Petersham Lodge Woods Nature Reserve

Management plan 2015-2025 • update #8

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LONDON BOROUGH OF RICHMOND UPON THAMES

Wild Future

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1. Introduction

Within the extensive and historic inter-connected open spaces of Petersham and Ham, in the central southern area of the greenest borough in London, Petersham Lodge Woods is a small conservation site with an important location and heritage, sitting squarely as it does on the River Thames within the famous vista from Richmond Hill – the only view in the UK protected by an Act of Parliament.

The woodland, formerly a landscape garden with a significant tree avenue on the eastern approach to Ham House, has been in the care of the Council since 1902 partially for the purpose of preserving that section of the Richmond Hill view. It is now managed as public open space and nature reserve.

In the 1990s and 2000s, the woodland was managed jointly by the Council and the local group of London Wildlife Trust with assistance from the Richmond and Twickenham Conservation Volunteers. The Thames Landscape Strategy was also involved in the wood's management during the London's Arcadia project.

However, for around ten years, the wood appears to have been managed on a more limited basis and a reintroduction of more proactive management is needed to restore the openness of the avenue and woodland habitats and to respond to recent environmental change such as increased flooding.

This plan seeks to consider the future management of the woodland using historical and new data and takes a fresh look at the woodland's value both in itself and in the context of the surrounding landscape. It sets out a framework for achieving the most favourable sustainable outcomes for conservation, the landscape and the site's visitors with options where more discussion or information is required.

The management proposed has been organised into a ten-year work programme with key goal-oriented changes focused in the first two years.

2. Terms of Reference

This management plan is designed to inform and outline the restoration and maintenance of Petersham Lodge Woods from conservation, landscape and visitor perspectives by Richmond Council working in conjunction with Petersham Environment Trust.

Prior to writing the plan, the two organisations agreed the following goals:

1. Restore the wood to make it an attractive leisure and environmental asset for locals and visitors alike.
2. Embrace the specific ecology of the wood (e.g. regular flooding) with appropriate planting to ensure sustainability and support biodiversity.
3. Enhance the Richmond riverside by creating an attractive natural space which invites exploration.

To deliver this vision, this plan considers the wood's history, hydrology, ecology and visitor use; it draws together existing data on its trees, habitats and species with new surveys; it sets out refined objectives and the prescriptions to deliver and maintain the woodland over the next ten years.

Flooding on the spring tide (October 2015)

3. Site description

Site background

3.1

Location	River Lane, Richmond TW10 7AQ
Grid Ref.	TQ 17805 73455
Ownership	London Borough of Richmond upon Thames
Designation	SINC Site of Borough Importance Grade 2 (#Ri.BII12)
Area	1.1 ha (2.7 acres)
Key habitats	Broad-leaved woodland; wet woodland; veteran trees
Key species	Song thrush (breeding); meadow crane's-bill; goldilocks buttercup; bats

Location & landscape

3.2 The woods lie directly on the south (Surrey) bank of the Ham reach of the River Thames, between Twickenham and Richmond, and within the famous view from Richmond Hill. The site is bordered to the east by River Lane and Petersham Meadows, an attractive area of riverside semi-improved neutral and wet grassland; to the south are the gardens of Petersham Lodge which contain a number of mature trees; and west are the grounds of the Petersham and Ham Sea Scouts, consisting of wet woodland and amenity grassland.

3.3 The river towpath and bankside grassland to the north are approximately 12m in width. The woodland floods on high spring tides and in the early 1980s (date estimated by Environment Agency) a raised dyke was installed along the riverside boundary of the wood approximately 50cm above the towpath height to protect against more frequent tidal inundation. The bank was breached deliberately to facilitate flooding[1] at one point close to the wood's north-west corner.

Land-use history

3.4 The wood was once part of the landscaped grounds of the first building on the site of the current Petersham Lodge which stood at the beginning of the 750m long eastern driveway of Ham House[1]. An avenue of fine mature trees dates to around 1750. William Westall's 1822 coloured lithograph "Richmond Hill from Petersham" may show a summerhouse at the river end of the garden[2].

3.5 In 1902, Sir Max Waechter purchased Petersham Lodge including the woodland to save it from development and gave the freehold to Richmond Council for preservation of this part of the Richmond Hill vista. The Council agreed to covenant:

- That the trees be maintained and any dying should be replaced with similar.
- That no building be erected on any part of the premises and that no addition visible from Richmond Hill be made.
- That no trade or business be conducted on the premises and the grounds be kept as gardens or pleasure grounds only.

William Westall's *Richmond Hill from Petersham*, dated 1822

3.6 Since 1902 the wood has been a public open space and is managed as a nature reserve, although with relatively limited maintenance between 2005 and 2015.

Designations

3.7 The wood is a Site of Importance for Nature Conservation and categorised as being a Site of Borough Importance Grade 2, the third of four tiers of importance.

Woodland compartments

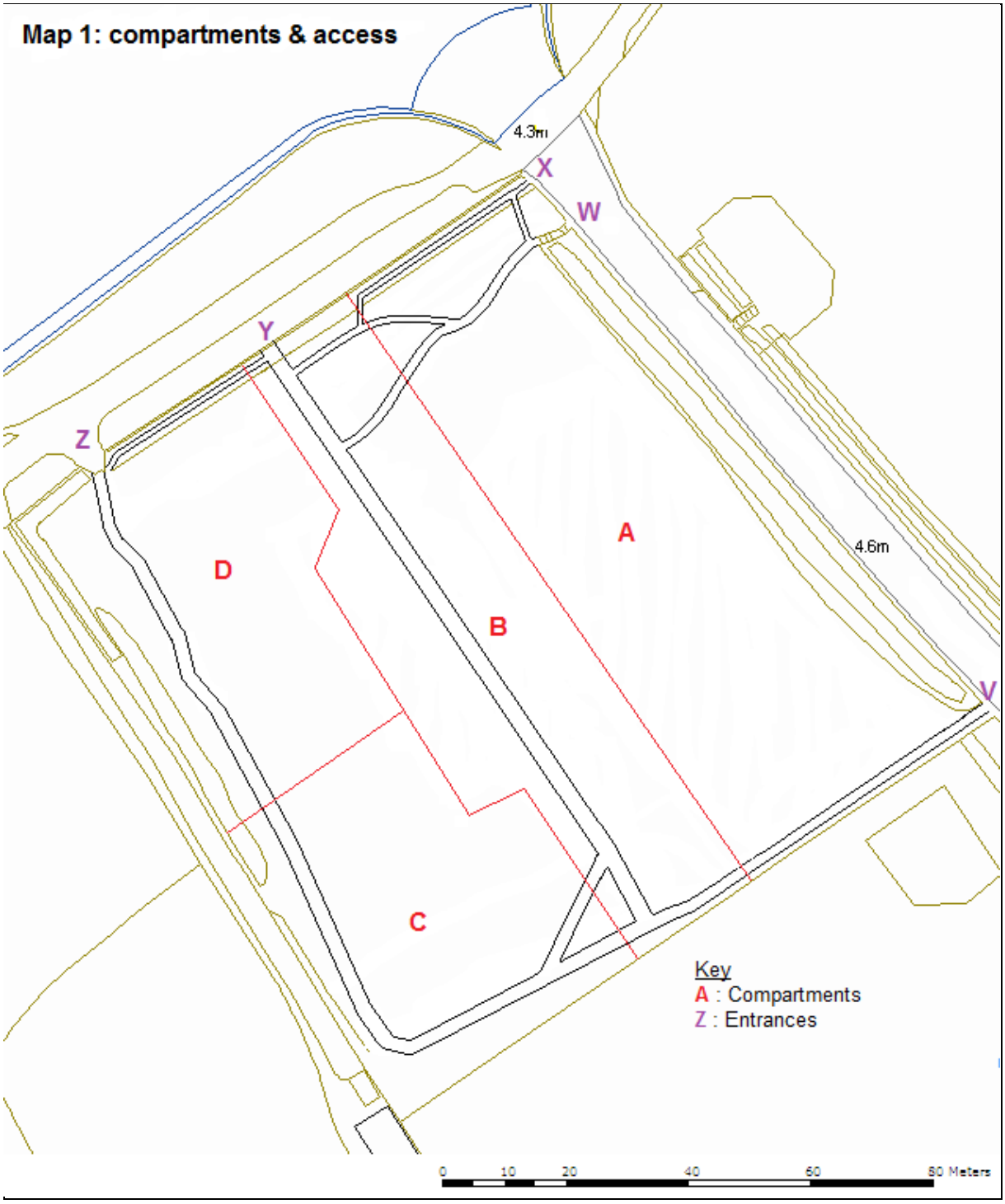
3.9 For ease of understanding, the woodland has been divided into four compartments (please see Map 1 overleaf):

A: the eastern third of the wood

B: the central avenue and open area to the west

C: the southern quarter of the wood

D: the damp north-western quarter


Map 1: compartments & access
4.3m
X
W
Y
Z
A
D
B
4.6m
V
C
Key
A : Compartments
Z : Entrances
0
10
20
40
60
80 Meters

Environmental factors

Geology & soils

3.10 Petersham Lodge Woods – together with the towpath, Sea Scout wet woodland and the majority of Petersham Meadows and much of the Thames river corridor – lie on superficial deposits of Thames clayey alluvium soil over a bedrock of London clay[3].

311 The Thames soil association is a stoneless mainly calcareous clayey soil that is affected by naturally high groundwater. The soil itself is normally soft to firm consolidated, compressible silty clay, laid down by overbank river floods up to two million years ago, primarily of the Thames soil series (70%) but with some minor amounts of Fladbury (12%) and Uffington (8%). Sometimes other minor soil series can be present with layers of silt, sand, peat and basal gravel (up to 10%). A stronger, desiccated zone may be present at the soil surface.

3.12 The surface soil layer is over 120cm deep above the bedrock. It is naturally wet, drainage-wise, but is moderately fertile.

3.13 Natural habitats for this soil type are wet flood meadows with wet carr woodlands in old river meanders

Hydrology, tides and flood risk

3.14 The Petersham Lodge Woods soils are waterlogged by seasonally fluctuating groundwater and river flooding, and have a relatively slow lateral saturated conductivity which can lead to slow drainage when the site becomes very wet.

