



Urban Development and Burnham Beeches SAC



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Summary

The gradual and long term degradation of the nature conservation integrity of protected sites in the UK is of increasing concern, particularly for sites surrounded by high and increasing levels of urban development. A range of impacts such as increased recreational pressure, fragmentation and reduced water availability is linked to development. This report focuses on these ‘urban impacts’ and the implications for Burnham Beeches.

Burnham Beeches is considered to be one of the most outstanding areas of acidic beech forest/beech wood pasture in the UK, and its importance for biodiversity is internationally recognised by wildlife designations. Its European importance is recognised in the designation as a Special Area of Conservation (SAC) under the provisions of the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), which transpose the European Habitats Directive into domestic legislation. The Burnham Beeches SAC, according to the most recent SSSI condition assessments in 2006, 2008 and 2010 is meeting its European site conservation objective. It is however apparent that there is a fundamental issue with an absence of old pollarded trees to succeed the current veterans, and there are indications that the woodland as a whole may be suffering some ill health.

The Burnham Beeches site is in multiple ownership. It comprises 220ha of public open space, with the remaining 160ha being mainly in private ownership. This report, focussing mainly on the accessible 220ha (of which 200ha is within the SAC), provides an overview of the current issues, information gaps and potential opportunities with regard to the protection of the outstanding natural asset of Burnham Beeches, alongside its continued use as a valuable greenspace, whilst considering the recreational pressure and other impacts arising from future growth. This document should be seen by all stakeholders as encouraging a co-ordinated approach, and should be used to agree the detailed measures to take forward, based on the recommendations made in this report.

Relevant impacts at Burnham Beeches that are related to development include increased access (resulting in increases in trampling and soil compaction; climbing of veteran trees; dog fouling; disease spread; disturbance; introduction/spread of alien species, litter/fly-tipping, vandalism and fire); reduction in water levels/supply; reduction in air quality; increased fragmentation and isolation of the site, and increased cat predation.

The publicly accessible area of Burnham Beeches provides an excellent greenspace resource. From the visitor information available at present, it is apparent that 66% of visitors live within 5 miles of the site, and that 38% of visitors come to Burnham Beeches at least twice per week. Over the last decade a range of significant measures to manage visitor use at Burnham Beeches has been put in place. These include major changes to infrastructure. The scope for further management of visitor pressure on-site is limited.

The application of strategic level mitigation for European site impacts arising from new growth is now an established and accepted approach and many of the problems can only be tackled in a strategic fashion. However, much of the precedent for such strategic approaches is for Special Protection Areas (SPAs), designated for their bird interest, rather than for SACs. These precedents have the benefit of detailed ecological studies that directly link housing to numbers, and distribution

or breeding success of the avian interest features. Such an evidence base is harder to compile for SAC sites where the interest features are habitat-based rather than species-based. Nonetheless, justification for the preparation and implementation of a strategic mitigation scheme for Burnham Beeches SAC is presented.

We consider how strategic mitigation measures may be developed for the site, and suggest possible components of such a package. These include some additional on-site measures, off-site provision of supporting green infrastructure, off-site provision of alternative greenspaces (SANGs), restrictions in policy to prevent further impacts from urbanisation and housing intensification in the immediate vicinity of the SAC, and a notable requirement for further research and investigations.

Discussions with a range of partners will be critical to the successful establishment of a mitigation strategy for Burnham Beeches SAC.

