The Construction Exclusion Zones identified on the Tree Protection Plan must be fully respected and their location and significance is to be highlighted to all site staff and contractors during the formal site briefing.

The storage of materials and arising's can result in an effective raised soil level. This buries tree roots at depths where air and water are less available and can lead to the decline or death of the tree.

For these reasons the storage of materials or refuelling will take place in agreed allocated areas at least 5m from the edge of the RPA of retained trees.

Any slope effect must be taken into account and where there is a potential for run off, heavy duty polythene sheeting and sandbags must be in place as bunding to prevent toxic materials reaching RPAs.

Particular care is required where high sided vehicles, long reach machinery and plant with jobs, booms and counterweights are to operate with in proximity to retained trees. A banksman will be used where the movement of plant or long reach machinery occurs within 5m of any part of a retained tree to ensure no damage is sustained.

The route to transfer material from the borrow pit to the eastern field to form the embankment is to be achieved outside of the RPA of all retained trees. If this is not feasible additional arboricultural advice must be obtained. A small amount of pruning may be required to provide a reasonable clearance for site vehicles using the gateway to the north of the Site. This work is to be completed in advance of the commencement of any significant works on Site.

7. Conclusions

The Proposed Development is likely to result in the loss of one individual tree (T12), one full tree group (G19) and part of one tree group (G8) of moderate quality (Category B). Three tree groups of low quality (G2, G17 and G18 – Category C) which will be exposed to regular saltwater inundation and are likely to die or decline in situ.

G8 is understood to be subject to a Tree Preservation Order. Havant Borough Council on line mapping suggests that T12 is not subject to statutory protection however this must be confirmed in advance of any works. An eight week tree works application and corresponding written consent from the Local Planning Authority will be required in advance of any tree works for all trees protected by a TPO if full planning consent is not in place.

Based on the inundation modelling the remaining trees within the Site are located outside of the area anticipated to be affected by salt water inundation and with consideration of the species concerned (which are generally considered to have moderate tolerance of soil salinity) and the pre-existing coastal site conditions, no significant adverse impact is anticipated associated with the breach of the existing sea defences.

The retained trees can be protected from damage throughout the construction phase with the use of careful site organisation, ground protection and protective barriers to exclude or manage access to the area of constraint associated with the trees.

The bund to the northwest has been positioned to avoid the majority of the spatial constraints associated with G8, G9 and T11. These trees will be protected from inadvertent damage using fencing to create an exclusion zone.

The materials and methodology for the construction of the bund in proximity to G21 and the methodology for the improvements to the existing footpath through G2B, G9 and other adjacent trees are also to be addressed during the detailed design stage in conjunction with arboricultural advice to ensure that these trees are not adversely affected by the proposed scheme.

References

British Standards Institution (BSI), BS5837:2012. Trees in relation to design, demolition and construction – Recommendations. BSI

British Standards Institution (BSI), BS3998:2010. Tree work – Recommendations. BSI

National House Building Council (NHBC) Standards, (2008). Chapter 4.2: Building Near Trees