3.15 The soil depth to gleying – the presence of grey and ochreous mottles within the soil that indicate intermittent waterlogging for at approximately 30 days each year – is usually only approximately 20cm and up to 60cm in areas of Uffington soil.

3.16 The soil depth to the bottom of a slowly permeable layer with lateral hydraulic conductivity of less than 10cm per day, which can impede downward percolation of excess soil water, is less than 40cm for the majority of the area.

3.17 The soil's integrated air capacity is only 50mm in the top metre for the Thames soil series, indicating poor percolation of rainfall into the ground.

3.18 The towpath and riverbank adjacent to the wood begin to flood when the Richmond Lock tide height reaches 4.75m above chart datum. The woodland floods occasionally on high spring tides when the water level is above 4.95m. Water enters via the breach in the northern boundary dyke, flows down the existing footpath and ponds in the lowest parts of the north-west quarter of the wood in compartment D, with the extent of flooding naturally increasing as the tide height increases.

3.19 The highest tide of the current 19 year tidal cycle was on 1st October 2015 and reached 5.41m, resulting in ankle depth water in several large puddles in compartment D. The majority of the water drained away within 30 minutes of the tidal peak and none remained 12 hours later. The weather was fine and seasonally warm with no rainfall. A full discussion of hydrological monitoring in 2015 is in Appendix 1.

3.20 The Environment Agency (EA) classifies the site as having a high chance of flooding from the river with a 1 in 30 chance of flooding each year. This takes into account any flood defences in the area.

3.21 Petersham Lodge Wood's flood defence dyke and slightly higher ground elevation means that River Lane and the Sea Scouts land are flooded at lower tide heights than the wood itself. At the north-west corner of the wood there is a small ditch that carries water away from the breach and into the Sea Scouts property. This ditch's capacity has been reduced by silt, leaf fall and debris. A partially blocked pipe within this ditch feeds water directly back into the Thames.

Ecological interest & features

3.22 The description below is illustrated in Map 2 opposite.

Trees & shrubs

3.23 The woodland is dominated by several large specimen trees that date to the late 18th century, relics from a more formal landscape, and that today form part of the skyline from Richmond Hill. They are concentrated along the woodland's central avenue in compartment B and these trees include nine horse chestnuts (*Aesculus hippocastanum*) and a single holm oak (*Quercus ilex*), common lime (*Tilia* x *europaea*) and cedar of Lebanon (*Cedrus libani*). Two more horse chestnuts stand outside the wood on the towpath. To the south-east of the avenue in compartment A is a large Oriental plane (*Platanus orientalis*), thought to be the largest of its type in Britain. In general, these trees are coming into the later stages of life. Many were damaged in the 1987 and 1990 storms and the pronounced lean of several is attributed to root plate movement during these events. The remains of former mature trees can be found within the site, including the standing trunks of a large variegated sycamore (*Acer pseudoplatanus f. variegatum*) and copper beech (*Fagus sylvatica f. purpurea*) in compartment A.

3.24 To the south-west in compartment C is another, younger, cedar of Lebanon surrounded by a grove of yew (*Taxus baccata*), a holly (*Ilex aquifolium*) and a hazel (*Corylus avellana*) coppice, still in active if irregular use. Compartment D mainly consists of hornbeam (*Carpinus betulus*) and a couple of field maple (*Acer campestre*), many of which have significant squirrel damage. There are two large horse chestnuts on the towpath at the entrance to the avenue on the northern boundary of the site. Semi-mature and mature ash (*Fraxinus excelsior*) and sycamore can be found along all four boundaries.

3.25 Young ash and sycamore regeneration is common throughout compartments A and B, frequent in D and occasional in C. Holly regeneration is frequent in C. At the north end of compartment A an area of crack willow (*Salix fragilis*) can be found over a number of pendulous sedge (*Carex pendula*) plants, perhaps indicating a once damper area as this area now rarely floods. A blackthorn (*Prunus spinosa*) thicket in compartment D appears to have been killed off by flooding. Elder (*Sambucus nigra*) can be found commonly throughout the wood; some are quite mature or dead.

Boundaries

3.26 The flood bank along the northern boundary is covered with regenerating sycamore and overhanging branches from adjacent trees. The southern boundary is a mixture


Map 2: ecological features
Key
Mature tree
Other tree
Dead veteran
Canopy woodland
Closed mature scrub
Young / open scrub
Tall herb vegetation
Ride gradient
A Ash
B Copper beech
C Cedar
F Field maple
H Horse chestnut
I Holly
L Common lime
O Holm Oak
P Oriental plane
S Sycamore
V Variegated sycamore
W Sweet chestnut
Y Yew
4.3m
4.6m
Shady scrub
Sycamore & willow scrub
Brambles
Native hedge & maturing woodland edge
Nettles, docks & umbellifers
Hornbeam & field maple
Elder scrub
Developing tussocky grassland
Brambles
Blackthorn scrub
Sycamore & ash regen
Hazel coppice
Significant deadwood

of fence and railings. The eastern boundary along River Lane is a partly laid hedge of hazel, sycamore, field maple and hawthorn (*Crataegus monogyna*) behind a cleft timber fence; the western has a chestnut paling fence (installed and maintained by the Sea Scouts) alongside previously coppiced hazel. Both of the latter are banked to some degree.

Flora & fauna

3.27 The occasional flooding of the wood led to the development of a lush ground flora in the more open parts of the wood in compartments A and B, including meadowsweet (*Filipendula ulmaria*), meadow crane's-bill (*Geranium pratense*), cuckooflower (Cardamine pratensis), hemlock water-dropwort (Oenanthe crocata) and goldilocks buttercup (Ranunculus auricomus), the latter rare in London and ususally associated with ancient woods. Whilst goldilocks and meadow cranes-bill have not been recorded in the period of this plan, the other species remain although perhaps at lower frequency. Surveys should continue to monitor their presence and extent.

3.28 The ground layer in the open areas in A and B is are dominated by tall perennials, a mixture of nettle (*Urtica dioica*), bramble (*Rubus fruticosus*) and broad-leaved dock (*Rumex obtusifolius*) with some hogweed (*Heracleum sphondylium*) and field bindweed (*Convolvulus arvensis*); after a number of years of unchecked growth, an annual cut has been re-established in these areas. The ground flora along the avenue still includes nettle, bramble and dock to some extent and ivy (*Hedera helix*) in bare areas, but also false brome (*Brachypodium sylvaticum*) tussocks, herb Robert (*Geranium robertianum*), lesser celandine (*Ranunculus ficaria*), garlic mustard (*Alliaria petiolate*), creeping buttercup (*Ranunculus repens*) and greater plantain (*Plantago major*). Wild garlic (*Allium ursinum*) occurs in small patches at the southern end. No bluebells (*Hyacinthoides non-scripta*) were seen but it is understood they were formerly scattered throughout the wood; higher ground water may have caused their decline.

3.29 In compartment D, the area most affected by flooding, the ground flora is a sparse mix of nettle, garlic mustard and wood avens (*Geum urabum*). Compartment C is very shaded with little ground flora to speak of. Cow parsley (*Anthriscus sylvestris*) dominates along the woodland edges with some Himalayan Balsam (*Impatiens glandulifera*) also along the outer northern edge.

3.30 The woodland's birdlife is good for the site's size, benefitting from the adjacent habitat in the garden of Petersham Lodge and the Sea Scouts property and from the good wildlife corridors connecting the wood – the towpath, River Thames and hedgerows. Robin, great tit and blackbird (all carrying food to nest) were confirmed breeders in 2015 and probable breeders included blackcap, wren, great tit, blue tit (all on permanent territory) and goldcrest (pair present in suitable habitat). Song thrush (singing male), long-tailed tit, jackdaw and ring-necked parakeet (observed in suitable nesting habitat) were all possible breeders, the latter two species both observed around the remaining totem of the variegated sycamore and in the upperparts of the cedar of Lebanon. A pair of Egyptian Geese also regularly visited the cedar in the late winter and early spring. Casual records from last winter include a sparrowhawk going to ground on the western boundary.

3.31 The wood is listed as a site of conservation importance for decaying wood for the borough in the Richmond Biodiversity Partnership's public leaflet on deadwood habitats. The reasonable deadwood content in the woodland means that the conditions are probably very good for some important invertebrate groups and the occasional flooding will only increase the associated invertebrate assemblage and biomass. Similarly, the deadwood content and damp areas also mean that the woodland is likely to be of some significance for fungi.

3.32 Invertebrates are not well recorded for the wood. The nationally notable (B) fungus weevil *Platystomos albinus*, which depend on dying or decaying fungus-infected trees or branches, was recorded in May 2009[4]. Other records include hibernating European hornet (*Vespa crabro*)[4], the hoverfly *Chalcosyrphus nemorum*[4] – typical of wet woodlands – and ground beetles *Platynus assimilis*[4]*, Abax parallelepipedus*[4] and *Pterostichus diligens*[4]. Speckled wood (*Pararge aegeria*), holly blue (*Celastrina argiolus*), small white (*Pieris rapae*) and orange tip (*Anthocharis cardamines*) were the only butterflies recorded casually in 2015. Stag beetles (*Lucanus cervus*) are not formally recorded from the site but must be regarded as a possibility. Apparently a stag beetle loggery was built on the site in 2004 by then BTCV volunteers but has not been located at this time.

3.33 Honey fungus (*Armillaria mellea*) grows on the remains of at least two trees at the southern end of the avenue – and probably led to their demise – and southern bracket (*Ganoderma australe*) on a living sycamore. Other records from 2014 and 2015 include sulphur polypore (*Laetiporus sulphureus*) on the rootplate of the fallen yew, dryad's saddle (*Polyporus squamosus*), sulphur tuft (*Hypholoma fasciculare*), porcelain fungus (*Oudemansiella mucida*), smoky bracket (*Bjerkandera adusta*) and velvet shank (*Flammulina veltipes* var. *velutipes*). Other previous records include bitter bracket (*Postia stiptica*) [4].