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1. Introduction

Purpose of the Report

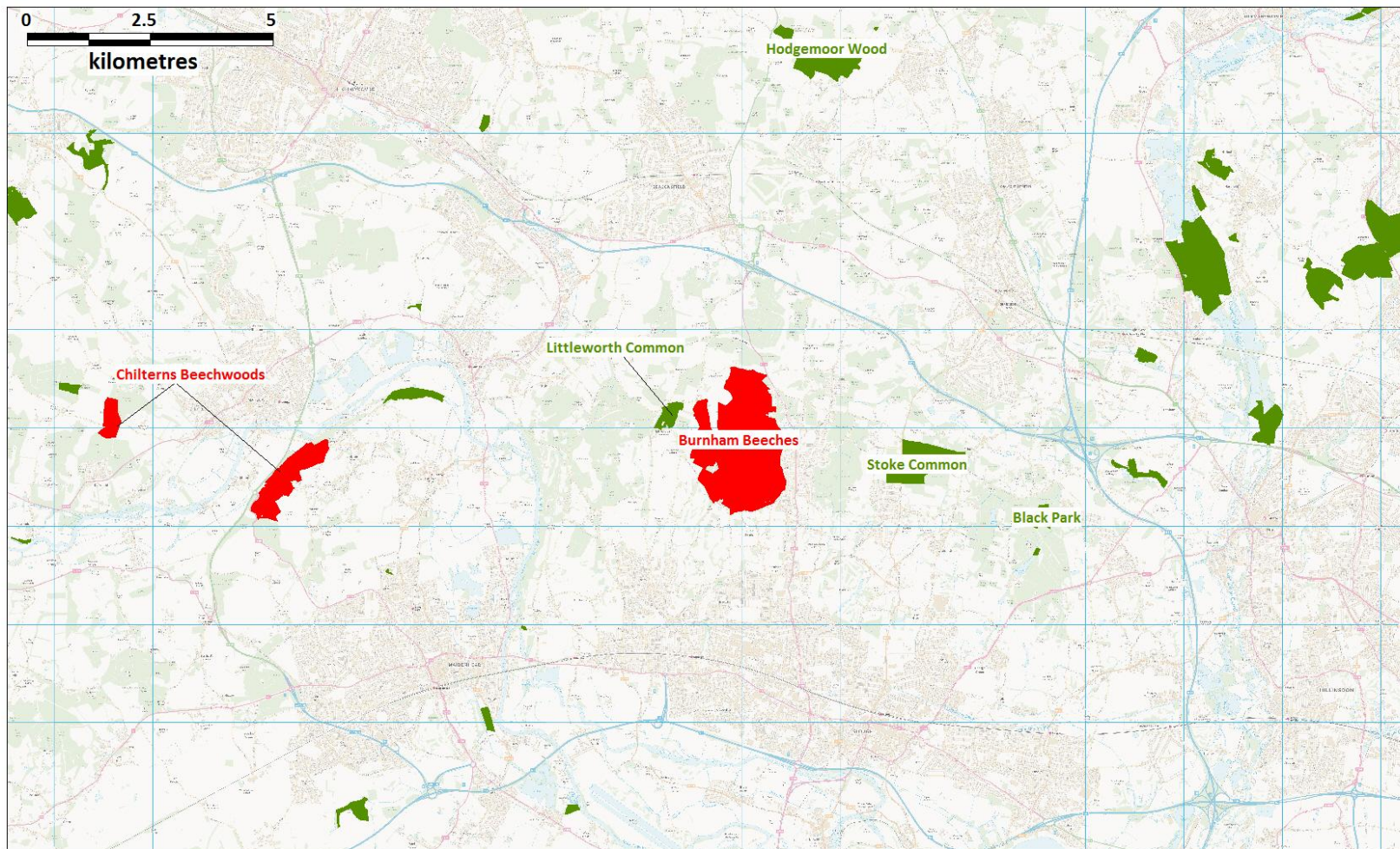
- 1.1 Nature conservation in the UK is largely centred upon designated sites, with a range of tiers of designation relating to their nature conservation importance. While the most important sites (falling within the Natura 2000 network of European Sites), have strict protection, the surrounding countryside is often subject to little protection. It is recognised that many of the designated sites are in themselves too small and that many of the natural connections in our countryside have been degraded or lost (Lawton *et al.* 2010). Particularly in southern England, with high (and growing) human populations, the pressures for land and resources are intense and there can be implications for the protected sites. Development and changes in land use outside the protected area boundary can have impacts on the sites themselves. Such impacts can happen gradually, be difficult to identify, tricky to monitor and typically require some kind of strategic approach to resolve.
- 1.2 This report provides an overview of the current issues and opportunities with regard to the protection of the outstanding natural asset of Burnham Beeches, a relatively small and isolated site, designated as a Special Area of Conservation (SAC). It aims to draw together existing research and information relevant to the consideration of the potential impacts of future development on Burnham Beeches, providing a summary of key issues that may need to be incorporated into any Habitats Regulations Assessment; and guiding those involved in both the day-to-day management of Burnham Beeches and those involved in forward planning and development management in the surrounding area.
- 1.3 Also incorporated within this report is a comparison with other sites that have international wildlife designations, in terms of visitor pressure arising from their visitor catchment. For these other sites we consider the strategies to mitigate for increasing recreational pressure from new growth.
- 1.4 The report has been commissioned by the City of London (which manages the main part of the site) and it is intended that the document should be used by all stakeholders to foster a co-ordinated approach, facilitating discussion between stakeholders and used to agree the detailed measures to take forward.