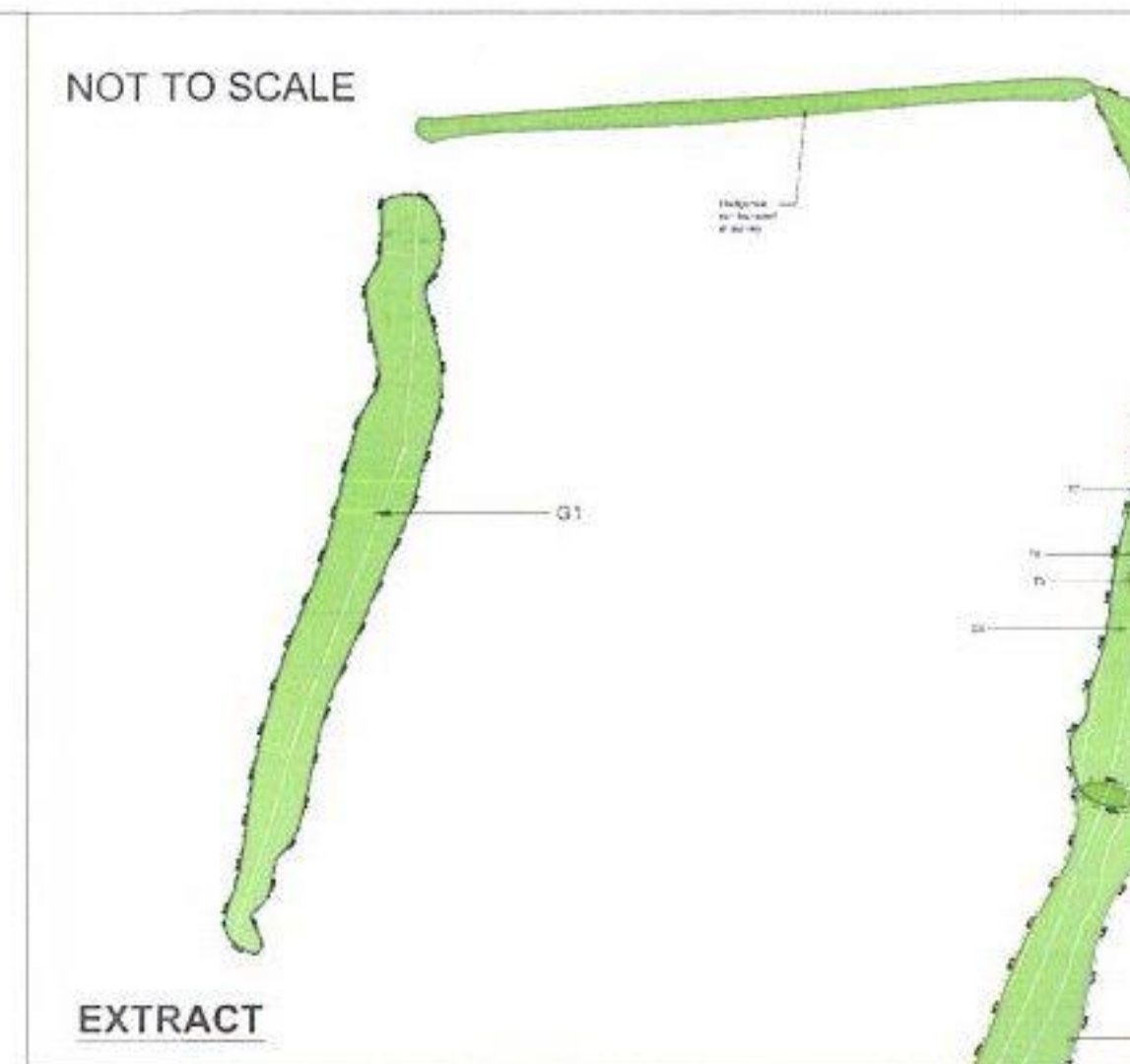
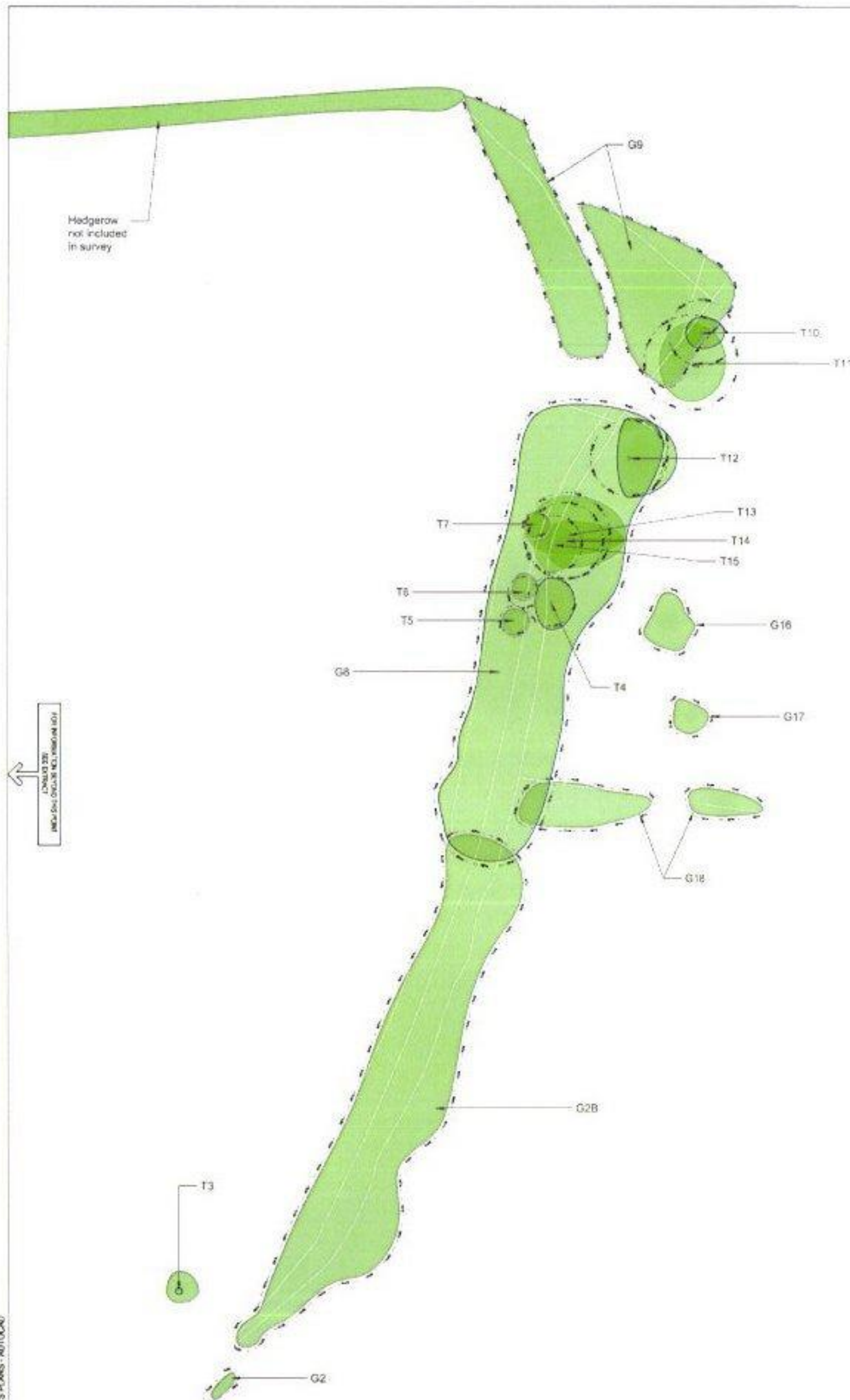
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Environment Agency, (2008). Portchester Castle to Emsworth draft coastal flood and erosion risk management strategy (2008), Planning for the Future. Environment Agency in partnership with Fareham Borough, Portsmouth City, Havant Borough and Chichester District Councils