3.34 The veteran trees have possible roosting potential for some bat species but are too tall for a reliable emergence survey to be undertaken from the ground. The woodland's connectivity to surrounding habitats with good feeding potential mean that it is of importance for bats. A detailed survey of the Ham towpath in 2008[2] found that there were good numbers of Daubenton's bat (*Myotis daubentonii*) and soprano pipistrelle (*Pipistrellus pygmaeus*), with common pipistrelle also frequent (*Pipistrellus pipistrellus*). The uncommon serotine bat (*Eptesicus serotinus*) was also recorded alongside the wood and these probably depend on the close proximity of Petersham Meadows and the woodland edge for foraging habitat.

3.35 There have been no observed tracks or signs of other mammals using the woodland besides grey squirrels in the recent survey period.

Access and visitor useage

3.36 The features below are illustrated on Map1.

3.37 There are five entrances to the woodland: one (V) in the south-eastern corner off River Lane; two (W and X) close together in the north-eastern corner at the river end of River Lane near the slipway, both via steps; one (Y) into the avenue from the northern boundary, with no aid to climbing over the dyke; and another (Z) in the north-west corner in the location of the dyke breach and thus damaged to some degree.

3.38 There are four principal paths within the woodland: one from entrance V to the south end of the avenue; the main central avenue path; a path from the south end of the avenue that hugs the southern and western boundaries to exit in the north-west corner at Z; and a path linking the north end of the avenue to the two entrances near the slipway. All paths are unmade.

3.39 Whilst the wood is not a final destination for many, it is at a junction of three key routes: the Thames towpath passes along the northern boundary, the path across Petersham Meadows from Buccleuch Gardens and the Rose of York terminates here, and River Lane is well used for parking and local access to the river from Petersham and Ham. It is also surrounded by other paths, including through the Sea Scouts land and south of Petersham Lodge.

3.40 Visitor numbers have been casually recorded on visits of an hour or more since November 2014 although this is meaningful up to April only due to the path closures around the unsafe cedar. This period averaged one visitor per hour, most using the central avenue or the south-eastern River Lane entrance. The most visitors were recorded on Wednesday 21st March when 16 people went through in eight hours. All visits were mid-week and summer weekends probably see a much higher throughput of visitors.

3.41 Recent afternoon and evening visits in September and October 2015 to monitor high tide flooding have seen up to a dozen people using the wood to escape the flooded towpath, highlighting the need for consideration of a dry route through the wood.

Evaluation

3.42 The key habitat features are the mature trees, deadwood, and gradations from ride / glade to canopy in the broad-leaved woodland. The occasional river inundation is also a positive factor in many ways, creating damp ground conditions at times and increasing invertebrate interest. The key species interests are breeding song thrush, bats, the previously recorded plant species meadow cranes-bill and goldilocks buttercup, and potential for invertebrates.

Constraints

3.43 Whilst the flooding brings benefits, it also has drawbacks. The strong flow and rising water pushes litter and debris into the woodland. It cuts off access to the towpath and north-west corner of the parts of the wood for the duration of the high tide. Whilst remnant waters drain away within hours, the cumulative effect over a period of high tides above 5.4m is the footpaths becoming soft and muddy and to reduce ground vegetation in areas where the water ponds.

3.44 The woodland is used as a male public sex environment and there is local awareness that this is the case. The areas used in compartment D are on or close to the path and this may deter some users. The litter left behind is unhygienic and unsightly.

4. Policies

Strategic principles for Parks & Open Spaces

4.1 The borough has the largest area of public open space per head of population of any London borough. We have a local and national reputation for quality and leadership in the delivery of excellent parks. To ensure the quality of our Parks and Open Spaces remains at a high level, following public consultation, we have developed a series of strategic principles by which parks will be managed:

1. Parks and Open Spaces will be a sustainable legacy for future generations.
2. Parks and Open Spaces will continue to define our borough.
3. Parks and Opens Spaces will enrich the life, health and wellbeing of residents and visitors.
4. The Council will lead in the delivery of excellent Parks and Open Spaces services.
5. Parks and Open Spaces will offer positive experiences to all visitors.
6. Through innovation, the future development of Parks and Open Spaces services will be ensured.
7. Increased community participation in Parks and Open Spaces will be encouraged and supported.
8. Parks and Open Spaces will be celebrated as centres of excellence.

The London Plan

4.2 The Mayor for London is responsible for the strategic planning in London. His duties include producing a ‘Spatial Development Strategy’ for London - the London Plan. Local (Local Authority level) plans must be in ‘general conformity’ with the plan. The London Plan, last updated in 2011, recognises “the current and potential value of open space to communities, and to protect the many benefits of open space including those associated with sport and recreation, regeneration, the economy, health, culture, biodiversity, and the environment”.

Richmond planning strategies

4.3 Richmond upon Thames’ Local Plan recognises the importance of open space in the Borough. The extensive areas of open land create a varied and distinct landscape prominently defined by Richmond Hill and the River Thames valley in addition to Kew Gardens, two Royal Parks and many smaller open spaces and water courses. The importance of open space as an urban structure, providing relief from the built environment, is acknowledged, as is the importance of providing for play and recreation. These collectively contribute to quality of life in the Borough.

4.4 The role of ecology and open space’s ability to provide a range of habitats is recognised, leading the Borough to protect areas of nature conservation value and to manage and enhance wildlife habitats. The strategy seeks to promote open space as a network of recreational, ecological and landscape assets which both serve the people of the Borough and help enhance and preserve the Borough’s physical entity.

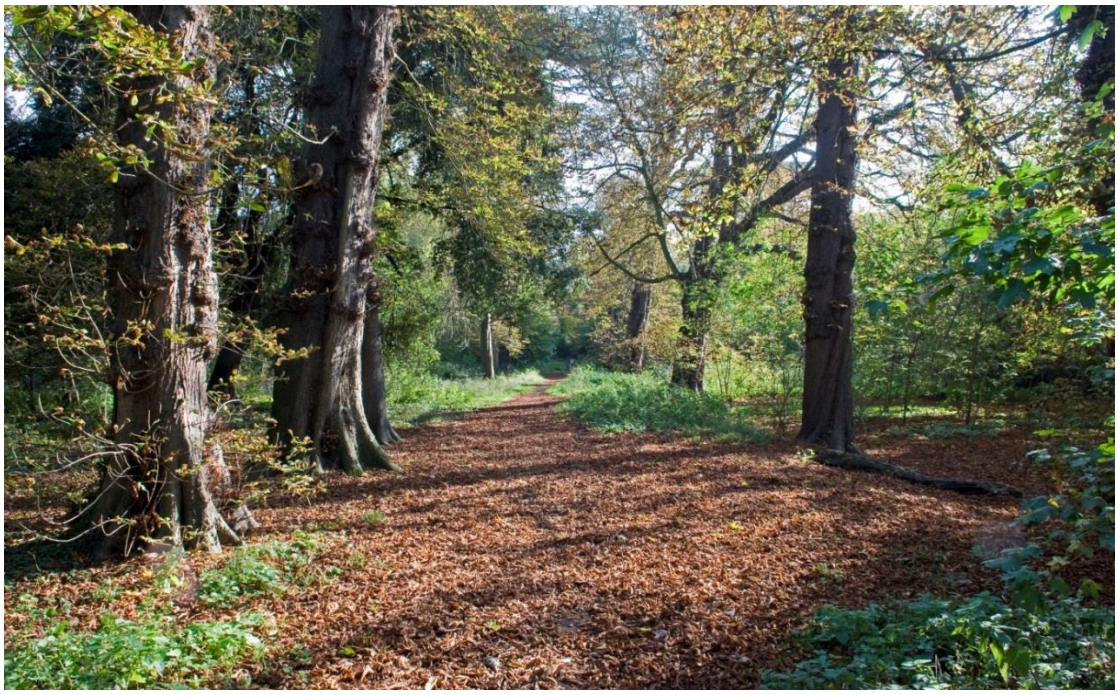
4.5 Petersham Lodge Woods is affected by a number of the borough's specific spatial policies. Policy Core Policy 10 summarises the protection of open land. The wood falls within a Conservation Area (policy DM HD 1 under Heritage), designed to protect and enhance the features of local importance. The wood is designated as Metropolitan Open Land (policy DM OS 2) for protection of its character and openness and as an Other Site of Nature Importance (Core Policy 4, Biodiversity) to be safeguarded and enhanced. It is Public Open Space (policy DM OS 6) which should be maintained and improved where appropriate. It also falls within two recognised vistas which are protected (policy DM HD 7): Richmond Hill's view of the Thames valley and also the Warren Footpath view to Richmond Hill.

Richmond Biodiversity Action Plan

4.6 To conserve Richmond's biodiversity, the decline of valuable species and habitats needs to be reversed. The origin of the Biodiversity Action Plans was to explain how to promote the conservation of biological diversity and the sustainable use of biological resources.

4.7 Richmond's BAP prioritises habitats and species that are rare, in decline or characteristic of Richmond, and aims to use them to help raise the profile of biodiversity in the borough. The BAPs strategy is based around protecting and celebrating local wildlife and improving the quality of wildlife habitats and the environment in our borough

4.8 There are currently thirteen Biodiversity Action Plans covering selected species and habitats for Richmond. The Council are committed to implementing the objectives enshrined in these plans into their management practices. The plans that have most relevance to Petersham Lodge Woods will be ancient parkland and veteran trees, bats, broad-leaved woodland, hedges, song thrush, stag beetle and tidal Thames.



The avenue looking south on 15th October 2015

5. Site vision and objectives

Site vision

5.1 The goals agreed at the outset of the project were:

1. Restore the wood to make it an attractive leisure and environmental asset for locals and visitors alike.
2. Embrace the specific ecology of the wood (e.g. regular flooding) with appropriate planting to ensure sustainability and support biodiversity.
3. Enhance the Richmond riverside by creating an attractive natural space which invites exploration.

Objectives

5.2 From these goals, informed by the updated site description and research into key areas, the following objectives have been developed to cover every aspect of the work to be done:

Objective 1: Nature conservation

Restore, maintain and improve existing habitat quality to ensure optimum conditions for key species and groups.

Objective 2: Floodplain woodland transition

Create and develop wet woodland in the area currently impacted by flooding.

Objective 3: Visitor access

Restore, maintain and improve the entrances, boundaries, pathways, furniture and cleanliness as well as the links and views to adjacent areas to ensure a good visitor experience.