Site Context

- 1.5 Burnham Beeches lies entirely within South Bucks District. Its ownership however is mainly split between the City of London Corporation and the private ownership of the Portman Burtley Estate, along with a small section owned by the National Trust and a very small area enclosed as a private garden. Whilst the report has regard to the entire site, and refers to the site as a whole, the issues, opportunities and recommendations are primarily focussed on the City of London Corporation owned area, amounting to 220ha and managed as a freely accessible public open space.

- 1.6 The site is considered to be one of the most outstanding areas of acidic beech forest/beech wood pasture in the UK, and its importance for biodiversity is internationally recognised by its wildlife designations.
- 1.7 Burnham Beeches lies between the M40 to the north, and the M4 to the south, and the associated urban areas of Beaconsfield and Gerrards Cross on the northern M40 corridor, and Slough and Burnham on the southern M4 corridor (Map 1). The location of the site within one local authority administrative boundary, and its part ownership by another presents the first of a multitude of challenges and opportunities for the site, around management and measures to be put in place to conserve its unique and legally protected biodiversity value.

Urban development and Burnham Beeches SAC



Map 1: Location of Burnham Beeches and Surrounding Designated Sites

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2. Designated Wildlife Site Interest

- 2.1 As a key site within the South Buckinghamshire Commons, Burnham Beeches lies in a wider landscape of woodland, wood pasture and heathland mosaic, some of which has the benefit of wildlife designations.

SAC interest

- 2.2 Burnham Beeches is a relatively small European site of just under 383ha in size. The site is an area of old beech wood-pasture, and its European importance is recognised in its designation as a Special Area of Conservation (SAC) under the provisions of the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), which transpose the European Habitats Directive into domestic legislation. The SAC citation refers to the Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) as being the primary reason for site selection, with veteran beech and oak providing epiphytic communities which in turn support a diverse saprophytic invertebrate assemblage.

- 2.3 Over 60 'Red Data Book' species have been recorded at the site, of which the vast majority are invertebrate species, particularly associated with the old beech trees, but also with some associations with the older oaks, and also the heath and mire habitats present within the site. Areas of acidic grassland, mire, dry and wet heath are found beneath the old pollarded trees. These habitats do not form part of the SAC interest features referred to within the citation. However, it is clear that the wider habitats within the site provide supporting habitat for the invertebrate assemblage and contribute to the overall ecological functioning of the site. When assessing potential impacts from plans or projects upon Burnham Beeches SAC, competent authorities should seek advice from Natural England where it is not clear whether potential impacts on the wider ecosystem constitute a likely significant effect upon the SAC.

- 2.4 In accordance with the requirements of the Habitats Directive, Member States must define conservation objectives for each European site, with favourable conservation status being achieved when all conservation objectives are being met. Burnham Beeches SAC has the following conservation objective:

To maintain, in favourable condition, Beech Forests with Ilex and Taxus rich in epiphytes.

- 2.5 From the most recent conditions assessments (see ecological condition below) in 2006, 2008 and 2010 (different SSSI units assessed in different years), Natural England concludes that the site is meeting this conservation objective.

Other designations

- 2.6 The European site designation is underpinned by the nationally designated Burnham Beeches Site of Special Scientific Interest (SSSI), following exactly the same designation boundary. The SSSI, which has been notified since 1951, is divided into

four units. Burnham Beeches has also been declared as a National Nature Reserve by Natural England, in recognition of its outstanding combined value to people, biodiversity and scientific research.