Appendix A Tree Constraints Plan



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX																																																																										
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Appendix B Tree Survey Schedule

Tree ID	Species	Estimated Height (m)	Stem Diameter (m)	Canopy Spread (N)	Canopy Spread (S)	Canopy Spread (E)	Canopy Spread (W)	First Significant Branch (m)	Canopy Clearance (m)	Physiological Condition	Life Stage	Structural Condition	Condition Comments	Preliminary Management Comments	Tree Works to Facilitate the Development	Estimated Remaining Contribution	Category
G1	Blackthorn (Prunus spinosa)	3	100#	1	1	1	1	n/a	n/a	Good	EM	Fair	Thicket of blackthorn, along western boundary adjacent to parking			20+	B2
G2	Blackthorn (Prunus spinosa)	1.5	100#	1	1	1	1	n/a	n/a	Fair	Y	Fair	Clump of blackthorn, dieback at tips		Can be retained but likely to decline/die due to increased soil salinity.	20+	C2
G2b	Blackthorn (Prunus spinosa), field maple (Acer campestre), common oak (Quercus robur)	2	100#	1	1	1	1	n/a	n/a	Fair	Y	Fair	Dense rows of blackthorn either side of footpath. Bramble, white bryony and rose growing throughout to north of group			20+	C2
T3	Wild pear (Pyrus pyralis)	4	100,120,120,100,100,100	5	3	5	3	2.0/S	2	Fair	EM	Fair	Lower branches removed by cattle, soil peaching at base			20+	C1
T4	Common oak (Quercus robur)	14	510	6	7	6	4	2.0/W	2	Fair	M	Fair	Located in group, deadwood throughout the crown			40+	B1
T5	Field maple (Acer campestre)	7	300	3	4	4	3	1.0/N	1	Fair	EM	Fair	Pollarded, minor deadwood throughout crown, bark damage to western limb			20+	C1
T6	Field maple (Acer campestre)	6	330	6	2	4	3	2.0/S	2	Fair	FM	Fair	Pollarded, severe squirrel damage and minor deadwood throughout crown			20+	C1
T7	Field maple (Acer campestre)	6	260	3	4	4	3	1.5/N	1	Fair	EM	Fair	Pollarded, minor deadwood throughout crown, occasional bark wounds from squirrel damage			20+	C1
G8	Field maple (Acer campestre), horse chestnut (Aesculus hippocastanum), common oak (Quercus robur), hawthorn (Crataegus monogyna)	<12	150	1	1	1	1	n/a	n/a	Fair	Y	Fair	Broadleaf group connected to G2B		Fell in part (as per Tree Protection Plan)	20+	B2

Tree ID	Species	Estimated Height (m)	Stem Diameter (m)	Canopy Spread (N)	Canopy Spread (S)	Canopy Spread (E)	Canopy Spread (W)	First Significant Branch (m)	Canopy Clearance (m)	Physiological Condition	Life Stage	Structural Condition	Condition Comments	Preliminary Management Comments	Tree Works to Facilitate the Development	Estimated Remaining Contribution	Category
G9	Field maple (Acer campestre), common oak (Quercus robur), hawthorn (Crataegus monogyna)	4	100#	1	1	1	1	n/a	n/a	Good	Y	Good	Group of mainly young scrubby stock			20+	C2
T10	Common oak (Quercus robur)	18	700	4	4	8	4	2.0/E	1	Fair	DM	Fair	North-east stem lean, poorly formed crown - ivy on stem, deadwood in crown typical for unmanaged tree of this age			20+	B1,2,3
T11	Common oak (Quercus robur)	18	1000	10	10	9	8	3.0/S	2	Good	OV	Fair	Large sprawling specimen stem bifurcates at approximately 2m. Ivy on stem, deadwood in crown typical for unmanaged tree of this age, likely to have good ecological value			40+	A1,2,3
T12	Common oak (Quercus robur)	18	800	10	10	12	3	2.0/E	1	Fair	M	Fair - Poor	Located within fenced off strip on collapsed embankment. Severe east stem lean, poorly formed crown. Ivy on stem, deadwood in crown typical for unmanaged tree of this age, likely to have good ecological value	F&C		20+	B1,2,3
T13	Common oak (Quercus robur)	18	900	10	5	15	10	2.0/E	1	Fair	OV	Fair - Poor	Located within fenced off strip on collapsed embankment. Severe east stem lean, poorly formed crown with eastern limbs on ground. Ivy on stem, deadwood and cavities noted, typical for unmanaged tree of this age, likely to have good ecological value			20+	A1,2,3
T14	Common oak (Quercus robur)	18	800	5	7	15	5	2.0/E	1	Fair	OV	Fair - Poor	Located within fenced off strip on collapsed embankment. Severe east stem lean, poorly formed crown with eastern limbs on ground. Ivy on stem, deadwood and cavities noted, typical for unmanaged tree of this age, likely to have good ecological value			20+	A1,2,3
T15	Common oak (Quercus robur)	18	800	5	7	5	5	2.0/W	2	Good	M	Good - Fair	Adjacent to footpath, some deadwood but in generally good condition. Located in fenced off strip			20+	A1,2,3
G16	Elder (Sambucus nigra), gorse (Ulex europaeus), hawthorn (Crataegus monogyna)	4	100#	1	1	1	1	n/a	n/a	Fair	Y	Good	Clump of scrub			20+	C2
G17	Elder (Sambucus nigra), gorse (Ulex europaeus), hawthorn (Crataegus monogyna)	4	100#	1	1	1	1	n/a	n/a	Fair	Y	Good	Clump of scrub		Can be retained but likely to decline due to increased soil salinity	20+	C2
G18	Elder (Sambucus nigra), gorse (Ulex europaeus), hawthorn (Crataegus monogyna)	4	100#	1	1	1	1	n/a	n/a	Fair	Y	Good	Clump of scrub		Can be retained but likely to decline due to increased soil salinity	20+	C2