Objective 4: Landscape history

Preserve the wood's remaining historical elements.

Objective 5: Education & information

Communicate the wood's history and ecology through information on site and on-line.

Objective 6: Management planning

Monitor key factors, review management regularly and look ahead to the next plan period.

6. Management prescriptions

6.1 The following detailed prescriptions are designed to manage the site features to deliver the site vision and objectives; the detailed management aim and rationale are given where relevant. The management is not set in stone and must be reviewed and updated based on evidence observed on site, even year to year, so that management is in response to the observed condition or any environmental change.

Prescription 1: Mature trees

6.2 Aim: The existing mature trees are approaching the end of their life but should be retained for as long as possible. As far as possible they should be allowed to age naturally, with dead branches left on the tree. Management intervention should balance tree health, safety and access with landscape and biodiversity. New trees of the same species should be planted close to the existing ones as future replacements.

6.3 Rationale: The mature trees, especially those in the avenue, are a link to the site's historic past and a key habitat feature for biodiversity, particularly nesting birds, roosting bats and saproxylic species. Tree health and visitor risk issues will arise on an increasing basis but the most site sensitive, safe option should be employed wherever possible. Succession planning now for existing mature trees through planting of future replacements will reduce future landscape change.

P1.1	Undertake regular surveys of the tree, floor beneath the canopy and surrounding trees at no more than four year intervals (shorter where individual tree circumstances require). Any tree being monitored should be tagged / numbered for record keeping.
P1.2	Where tree pruning is required, wounds should be kept to the minimum diameter necessary and final cuts on limbs should use natural fracture or coronet finishes.
P1.3	Where regeneration beneath the mature tree or where nearby trees are creating unhealthy competition for light or resources, these trees may need to be removed. If the trees are of a reasonable age (semi-mature or older) this should be done gradually over a number of years to prevent sudden exposure.
P1.4	Where defects develop in the tree to a level of unreasonable risk, the target zone may need to be managed to reduce public access and thus reduce the risk as an alternative to or in combination with undertaking pruning work. Restricting access by allowing taller growth of ground vegetation or installing chestnut paling / dead hedging may be necessary. This is being considered for the avenue's cedar of Lebanon; the tussocky grassland and tall-herb species should be permitted to establish but bramble and other woody species should be removed. Some topping of the area may be required every 3 years.

P1.5	New saplings of the same species / variety (and genetic strain if possible) should be planted in compartment A to replace the variegated sycamore, copper beech and Oriental plane. In the avenue in compartment B, a replacement should be planted for the cedar of Lebanon and, where spacing allows or where tree condition is thought poor, horse chestnuts should planted. Consider two new horse chestnuts at south end of avenue. Timber guards may be necessary to protect these trees.
P1.6	Aftercare should be scheduled and carried out as needed to ensure the new trees are successful. This includes watering, weeding and staking.

Prescription 2: Woodland management

6.4 Aim: Maintain the woodland to a similar extent as in 2015 but with a more open and diverse structure creating dappled light conditions, achieved via path widening, tree lifting, coppicing, glade enhancement and general thinning. There will be no non-native or invasive species. Scrubby areas will be managed on a mixed rotation to diversify the habitat and keep part always open. Keep some small dense and undisturbed pockets to ensure there is a wide range of niches available.

6.5 Rationale: In recent years the woodland structure has become less open, more shaded resulting in lower temperatures within the wood, a sparse understorey and a homogenisation of the ground flora, i.e. bramble. This situation leads to an increase in soil nutrients which only perpetuates those species which prefer high nutrient levels, i.e. ash and sycamore. Changes should be made gradually throughout the woodland. Creating sudden full light conditions can lead to coarse fast growing species out-competing other woodland flora.

P2.1	The removal / reduction / selective thinning of ash and sycamore regeneration in open areas begun during winter 2014/15 should be continued in compartments A, B and C. Regeneration should be pulled where possible but otherwise cut. Larger stumps may need to be treated if they are in a key open area. The amount of elder in the understorey should be reduced by a small degree.
P2.2	Reduce shading and increase width / height along paths by: pruning to lift or reduce the canopy (i.e. yews in com C); coppicing hazel, lime, willow, hornbeam, ash or field maple; or thinning (selecting sycamore, other exotics, or ash first) trees and shrubs as appropriate in the circumstances in order to create dappled light. Any coppicing needed should not all be done in one year and should be maintained on roughly a seven-year rotational cycle.
P2.3	In heavily shaded areas away from paths, a choice should be made to reduce the canopy by lifting, pruning (such as the field maples over the hazel coppice in compartment C), thinning (selecting sycamore, other exotics, or ash first) or coppicing (hazel, lime, willow, hornbeam, ash or

	field maple) as appropriate in the circumstances in order to create dappled light. Coppicing should be carried out on roughly a seven-year rotational cycle with no more than one fifth cut in one year.
P2.4	Areas of younger, open scrub should be coppiced on a mixed 7-year and 15-year rotation to keep a range of ages and niches. No more than one quarter should be cut in one year.
P2.5	Leave small areas with minimal intervention to create natural refuge areas.

Prescription 3: Avenue and open space management

6.6 Aim: A variety of vegetation heights should be maintained to create a graduated effect and offer a range of habitats. Rides and glades should have a shorter central zone of shorter grassland and then grade through a strip of tall-herbs, then coppice and scrub on the edge of the woodland. The management will also enhance the aesthetics of the avenue from a historical perspective.

6.7 Rationale: Open spaces within woodland are significant structural features. They are one of the most important mechanisms for enhancing biodiversity. Nettles and brambles are important features in this context but diversification of some of this area is desired.

P3.1	Either side of the avenue and the path through com A, a one metre strip should be mown on an at least monthly basis, ideally with the arisings removed.
P3.2	For the first two years – possibly longer if required – the central area of the Com A glade (apart from any areas being left beneath tree canopy for safety reasons - see P1.4) should be cut and have arisings removed three times annually to weaken the nettles, brambles and other coarse species and allow a grass sward and forb species to compete.
P3.3	The avenue – and in the long-term the glade should be cut on an annual basis with arisings removed, apart from any areas being left beneath tree canopy for safety reasons (see P1.4). This annual cut should be undertaken at different times, from late summer to autumn, from year to year. Small patches can be tolerated but not allowed to expand.
P3.4	Any bramble, regeneration or invasive species in the central open spaces should also be managed on an annual basis by cutting back or complete removal.
P3.5	Maintain a 1m strip of tall-herb vegetation along the boundary of the avenue with compartment A and around the edge of the glade in compartment A. 30% of the strip should be cut annually on a rotating basis and the arisings removed , ensuring there is always some taller

	vegetation over winter.
P3.6	In the woodland edge or scrub line behind this boundary strip, shrubs should be coppiced on a 15-year rotation. Small amounts should be done occasionally, with no more than one fifth cut in any one year.

Prescription 4: Retain deadwood in appropriate locations

6.8 Aim: Maintain a variety of different types including standing, canopy, and lying deadwood, both scattered and low piles. Some should be left *in situ* or as close to source as possible. Plan ahead for the next generation of deadwood. Ensure that the quantity or location of deadwood does not conflict with other conservation or operational objectives and consider visitor amenity where close to paths.

6.9 Rationale: Deadwood is a fundamental base to the woodland ecosystem. It is sometimes regarded as a source of disease, sign of neglect or obstruction to efficient management, however deadwood is vital in providing soil with nutrients and it harbours around 1700 species of invertebrate, many of which are rare, and those of high abundance are a vital food source for other, more visible woodland wildlife including birds and hedgehogs. This importance is even greater in wet woodland.

6.10 Generally larger and longer pieces of deadwood are more valuable but a large volume of small deadwood can also be important. Dappled shade locations close to open space are most probably valuable; many deadwood invertebrates as adults feed on nectar from plants in these areas. It is also helpful to replenish or expand the deadwood in areas where it is already valuable, to provide continuity. Deadwood species are not very mobile so may not expand to new areas.

6.11 It is preferred to leave it lying rather than create piles, however if some needs to be moved for operational reasons it can be placed into low piles with as few air gaps as possible; this can be achieved by stacking end to end and then cutting into the piles to compress them.

P4.1	When operations produce deadwood, consider distribution or removal. Most brash should be removed but some and the larger cordwood should be scattered throughout the wood in at least small amounts so it is found in all conditions from sun to shade, lying, piled and half-buried.
P4.2	Create a stag beetle loggery with half-buried timbers in a partly shaded location.
P4.3	The high tides often wash in natural timber (and much else). Some of this should be retained and spread along the wet woodland edge due to the importance of wet and submerged wood for some priority invertebrates. However, large accumulations should be removed particularly from the area around entrance W. All rubbish and treated timber should be removed.

Prescription 5: Continue hydrological monitoring

6.12 Aim: Continue to build-up a picture of the extent to which the site and surrounding land floods.

6.13 Rationale: No work to manage water ingress or dissipation is currently believed necessary. The conservation impact of the flooding is positive overall and more so if habitat transition to wet woodland is made (see prescription 6). It also serves as flood storage capacity that relieves pressure elsewhere. Equally, whilst opening up the protective dyke further to increase flooding might have some benefits for site ecology and to the wider area through increased flood storage capacity, it is felt this decision must be made in consideration of other hydrological units as well rather than in isolation. Further study would be required to progress either option. A full discussion of the 2015 hydrological monitoring can be found in Appendix 1.

P5.1	Monitor inundation on higher spring tides predicted above 5.00m for a range of different fluvial flows. Record actual tide height reached and flow rate at Kingston gauge (from http://rjen.me.uk/tides/now), area inundated (photographs or map) and length of time to dissipate (even if only partially).
P5.2	Keep in touch with EA and TLS about the wider hydrological picture.

Prescription 6: Create and manage wet woodland habitat

6.14 Aim: Convert flood impacted part of the woodland to wet-loving species for sustainable future management. Stay in touch with partners about future plans.

6.15 Rationale: Compartment D in the lowest part of the site and where flood water ponds. This has impacted the site by eroding a channel and reducing ground flora (possibly combined with heavy shading). The higher groundwater in this area has possibly contributed to poor tree and understorey health. This flooding should be embraced as it is likely to be a permanent situation and the area converted to species that are suited to the wet soils and thrive on regular inundation.