Ecological Condition of the Site

- 2.7 European and nationally designated wildlife sites are regularly monitored by Natural England for their ecological condition. SSSI designations underpin the European site designation, and it is the SSSI unit that forms the basic component of site condition assessment for nationally and European designated sites. For Burnham Beeches, Units 1, 3 and 4 are currently assessed as being in 'favourable condition', whilst Unit 2 is assessed as being in 'unfavourable recovering condition'. Unit 2 is the part of the site in private ownership and here some conifer stands and also a lack of regeneration of beech, and thus a gap in the representation of age classes of trees, and some patchiness in ground vegetation, were noted concerns¹.
- 2.8 Despite the SAC habitat being assessed as being in favourable condition, those involved in the management of the site have highlighted concerns. As discussed in more detail later in this report, despite the dedicated team of staff managing the site, Burnham Beeches appears to have suffered from a level of deterioration in recent years. The increased rate of veteran tree loss is considered to be essentially a result of a lack of appropriate veteran tree management for the last two centuries, but that this may also be being compounded by other issues. In recent years much work has been put in place to create new pollards from young beech stems. Additionally, members of staff involved in the management of the site are also noticing that the young beech trees are showing indications of ill health. Possible impacts are discussed in the next section of this report.
- 2.9 Monitoring habitat health is essential to informing the extent of impacts and mitigation measures required. Burnham Beeches staff undertake detailed surveys of ancient pollards on a 10 year cycle, a less intensive check for management requirements every two years and tree health surveys in both winter and summer, observing features such as canopy, twig structure and leaf growth.

¹ <http://www.natureonthemap.naturalengland.org.uk/map.aspx>

Summary

The Burnham Beeches SAC, according to its most recent SSSI condition assessments in 2006, 2008 and 2010, is meeting its European site conservation objective. It is however apparent that there is a potential issue with insufficient old pollarded trees to succeed the current veterans; and there are indications that the woodland as a whole may be suffering some ill health from various causes.

Further discussions with Natural England are required to establish an understanding of:

- What habitats on site contribute to the favourable conservation status of the SAC interest?
- How critical are indications of ill health in younger woodland to the six year condition assessment?
- Future timings of condition assessments

3. Impacts of Urban Development at Burnham Beeches

Introduction

- 3.1 In this section we consider the impacts of development surrounding Burnham Beeches on the SAC and nature conservation interest of the site, drawing in part on an existing summary (Read 2011) and a range of dedicated studies commissioned at Burnham Beeches.
- 3.2 The ecological evidence base is the foundation on which management and site protection measures need to be built. For many other European sites in the UK, studies have shown clear links between development and the ecological interest features. This has led relevant competent authorities to address the impacts in order to ensure compliance with the Habitat Regulations. Such studies have mainly related to SPA sites; for example the negative relationship between nightjar numbers on heathland patches and the amount of surrounding housing (Liley & Clarke 2003a) was pivotal in underpinning strategic mitigation work relating to the Dorset Heaths. In Breckland the negative relationship between the area of development and the number of nesting stone curlews (Sharp *et al.* 2008a) led Breckland Council and neighbouring authorities to adopt development exclusion zones around the SPA.
- 3.3 With SAC sites, designated for the habitats present, it is much harder to demonstrate a clear relationship with the volume of surrounding housing. In some cases the effects may be seen relatively immediately with vegetation exhibiting obvious signs of wear and tear, or key often sensitive and important species showing declines in populations or reproductive success. This is especially apparent in habitats based on herbaceous or dwarf-shrub vegetation where the impacts, for instance from heavy visitor pressure, can be detected over a short timescale, typically just a few years. However, gradual changes in the amount of development and potential impacts such as veteran tree loss may be impossible to link. Gradual, chronic impacts may go undetected as the trees appear robust and virtually everlasting. Nonetheless such impacts can be every bit as serious in their cumulative impact on the habitat features, not least since the time it will take to replace a mature or veteran tree must be measured in many decades or even a century or more.
- 3.4 There is considerable concern at Burnham Beeches because the number of old trees has declined quite markedly in recent years, especially in the case of oak. Although there is a good supply of young trees, at least in the case of beech, the gap between this young generation and the now relatively small number of ancient trees means that at current rates of loss, there could be a major break in the succession from young to truly ancient specimens. This is serious since there is a concentration of special interest in the old trees, with many notable and scarce species of invertebrates, mosses, lichens and fungi dependent on ancient rather than young or middle-aged trees.