Tree ID	Species	Estimated Height (m)	Stem Diameter (m)	Canopy Spread (N)	Canopy Spread (S)	Canopy Spread (E)	Canopy Spread (W)	First Significant Branch (m)	Canopy Clearance (m)	Physiological Condition	Life Stage	Structural Condition	Condition	Comments	Preliminary Management Comments	Tree Works to Facilitate the Development	Estimated Remaining Contribution	Category
C19	French tamarisk (Tamarix gallica)	6	400mm	As per Tree Constraints Plan				n/a	n/a	Good	OV	Fair		Group of approximately 6 trees located in wet area. No access feasible. Fairly large stems for species, deadwood, cavities and stem hollowing observed		Can be retained but likely to decline due to increased soil salinity	20+	B2
C20	Hawthorn (Crataegus monogyna), blackthorn (Prunus spinosa), English elm (Ulmus procera)	2	100mm	1	1	1	1	n/a	n/a	Fair	SM	Fair		Clusters of scrub along embankment			20+	C2
C21	English elm (Ulmus procera), elder (Sambucus nigra)	12	300mm	As per Tree Constraints Plan				n/a	n/a	Fair	SM	Fair		Group of predominantly elm growing along embankment, no access available			20+	B2
C22	Hawthorn (Crataegus monogyna), blackthorn (Prunus spinosa), English elm (Ulmus procera)	2	100mm	1	1	1	1	n/a	n/a	Fair	SM	Fair		Boundary scrub			20+	C2

Key to Abbreviations Used in the Survey

Ref No	Specific identification number given to each tree or group. T=Tree/H=Hedge/G=Group.	
Species	Common name followed by botanical name shown in <i>italics</i>	
RPA	Root Protection Area (As defined by BS5837)	
Stem diameter	Diameter of main stem, measured in millimetres at 1.5 m above ground level. (MS = Multi-stem tree measured in accordance with BS5837 Annex C)	Av / Average: indicates an average representative measured dimension for the group or feature
Spread	The width and breadth of the crown. Estimated on the four compass points in metres.	
Crown clearance	The estimated height (in metres) above ground level of the lowest significant branch attachments.	
#	Estimated dimensions	
*	Indicates estimated position of tree (not indicated on topographical survey).	
Category	Categorisation of the quality and benefits of trees on Site as per Table 1 and 2 of BS5837:2012. 1=Arboricultural quality/value 2=Landscape quality/value 3=Cultural quality/value (including conservation)	
	A=High quality/value 40yrs+ (light green). B=Moderate quality/value 20yrs+ (mid blue). C=Low quality/value min 10yrs/stem diameter less than 150mm (grey). U=Unsuitable for retention (dark red).	
Life stage	Young (Y): Newly planted tree 0-10 years. Semi-Mature (SM): Tree in the first third of its normal life expectancy for the species (significant potential for future growth in size). Early Mature (EM): Tree in the second third of its normal life expectancy for the species (some potential for future growth in size) Mature (M): Tree in the final third of its normal life expectancy for the species (having typically reached its approximate ultimate size). Over Mature (OM): Tree beyond the normal life expectancy for the species. Veteran (V): Tree which is of interest biologically, aesthetically or culturally because of its condition, size or age.	
Structural condition	Good: No significant structural defects Fair: Structural defects which can be resolved via remedial works. Poor: Structural defects which cannot be resolved via remedial works. Dead: Dead.	
Physiological condition	Good: Normal vitality including leaf size, bud growth, density of crown and wound wood development. Fair: Lower than normal vitality, reduced bud development, reduced crown density, reduced response to wounds. Poor: Low vitality, low development and distribution of buds, discoloured leaves, low crown density, little extension growth for the species. Dead: Dead Fair/Good = Indicates an intermediate condition Fair – Good = Indicates a range of conditions (e.g. within a group)	
Preliminary management recommendations	Works identified during the tree survey as part of sound arboricultural management, based on the current context of the Site (where relevant reference has been made to tree management based on the potential future context of the site).	
Works to facilitate the development	Tree works identified as necessary to facilitate the Proposed Development following a desk top analysis of the proposals in relation to tree constraints	