6.16 The habitat creation will extend the wet woodland habitat that has been developing naturally to the west at the river end of the Sea Scouts land; this area should be surveyed and species of tree and ground flora noted. Further developments on managing the site together with adjacent hydrological units – such as connecting the site with the Sea Scouts woodland – will only speed and improve habitat change. It may be prudent following monitoring to investigate the possibility of allowing greater controlled inletting into the woodland.

P6.1	Openings for planting should be made in this area by coppicing the hornbeam and field maple that are significantly squirrel damaged. The area should not all be cleared at once else species such as bramble will take over in the short-term. Regeneration should not be overly thinned at this early stage.

P6.2	The woodland community if naturalised would probably be the W7 Alder-Ash-Nettle sub-community. Alder (*Alnus glutinosa*), downy birch (*Betula pubescens*) and willow (*Salix spp*., particularly *cinera* with some *fragilis*) should be planted in this area, possibly along with native black poplar (*Populus nigra*). Aspen (*Populus tremula*) could also be considered. Ash and hornbeam may also be part of this community in the drier transitional areas. Guards may be needed for new plantings in the short-term.
P6.3	Aftercare should be scheduled and carried out as needed to ensure the new trees are successful. This includes watering, weeding and staking. Squirrel damage should be monitored.
P6.4	The ground flora should be allowed to develop naturally initially; control bramble controlled but nettle will be a natural part of the ground flora and should not be discouraged. Consideration should be given to planting sedges (*Carex spp.*), especially greater tussock sedge (*Carex paniculata*), meadowsweet and tufted hair-grass (*Deschampsia cespitosa*) in the first phase. Depending upon natural colonisation, other species such as marsh marigold (*Caltha palustris*) and wood anemone (*Anemone nemorosa*) may be introduced sparsely. Low deflectors may help retain soil and aid plant establishment.

New wet woodland? Compartment D at peak spring high tide on 1st October 2015

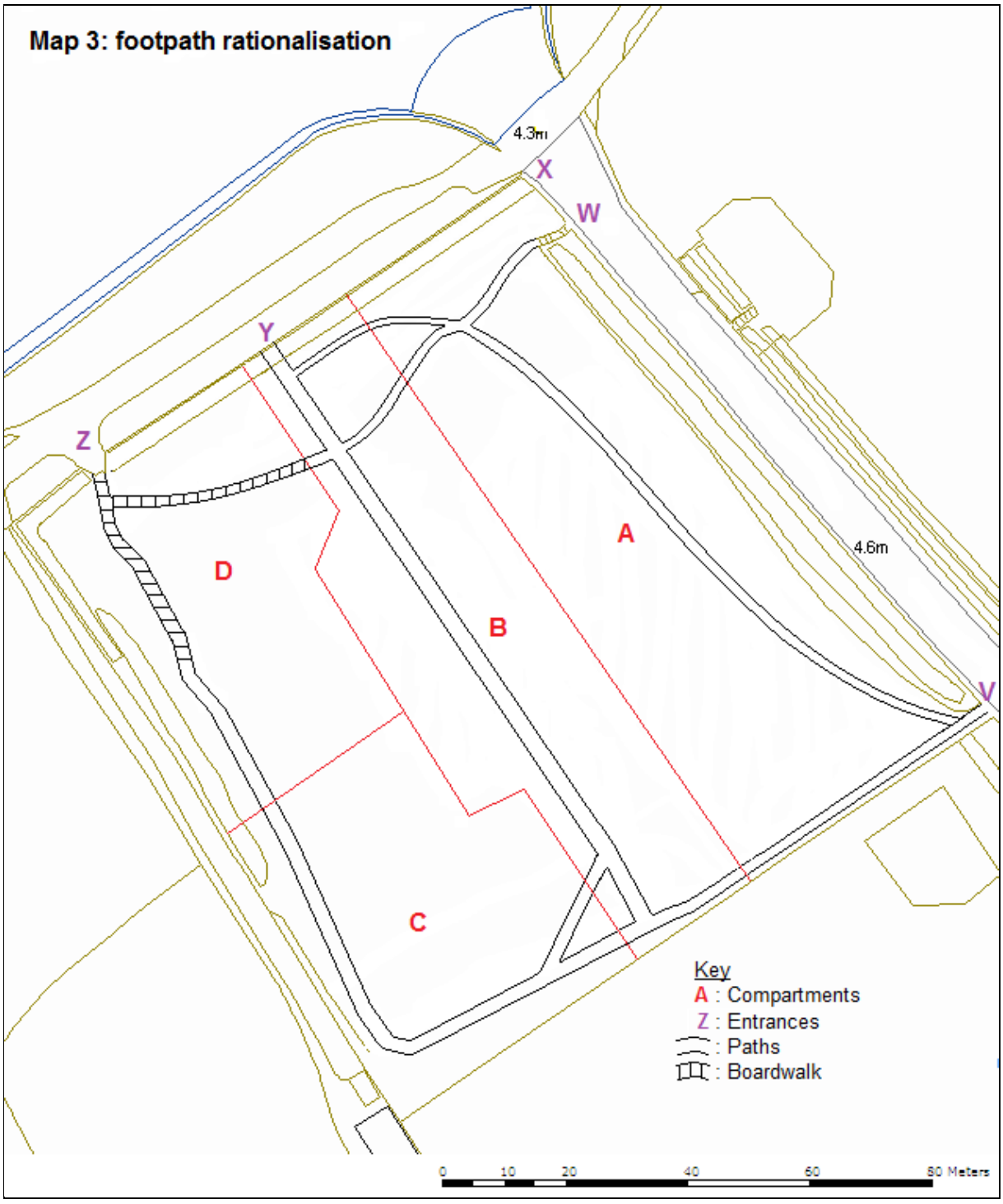
P6.5	Land form, water levels and plant condition should be monitored and changes considered to improve success if necessary. Patience should be rewarded, however, as this area will naturally tend towards this habitat with time. Construction of a shallow seasonal pond in this area may assist matters and would be a significant addition for biodiversity.

Prescription 7: Create and maintain improved visitor environment

6.16 Aim: Provide a welcoming and clean visitor environment with clear, spacious paths that provide a dry route in times of flood.

6.17 Rationale: A review of existing paths and furniture shows room for improvement both in the overall network provision and in specific path sections (see Map 3 opposite). The current site paths are quite limited and those with mobility difficulties can only enter or exit at V with no circuit available.

P7.1	Entrance Z should be moved from the area of the breach to the north-west corner of the wood close to the Sea Scouts boundary and an entrance ramp should be considered in order to give full disabled access to the woodland. Install site sign.
P7.2	A curved boardwalk should be constructed from this entrance to where the existing path rises slightly on the boundary of compartments C and D, approximately 40m, thus creating a dry escape route from the towpath to River Lane. The boardwalk should be raised to around 50cm above ground height; this should cope with all but extreme floods and will dovetail nicely with the dyke's height. The boardwalk could be timber or recycled plastic, timber perhaps fitting better landscape-wise but plastic being longer lasting in the damp environment. It should be 1.2m wide, one passing place to 1.7m wide should be built-in.
P7.3	A 35m spur of boardwalk could also be built from near new entrance Z across to the avenue, perhaps as a second phase if funding permits. This should provide a dry route between entrances Z and W. Another passing place will be needed.
P7.4	Only one of the two paths from the north end of the avenue to the slipway entrances should be retained. It is suggested that entrance X and the path that runs partly along the northern dyke be closed; entrance W is at a slightly higher level in terms of flooding on River Lane and establishing a formal path on the dyke would be expensive considering it does not provide a full dry route in periods of flood as there is generally no exit at the slipway end in flood periods.
P7.5	A new mown path curved across compartment A from entrance V to meet the path between W and the avenue will create an excellent link across the site. The path will need fortnightly cutting in the short-term. A one metre strip either side will be cut on an at least monthly basis.


Map 3: footpath rationalisation
4.3m
X
W
Y
Z
A
D
B
4.6m
V
C
Key
A : Compartments
Z : Entrances
: Paths
: Boardwalk
0
10
20
40
60
80 Meters

P7.6	The remainder of the path through compartment D and C should be opened up and widened slightly through a combination of coppicing and overhead pruning to lift and reduce the canopy.
P7.7	The entrances V and W, and where needed the paths immediately inside, should be widened through thinning, coppicing and canopy lifting to create a more welcoming impression. A new site sign should be installed at W. New steps should considered for W.
P7.8	Steps (or a ramp if not positioned at Z) should be considered for entrance Y at the northern entrance to the avenue. This impressive access point is often slippery on the steep boundary mound, especially in winter.
P7.9	A new bench has already been installed although should be moved slightly further out of the main sightline along the avenue and into better alignment with the path change.
P7.10	Ensure adequate regular bin and surface litter collection. The wood is regularly visited by the litter teams working along the towpath but this should be formalised to improve cleanliness. At present, litter from tides, public sex and at the River Lane entrance leaves the site with a sense of untidiness.

Prescription 8: Retain and enhance remaining historical features

6.18 Aim: Ensure that remaining historic landscape features are reflected in site management.

6.19 Rationale: The avenue and its vista is part of the site's history and the sightline should be kept open.

P8.1	The slight kink in the avenue path towards the southern end should be straightened, involving some clearance of sycamore regeneration on the eastern side.
P8.2	The trees should be cleaned up and lifted on their lower trunks to open out this view again in both directions. The horse chestnuts on the towpath may also need some low pruning.

Prescription 9: Manage boundaries

6.18 Aim: Create and maintain dense boundary vegetation but with windows to the north and east.

6.19 Rationale: Ideally, the north, east and west woodland boundaries should be relatively dense in order to deflect wind and retain higher humidity and temperature within the

woodland – particularly considering the more open structure being sought inside. However, this needs to be balanced with the reality of managing safe public open space and also maintaining visual links between the site and neighbouring areas.