- 3.5 We split this section into impacts relating to access on site (assuming that increased development leads to an increased population in the surrounding area), and ‘off-site’ impacts. We focus on Burnham Beeches and consider the range of impacts in turn. There are more general reviews of the nature conservation impacts of urban development available (e.g. Land Use Consultants 2005; Underhill-Day 2005)

Impacts related to access on-site

Trampling

- 3.6 One of the more obvious signs of the impact of visitors is the amount of bare and trampled ground. Herbaceous vegetation, i.e. grasses and herbs, is in some places worn away and bare, compacted soil is clearly visible. This occurs in obvious pressure points such as gateways and paths but is also apparent around some of the feature trees. Indeed in some of the more readily accessible sites, such as the open wood pasture northwest of Victory Cross, ancient trees are surrounded by a wide halo of bare, hard packed soil. Superficially, unlike the ground vegetation that is quite clearly worn away, the trees may appear not to be affected by this. However, this impression could be misguided as the long-term effect of such compaction close to the trunks of feature trees may be very serious for the health and thus life expectancy of these trees.
- 3.7 Soil compaction, caused by repeated treading and standing around the trunks of the feature trees, starves the tree roots of oxygen as soil particles are pressed together and natural small spaces within the soil are eliminated. Soil micro-organisms, both invertebrates and fungi, will also be adversely affected. Whilst a degree of bare ground is a requirement of many invertebrates, for instance providing the environment for nesting solitary bees and wasps, compacted and constantly trodden soil is not suitable for such species. Adults may be less attracted to lay eggs in loose soil or if larvae do hatch they are more likely to be crushed by trampling. The hard-pressed soil surface also tends to shed water rather than allow natural percolation of rain, again affecting the health of tree roots, especially in times of natural stress such as summer drought. This issue is clearly compounded when the current hydrological status of the site is considered, as discussed below.
- 3.8 For old trees, well past their vigorous growth phase, such effects can easily tip the balance and speed the death of the tree. Paradoxically of course it is just the most vulnerable trees - the very aged and characteristic feature trees, often with hollow trunks and few live branches - which are the subject of such pressure. They are a natural attraction and people want to get up close to the trunks of these veterans, probably not realising the cumulative damage they may be causing.
- 3.9 It appears that trampling and the associated effects are most obvious in the areas close to main access points. Whilst the effects on ancient trees are the most worrying, not least because of the almost irreplaceable nature of these features, trampling is also affecting other habitats. The acid grassland and dwarf-shrub heath, again close to some of the main access routes, are similarly heavily trampled

in places. This reduces the capacity of the herbaceous vegetation to flower, removing a potentially critical nectar source for insects some of which will be key features of the old woodland and trees. Heathers are also very vulnerable to trampling and in conditions of repeated tread will be replaced by grass. This will be further exacerbated by climate change, which may favour grass species rather than heather.

Tree Climbing

- 3.10 A development of the impact of trampling, affecting a sub-set of feature trees of the right character, is the impact of climbing into the branches. This may place additional stress on a veteran tree, in addition to the trampling that is bound to apply. At particular risk from damage due to climbing are any epiphytes growing on the trunk and branches, such as lichens, mosses and fungi. These lower plants have little robustness or resistance to abrasion and can very quickly become degraded or entirely worn off. Some of these plants are themselves rare species that are important features of the SAC habitat.

Dog fouling

- 3.11 Dog fouling is a particular issue on sites that receive high numbers of visits from dog walkers and where the semi-natural vegetation communities are vulnerable to nutrient inputs. It has been estimated that some 33 tonnes of faeces and 1650 litres of urine may be left on site each year (Barnard 2003). Some of the faeces will be picked up and binned (not of course the urine) but generally many more dog walkers claim to pick up after their dogs than is actually the case. There may have been some improvement in dog walkers' behaviour, following a concerted campaign to encourage picking up, but it is all too readily apparent that many dog owners still do not do so.
- 3.12 In common with most semi-natural ecosystems of high nature conservation value, Burnham Beeches is of naturally low nutrient status and the site's key features, being the acidophilous beech forest and the heath and mire, have survived in part due to the low fertility soils. The addition of high levels of phosphorus and nitrogen in dog faeces and urine could be contributing to a decline in the health and ultimately the survival of the veteran trees. This is especially so in combination with the background stresses of climate change and increased drought.