Appendix C Site Photography

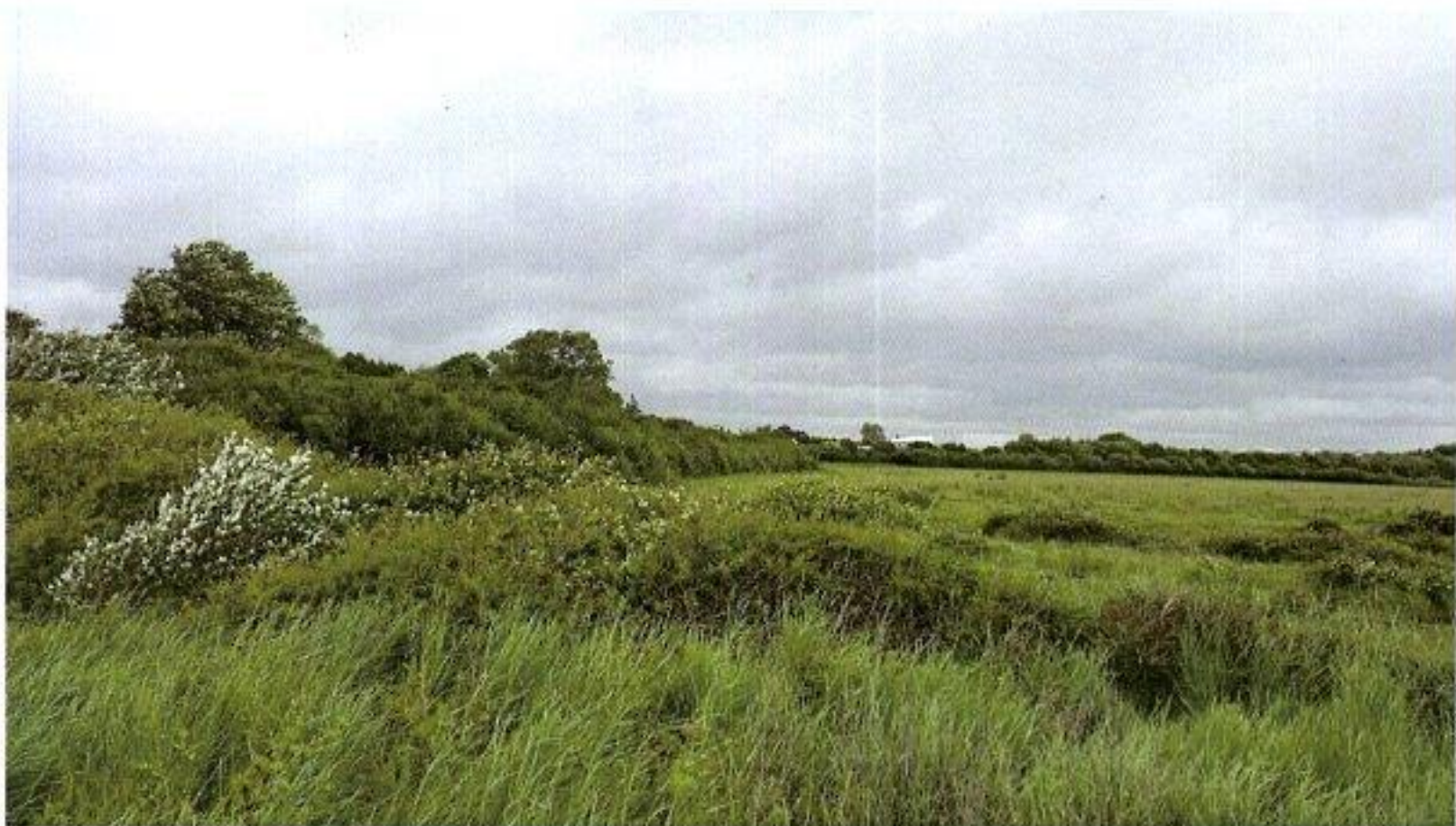


Image 1 View of H1 from south



Image 2 Public footpath along length of G2b and G8



Image 3 View from east to west, T12 to left with G9 to right of gate



Image 4 English elm (G21) located to east of Site

Appendix D Tree Protection Plan

Appendix E Outline Tree Protection Measures

7.1 Outline Tree Protection Measures

The default position as set out by BS 5837:2012 is that retained trees must be protected from construction operations with the erection of robust protective fencing positioned on the outer edge of the RPA or crown spread (whichever is greatest). All site operations will be restricted to the area outside of tree protection fencing and this area will form a Construction Exclusion Zone (CEZ) unless agreed otherwise. Protection measures will be installed as set out in the Tree Protection Plan included as Appendix C of this report.

The area inside the fence and any additional tree protection measures will be sacrosanct and must not be removed or altered without the prior approval of the LPA Tree Officer. Any damage to tree protection measures must be reported immediately.

Fencing shall be constructed with robust vertical and horizontal scaffold framework with weldmesh panels firmly attached as per BS 5837:2012 Figure 7 (included below). Vertical support poles and bracing poles must be located with care to avoid underground utility services and will be sited to avoid the structural roots of retained trees.

Alternative equivalent robust and immovable fencing specification including site hoarding will also be appropriate.

Suitable all weather signage will be fixed to fencing to notify site staff and visitors of the construction exclusion zone and its purpose.