P9.1	The existing hedges along the west and east boundaries should be laid where possible; older growth should be coppiced for future laying in seven years. Some good standards should be retained in the hedgelines.
P9.2	New hedge plants of hawthorn, hazel, field maple and holly should be used to thicken up the east and west boundaries. If more standards are required, some should be planted (light permitting). Beat up in year 2 and aftercare should continue for 5 years.
P9.3	Along the northern boundary, inside and outside the dyke, the vegetation should be managed to create a thicker but more attractive boundary along the riverside.
P9.4	At carefully planned points in the north and east boundaries, windows should be left or opened, coupled with a sightline to or from a relevant position within the woodland.
P9.5	Carry out a cut only where needed on hedges and windows, annually or in alternate years as demanded.

Prescription 10: Increase available information on site and on-line

6.20 Aim: Increase awareness of site's importance for wildlife and local history.

6.21 Rationale: Communicating the wood's importance will hopefully lead to better care being taken by visitors.

P10.1	An interpretation panel should be created and installed to inform visitors about the past history of the wood and its relationship with the adjacent site.
P10.2	A panel could be considered for the ecological aspects of the wood as well but it is suggested that instead some temporary interpretation be used through the restoration phase and that this then be revisited once the situation has stabilised.
P10.3	The Council's site page for the woodland should be updated with some more basic historical and conservation information and perhaps a copy of the final version of this management plan.

Prescription 11: Monitor key species

6.22 Aim: Formally monitor key species or groups of species through repeatable surveys to build up site knowledge and give feedback on management direction.

6.23 Rationale: The population trends of key species or assemblages will provide information on whether management is achieving its objectives.

P11.1	Every year, identify a key community or group to monitor to inform management success. Examples are breeding song thrushes and other woodland birds; foraging bats; key plants such as meadow cranes-bill, goldilocks buttercup or the developing community in the wet woodland; or groups such as deadwood invertebrates. Expert help should be sought where required, from volunteers if possible.

Prescription 12: Review management plan

6.24 Aim: Keep work records and review site condition / work programme / management plan on a regular basis.

6.25 Rationale: Ensure that management remains on track to deliver the site vision and objectives. No plan can anticipate every situation or environmental response and it is vital that management be reviewed every year and the subsequent work programme adjusted. The plan should be seen as a live document for editing and updating.

P12.1	Each year, a simple summary of the work completed should be produced with an annotated map.
P12.2	A more major review should be undertaken in year 5 to check that the vision and objectives remain correct. In year 9, plans should be put in place for completion of the new plan in advance of the new period.

Work programme

6.26 The detailed ten-year work programme and management maps begin on page 27.

6.27 Work programme key:

AC	Arboricultural contractor
CC	Conservation contractor
EA	Environment Agency
GC	Grounds contractor
LBRuT	London Borough of Richmond upon Thames
PET	Petersham Environment Trust
TLS	Thames Landscape Strategy
Vol	Volunteers, supervised by LBRuT or CC

Priority levels

6.28 **1** – Very important for the maintenance of the key habitats, species or visitor amenity (i.e. annual meadow cut) and should reflect the bare minimum of what should be achieved each year.

2 – Of secondary importance to the key tasks, to be done if more time / resources are available (i.e. coppicing / thinning a secondary woodland boundary to a meadow, or additional survey work); priority 2 tasks could become 1s if not completed for a number of years.

3 – Luxury, wish list tasks: nice to do but not important if resources are not available; these items might become priority 2s over time if not completed but are unlikely ever to reach priority 1 unless significant change in other factors.

1 – Priorities in red mean the task was not completed as scheduled.

R – Reactive, unplanned work, may be coupled with a numerical priority, i.e. R1.

PLW work programme **Prescriptions**	**Com**	**Year & Priority**										**Usual month**	**Resources** (see p25 for abbreviations)	**Remarks**
		15-16	**16-17**	**17-18**	**18-19**	**19-20**	**20-21**	**21-22**	**22-23**	**23-24**	**24-25**			
P1.1: Survey and tag mature trees.	A, B, C	**1**	2		2	**1**	2	2	2	**1**	2	Nov - Feb	LBRuT / AC	
P1.2: Carry out any required work on mature trees.	A, B, C	R	R	R	R	R	R	R	R	R	R	As req.	LBRuT / AC	
P1.3: Manage canopy zone of mature trees.	A, B, C	**1**	2	2	**1**	2	2	**1**	2	2	**1**	Nov - Feb	LBRuT / vols	
P1.4: Allow area beneath cedar of Lebanon to grow taller to discourage public access. Bramble and woody species should be removed annually.	B	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	All year	CC / vols	
P1.5: Plant replacements for mature trees.	A, B	**1**	**1**									Nov - Feb	LBRuT / AC	Plant in Y2, beat up in Y3.
P1.6: Aftercare of new trees planted.	A, B		**1**	**1**	**1**	**1**	2	**1**	2	**1**	2	Summer	AC / CC	
P2.1: Remove / reduce / select natural regeneration of ash and sycamore.	A, B, C	**1**	2	**1**	2	**1**	2	**1**	2	**1**	2	Nov - Feb	CC / vols	Monitor ash dieback.
P2.2: Reduce shading along paths by lifting, pruning, coppicing and thinning.	All	**1**	2	2	**1**	2	2	**1**	2	2	**1**	Nov - Feb	CC / vols	
P2.3: Reduce woodland shading by lifting, pruning, coppicing and thinning.	All	2	**1**	2	2	**1**	2	2	**1**	2	2	Nov - Feb	CC / vols	
P2.4: Coppice younger scrub on mixed rotational basis.	A, B,	**1**	2	**1**	2	2	**1**	2	2	**1**	2	Nov - Feb	CC / vols	
P3.1: Mow 1m path sides at least monthly in growing season.	A, B	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	Mar - Oct	GC / CC	
P3.2: Cut glade nettle three times each year in early stages.	A		**1**	**1**	**1**							Apr, Jul, Oct	GC / CC	Review after Y4.

Prescriptions	Com	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Usual month	Resources	Remarks
P3.3: Cut open areas annually and remove arisings.	A, B				**1**	**1**	**1**	**1**	**1**	**1**	**1**	Oct	GC / CC	
P3.4: Manage bramble or regeneration in the central open spaces.	A, B	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	As req.	CC / vols	
P3.5: Cut 30% of 1m tall-herb strip annually and remove arisings.	A, B	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	Aug - Oct	GC / CC	Not concerning if the occasional year is missed.
P3.6: Coppice scrub or woodland edge on 15 year rotation.	C	**1**		**1**		**1**		**1**		**1**		Sept - Nov	GC / CC / vols	
P4.1: Maintain deadwood distribution.	All	R	R	R	R	R	R	R	R	R	R	Nov - Feb	CC / vols	
P4.2: Create stag beetle loggery.	A or C	**1**										Jan - Feb	CC / vols	Under review – site too wet?
P4.3: Spread or remove tide-washed timber and debris.	A, D	R	R	R	R	R	R	R	R	R	R	As req.	CC / vols	
P5.1: Hydrological monitoring on high spring tides.	A, B, D	**1**	**1**	3	3	3	**1**	3	3	**1**	**1**	As req.	LBRuT	Focus on higher spring tides.
P5.2: Keep in contact with EA and TLS.		**1**	2	2	2	2	2	2	2	**1**	**1**	As req.	LBRuT	
P6.1: Coppice existing trees in flood area.	D	**1**	**1**	**1**	**1**	**1**	2	2	2	2	2	Nov - Feb	LBRuT / CC / vols	
P6.2: Plant new wet woodland trees.	D	**1**		**1**								Nov - Feb	LBRuT / AC	Plant in Y1, beat up in Y2.
P6.3: Aftercare of new trees planted.	D	**1**	**1**	**1**	**1**	**1**	2	**1**	2	**1**	2	Summer	AC / CC	
P6.4: Add to natural ground flora	D		2	2	2	2	2					As req.	CC / vols	Only if needed.
P7.1: Create new entrance Z, with site sign and possibly ramp.	All			**1**								Nov - Feb	LBRUT / CC	Ramp in spring.

Prescriptions	Com	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Usual month	Resources	Remarks
P7.2: Construct boardwalk for path in area that floods.	D				2							Sep - Mar	LBRUT / CC	
P7.3: Spur of boardwalk from Z to avenue.	B, D			2								Sep - Mar	LBRUT / CC	
P7.4: Close off entrance X and associated path.	A, B	**1**										Nov - Feb	LBRUT / CC	Once 7.7 completed
P7.5: Mow in new path across glade.	A											Mar - Apr	GC	On hold due to condition of cedar
P7.6: Widen path through C and D.	C, D	**1**	2									Nov - Feb	CC / vols	
P7.7: Open up entrances V, W and Z and approach paths; install signs and steps.	A, D	**1**			**1**							Nov - Feb	CC / GC	Steps in spring.
P7.8: Consider steps or ramp for entrance Y.	B	2	**1**									Mar - Apr	CC / GC	
P7.9: Move new bench into improved position.	B	**1**										Nov	GC	
P7.10: Improve litter collection with CL.	All	**1**										Nov	LBRuT / GC	
P8.1: Straighten avenue path.	B	**1**										Nov - Feb	CC	
P8.2: Lift lower shoots on avenue trees.	B	**1**						**1**				As req.	LBRuT / AC	
P9.1: Lay and coppice east and west boundaries.	A, C, D	**1**	**1**						**1**			All year	LBRuT / AC	East in Y1; west in Y2
P9.2: Thicken the east and west hedges with whips; beat up and maintain for 5 years.	A, C, D	**1**	**1**	**1**	**1**	**1**	**1**					As req.	CC / vols	