Disease Spread

- 3.13 In addition to the introduction of non-native plants and animals (see below) there is the threat of diseases, both arriving at and being spread within the site. More worrying and far harder to deal with than the usual alien species is the spread of microbial pathogens such as fungal diseases, the first sign of which may be the death of the host species.
- 3.14 The fungal pathogens, *Phytophthora* spp are known to be responsible for tree deaths throughout the world (Brasier, Cooke, & Duncan 1999; Grünwald *et al.* 2008) and can also affect a wide range of woody shrubs including heathland dwarf shrubs (Beales *et al.* 2010). These pathogens may be inadvertently transported by people

or dogs (DEFRA 2008). Studies in the U.S. have found that *P. ramorum* more commonly occurred in soils on heavily used tracks compared to soil from adjacent areas off trails. Human-induced dispersal occurred within already infected areas and into areas lacking local sources of inoculum (Hall Cushman & Meentemeyer 2008) and soil on car tyres, the feet of animals and hikers' boots have been implicated in the spread of the pathogen (Tjosvold *et al.* 2002).

- 3.15 The high levels of visitor numbers to Burnham Beeches and the high proportion of visitors accompanied by dogs adds to this threat, not least since dogs are often off lead and more likely to roam more widely from the paths, increasing the risk of casual spread of any pathogen present.

Disturbance

- 3.16 The faunal elements of the Burnham Beeches ecosystem are essential for its continued ecological functioning. Disturbance can be defined as the influence on an animal's behaviour or survival, caused by human activity or the presence of humans in the environment. There is a wide variety of studies which review disturbance effects, principally on birds (Hockin *et al.* 1992; Hill *et al.* 1997; Carney & Sydeman 1999; Nisbet 2000; Saunders *et al.* 2000; Woodfield & Langston 2004; Lowen *et al.* 2008). 'Flightier' bird species are those that are declining across Europe (Møller 2008) and seem less able to colonise urban environments (Møller 2010).

- 3.17 It is felt that some of the scarcer bird species could be expected to return to Burnham Beeches now that management has restored suitable habitat, but current levels of disturbance prevent this. Suitable habitat certainly exists for species such as nightjar, known to be vulnerable to disturbance (Murison 2002; Liley & Clarke 2003b). There may even be a deleterious effect on commoner woodland birds, again by the very frequent presence of dogs.

- 3.18 Disturbance, albeit unintended, from the large number of visitors can also impact on grazing animals and thus influence the effectiveness of habitat management from livestock grazing. It is observed that cattle and ponies tend to avoid people and move to the more remote parts of the site, especially on days when visitor numbers are high. An increasingly urban-based visitor pool is more likely to be dissociated from countryside management practices such as the need for grazing or the need to remove, manage or control certain species.

Alien Species

- 3.19 The deliberate or casual introduction into the wild of alien species is a frequent occurrence in the countryside. It is especially problematic in sites of high nature conservation value and where the introduced species are highly competitive and thus potentially damaging to the key habitats and native species composition. The dumping of garden waste with higher plant fragments that may become established, and the emptying of aquaria or the result of pond clearances with both animal and plant material, are obvious examples of the source of some introductions.

- 3.20 Frequent checks on known ‘hotspots’ for garden refuse dumping may reveal potential alien plants and enable their eradication before problems ensue but the bigger threat comes from species that can disperse or spread rapidly before becoming obvious. In wet habitats such as ponds and mires the establishment of discarded pondweeds is a real threat. One of the worst offenders is Australian swamp-cress *Crassula helmsii*. It can be distributed by small fragments carried by animals and birds or on footwear and once present in a habitat is all but impossible to remove without drastic and damaging (and expensive) intervention.