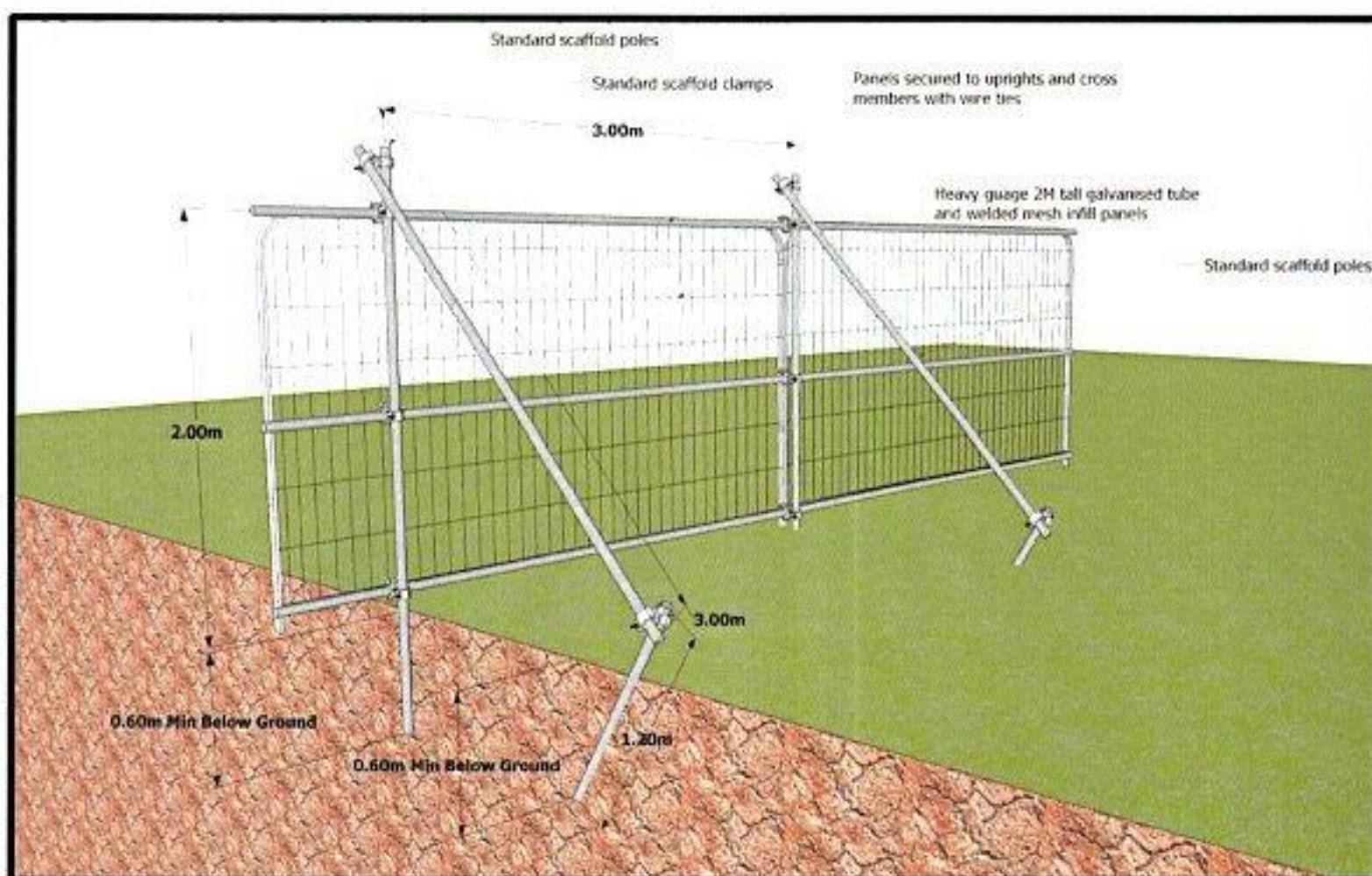


Figure 1 Default specification for protective barrier

Due to the context and scale of this site and the considerable distance from areas of significant site works an alternative specification of fencing is to be adopted in areas away from the main works sites as shown on the Tree Protection Plan included as Appendix C. This will comprise of hi visibility orange barrier tape fixed in place

with road pins or treated wooden stakes at a maximum spacing of 4m (carefully positioned to avoid any services or significant tree roots).

An example of this style of fencing is included below.



Figure 8: Example of hi-visibility barrier tape fencing secured with timber stakes (Image supplied by Honesty & Faith Hardware Products Co. Ltd).

7.2 Ground Protection

Should access be unavoidable within the RPA of retained trees fit for purpose ground protection must be in place which is sufficient to protect the structure of the soil from damage based on the heaviest anticipated load.

As set out in section 6.2.3.3 of BS5837:2012 the following ground protection measures will be appropriate:

- Suitable ground protection for pedestrian only access will comprise a single thickness of scaffold boards set on a compressible layer of 100mm of woodchip on a geotextile separation layer.
- Pedestrian operated plant up to two tonnes in weight would require the use of a proprietary ground protection system (such as Ground Guards or Eve Trakway or equivalent) set on a minimum depth of 150mm woodchip or sharp sand.
- Heavier loads will require ground protection to an engineering specification in conjunction with arboricultural advice.

As a guide the threshold beyond which root development is significantly affected is a bulk density ranging from 1.4g per cm³ for clay soils, to 1.75g per cm³ for sandy soils.

Tree protective measures shall stay in place until all construction operations are completed and removal is agreed with the Site arboriculturist and/or the Local Authority Tree Officer as appropriate

7.3 Storage, use and mixing of materials

The use, mixing and washing of materials can lead to run off or inadvertent spillage into tree root zones. Many substances often used on construction sites can be toxic to tree roots (such as concrete, fuels, salts, builders sand and herbicides), can result in the death of tree roots and beneficial soil organisms; and have a significant impact on the future health and appearance of trees.

The storage of materials can result in an effective raised soil level. This buries tree roots at depths where air and water are less available and can lead to the decline or death of the tree.

For these reasons the storage of materials and any washing, mixing or refuelling must take place in agreed allocated areas at least 10m from the edge of the RPA of retained trees.

Any slope effect must be taken into account and where there is a potential for run off, heavy duty polythene sheeting and sandbags must be in place as bunding to prevent toxic materials reaching RPAs.

Appendix F Example All Weather Signage