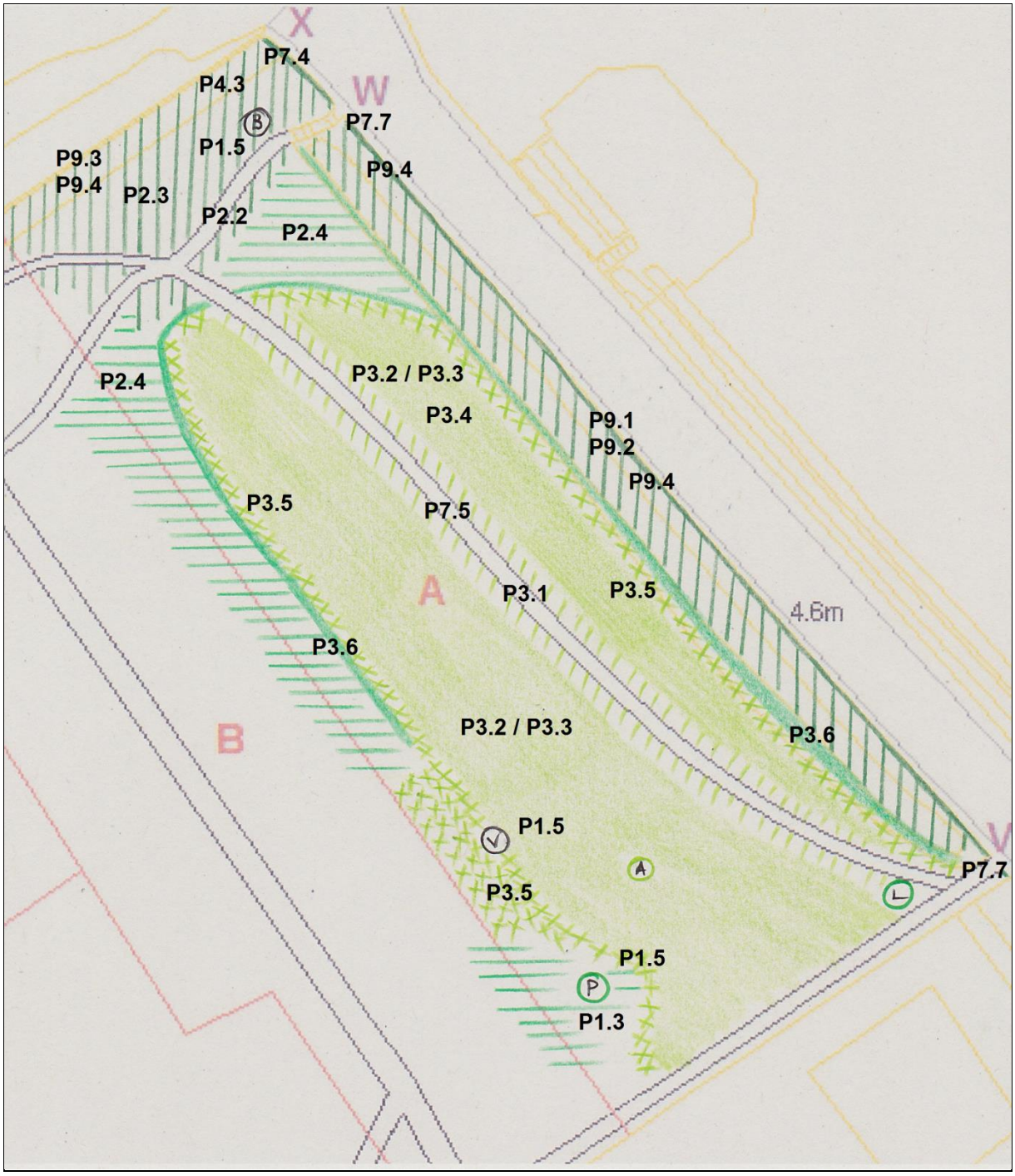
Prescriptions	Com	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	Usual month	Resources	Remarks
P9.3: Manage vegetation along northern boundary.	A, B, D	**1**	**1**	2								Nov - Feb	CC / vols	
P9.4: Open boundary windows at selected points.	A, D	**1**	**1**	2								Nov - Feb	CC / vols	
P9.5: Maintain hedges and windows.	A, D	2	**1**	2	**1**	2	**1**	2	**1**	2	**1**	Nov - Feb	CC	
P10.1: Agree and install interpretation panel about site history.	B	2	2									As req.	LBRuT / PET	
P10.2: Use temporary signage to communicate ecological works.	All	**1**	**1**	**1**	**1**	**1**						As req.	LBRuT / CC	
P10.3: Improve information on-line.		2	2		2			2			2			
P11.1: Monitor key species on an annual basis.		**1**	**1**	**1**	2	2	2	2	**1**	**1**	**1**	As req.	LBRuT / CC / vols	
P12.1: Produce annual work summary with map; update work programme and prescriptions where needed.		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	Spring	LBRuT / PET	
P12.2: Review management plan.		**1**				**1**				**1**	**1**	Summer	LBRuT / PET	

7. Management maps

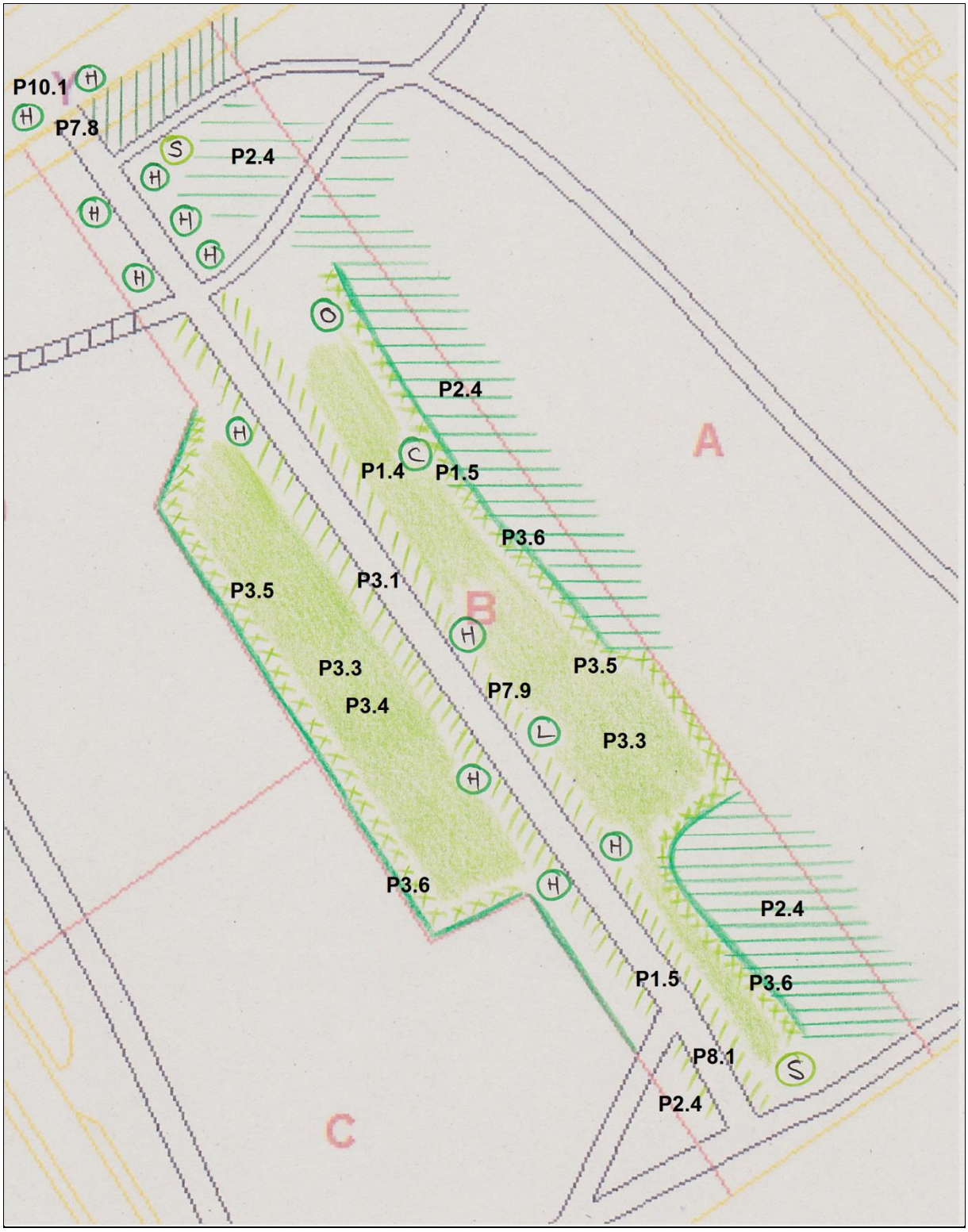
Key to management maps

	Mature tree
	Other tree
	Dead veteran
	Canopy woodland
	Closed mature scrub
	Young / open scrub
	Woodland edge
	Hedgeline
XXXX	Tall-herb vegetation
	Annual cut
	Mown path edges
	Coppice area
	Wet woodland extent
	Path
	Boardwalk
P7.2	Prescription #
B	Compartment #
W	Entrance #
A	Ash
B	Copper beech
C	Cedar
F	Field maple
H	Horse chestnut
I	Holly
L	Common lime
O	Holm Oak
P	Oriental plane
S	Sycamore
V	Variegated sycamore
W	Sweet chestnut
Y	Yew

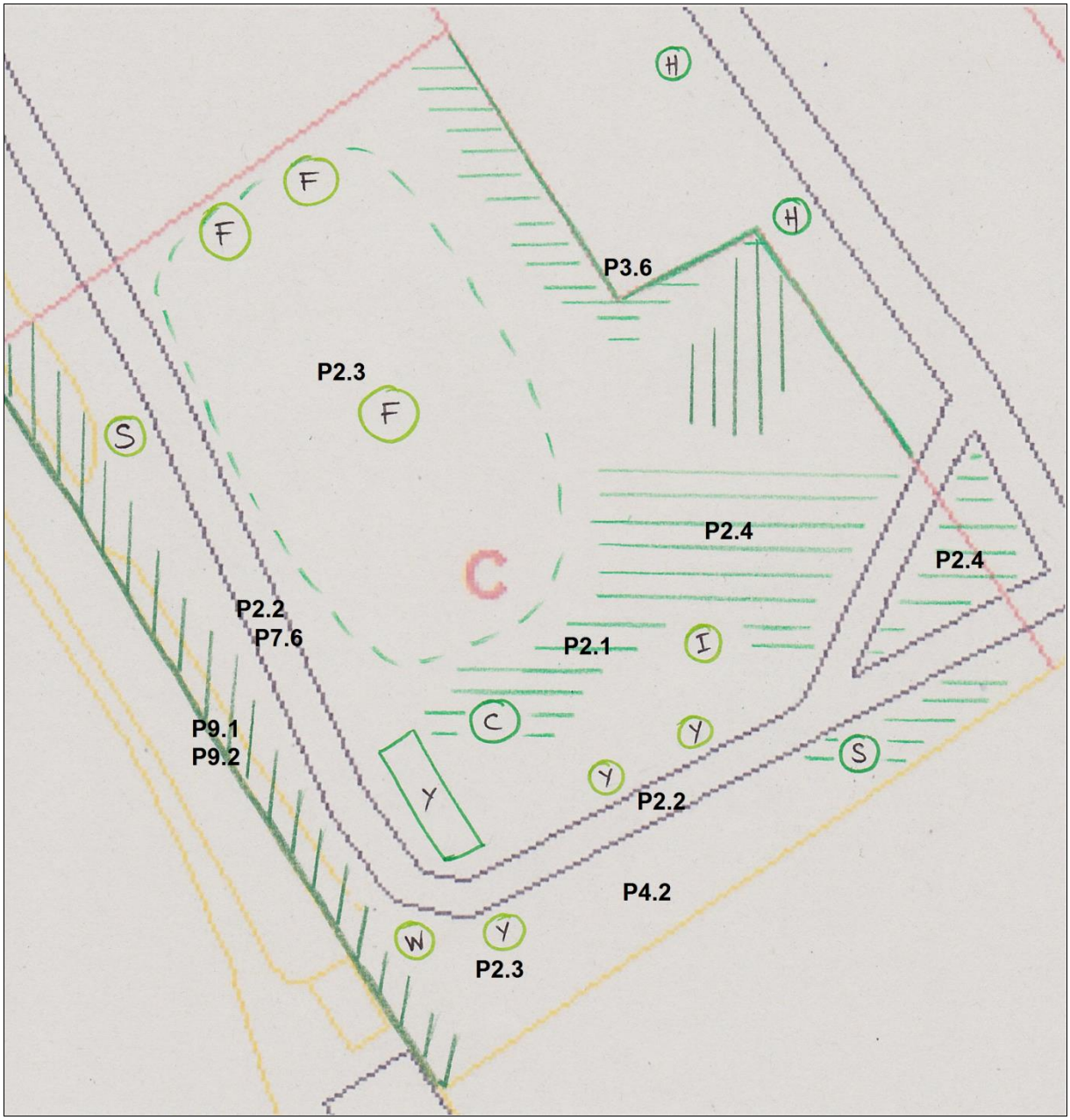
Compartment A: management map



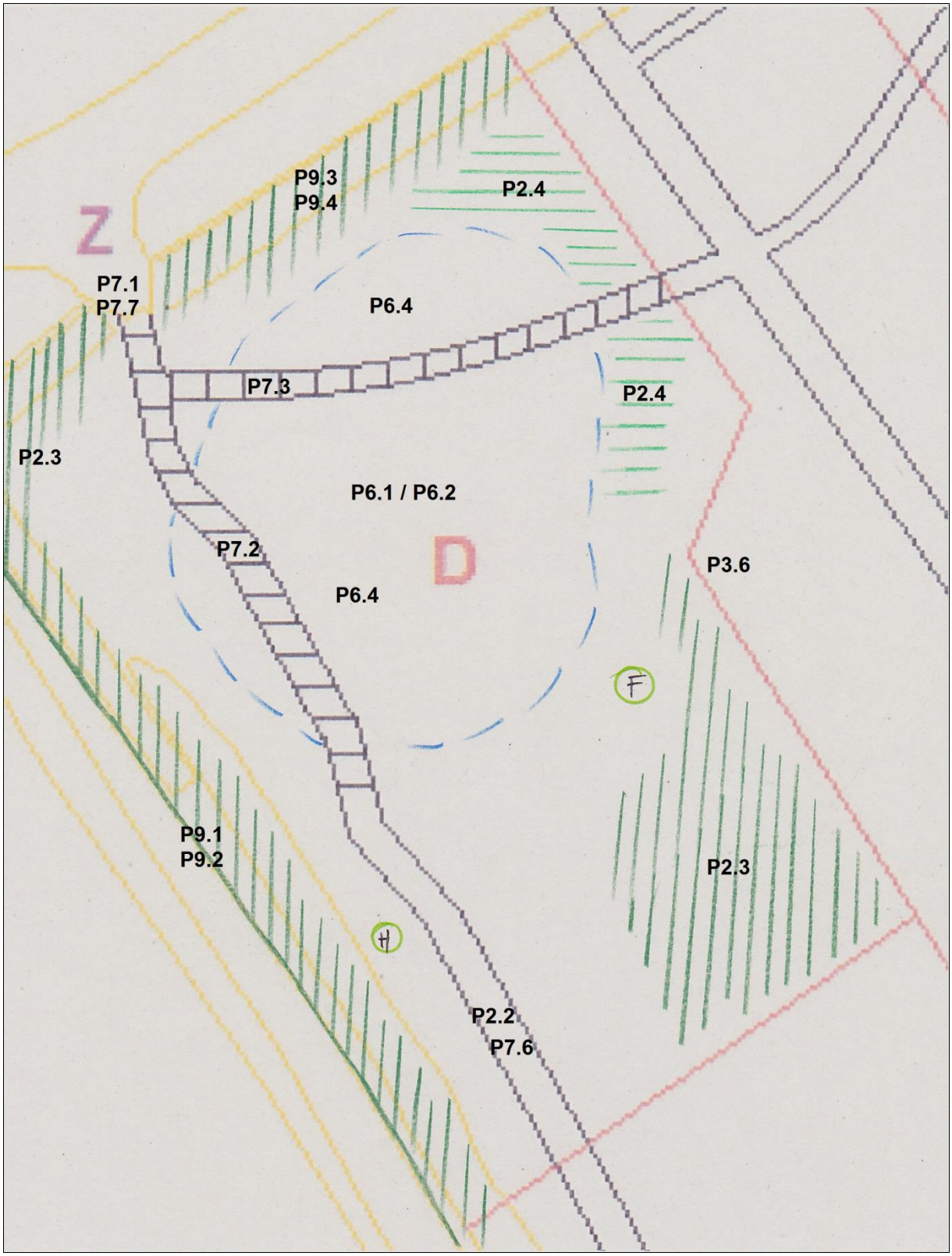
Compartment B: management map



Compartment C: management map



Compartment D: management map



8. References

1. Archer, J. & Curson, D., *Nature Conservation in Richmond upon Thames* (1993): London Ecology Unit.
2. Fison, V, *The Matchless Vale: The Story of Ham and Petersham and Their People* (2009).
3. *Petersham Lodge Woods Soils Site Report* (2015): National Soil Resources Institute.
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5. *Thames Estuary 2100: Managing flood risk through London and the Thames Estuary* (2012): Environment Agency

Appendix 1. Hydrology

A1.1 At the beginning of this project, it was anticipated that some change may be needed not to stop flooding occurring but in speeding its dissipation from the site to reduce the impacts of longer waterlogging, especially in compartment D. Such control can disrupt the natural hydrological processes within sites and needs to be carefully weighed, although these processes have already been interrupted with the construction of the dyke.

A1.2 Tide heights and inundation were monitored from late September to mid-October in 2015 as the 18.6 year astronomical tidal cycle reached its peak at the time of the autumn equinox and 'supermoon' (co-incidence of a full moon with the closest approach of the Moon to the Earth on its orbit).

A1.3 The afternoon high tide on 28th September reached 5.01m (as measured at Richmond Lock) and resulted in a minimal amount of water entering through the breach in the northern dyke, causing a small puddle on the eroded pathway just inside the woodland. The afternoon high tide on 14th October reached 4.78m and caused only partial flooding of the towpath adjacent to the wood.

Compartment D at peak spring high tide on 1st October 2015

A1.4 The afternoon high tide on 1st October reached 5.41m; this was the highest tide since March 2015 (when the last 'supermoon' combined with the alignment of the sun and a tidal surge led to a 'supertide') and the highest until one predicted to be 5.49cm in October 2016. This tide caused water to enter the wood for a period of around 45 minutes and resulted in an 8cm deep pool over approximately one quarter of compartment D and prevented use of 10m of footpath inside entrance. At its peak, the tide remained approximately 40cm below the height of the rest of the northern dyke. 75% of the water drained away within half an hour of the tide receding below the breach and the remainder likely dissipated within a few hours. There were no impacts on the wood beyond erosion to the water's channel.

A1.5 From these visits, it is estimated that the wood only floods on tides measuring above 4.95m at Richmond Lock and that tides of up to 5.25m do not result in any loss of amenity apart from a few metres of footpath in compartment D. Tides above 5.60m will likely flood most of the north-western part of the wood whilst 5.80m may be enough to see water enter the better defended north-eastern section.

A1.6 Predictions from the Port of London Authority (PLA) show that the highest tides for Richmond Lock up to the end of 2025 are the 5.49m in October 2016 and 5.48m in September 2024, and just 21 high tides at 5.40m or above are predicted in total up to the end of 2025.

A1.7 It is therefore anticipated that tidal flooding by itself does not pose particular problems within the ten-year plan timescale. Significant flooding is more likely to arise from high fluvial flow over Teddington Lock from upstream in the Thames catchment but this is still around a 3.3% chance annually. If high fluvial flow coincides with high spring tides or a North Sea surge, the actual heights seen will be higher and the water will take longer to dissipate. However, the Thames Barrier protects the borough to some degree during such periods and thus there should be a limited number of occasions when significant flooding might occur in this plan period.

A1.8 It is likely that the frequency of tidal and fluvial flooding will increase gradually in the long-term. Whilst sea level rise is currently around 3mm per year and thus will not significantly affect tide heights by itself in the near future, it is estimated to be 20cm to 90cm over the next century and peak freshwater flows are predicted to rise by as much as 40% by 2080[5]. The Environment Agency (EA) plans to start gradually reducing the use of the Thames Barrier to combat fluvial flood events in order to ensure its ability to deal with tidal flooding, the purpose for which it was built.

A1.9 It is therefore likely that EA and Thames partners will at some point revisit plans for sustainable flood management on riverside land in the Ham and Petersham area. It is suggested that the Council engage with this initiative when it arises and consider again the long-term hydrological management of the wood, Petersham Meadows, the Thames towpath and Ham Lands, for conservation and safe visitor amenity, and that it prepares for this initiative by monitoring the flooding of the woodland and the surrounding areas on high spring tides.