Litter/fly-tipping

- 3.21 While the casual or inadvertent introduction of plant or animal material may be seen (wrongly) as harmless, there can be no such excuse for deliberate dumping of litter or fly-tipping. Such impacts on the site increase with increasing urbanisation of the surrounding area, and range from the thoughtless dropping of paper, cans and bottles to the more intentional dumping of bulkier waste. The latter usually occurs where there is easy and relatively unobserved vehicle access, such as at roadside or car parks at quiet times.
- 3.22 The discarding of food items also risks enhancing numbers of opportunist species like foxes, crows and magpies that will not be entirely supported by waste food but exert an increased predation rate on smaller birds and mammals

Vandalism

- 3.23 Ever-increasing urbanisation of the context of Burnham Beeches, as with other adverse impacts like fly-tipping, is likely to lead to higher levels of vandalism especially perhaps from elements of the population unconnected with the countryside. Damage to site infrastructure such as fences, signs and gates is not infrequent on more ‘urban’ sites and, even if it does not cause more serious harm, such as escape of livestock, is costly in time and resources to make good.
- 3.24 Vandalism on the trees themselves does currently occur, though at a low level and the visible graffiti would indicate has been happening for many years (see Figure 1)

Fire

- 3.25 Various studies have linked the incidence of fire with areas used by the public (e.g. Kirby & Tantram 1999). On heathland or moorland sites with public access a very high proportion of unplanned fires occurs close to public roads, paths or other access points.
- 3.26 Though less vulnerable than some habitats of high nature conservation value, Burnham Beeches is at threat from fire, either accidental or more likely deliberate. Such risk is again increased with the effects of climate change and longer or more frequent periods of drought. Features like the dwarf-shrub heath, junipers and dead wood are especially vulnerable and damage to any of these very limited resources could result in long-term or even permanent adverse impacts. Old trees can be particularly harmed by fire as the often hollow trunks function as chimneys. Moreover, beech trees do not tend to recover from fire damage.

Other Impacts (predominantly “off-site”)

Hydrological issues

- 3.27 There are two areas of concern with regard to water provision within the SAC: Surface water supply to the streams; and ground water levels, particularly in relation to the veteran trees.
- 3.28 There are two catchments serving the Nile and the Withy streams within the Burnham Beeches SAC, both of which are among the minor water-courses classified within the Thames Basin Catchment as the Twyford Tertiaries. The Withy Stream flows through a heathland mire and serves three ponds, two probably artificial and one natural in origin.
- 3.29 It is understood that the quantity of water flowing down the Withy Stream has significantly reduced in volume since the 1960’s due to diversion of water into a combined drainage system resulting from the installation of a new sewerage system (Read 2011). A report by hydrological specialists (Evans & Day 2011) noted the following; that there was no clear groundwater influence on the ponds within the course of the Withy Stream; that there had been a reduction of 24% in the catchment of the Middle Pond due to the installation of the combined drainage scheme and upstream urbanisation; and that an estimate of the annual water balance showed that annual run-off was five times total annual evapo-transpiration, leading to the possibility of the edges of the mire drying out in summer. Haycocks also installed six dip-wells in the Withy Stream mire and recommended that these should be monitored on a monthly basis, and this is in place.
- 3.30 They recommended that a collaborative approach between the City of London Corporation managers of Burnham Beeches and South Buckinghamshire District Council be put in place to ensure that the flows feeding the water features on the site are appropriately protected and conserved. This includes ensuring that no further surface water goes to combined drainage systems, that there is no further reduction in the catchment area for surface water feeding the mires and ponds, and that the City of London monitors proposed developments within a defined catchment area (defined by OS contours) to the east of the site.
- 3.31 Whilst the South Buckinghamshire District Council Core Strategy recognises the need to maintain and enhance water resources and quality in the District as a policy, there is no specific recognition of the need to maintain surface water flows to the Withy catchment, particularly by avoidance of reductions in the catchment area.
- 3.32 The Core Strategy (Anon 2011) notes that “Wilton Park lies ‘upstream’ from Burnham Beeches Special Area of Conservation (SAC), meaning that groundwater from Wilton Park has a hydrological connection to the system of streams and springs at Burnham Beeches. In preparing a Development Brief and any subsequent planning application, developers must demonstrate that any scheme would have no detrimental impact on the quality or quantity of ground and surface water resources at the SAC.” This implies that a baseline exists for water quality and quantity against

which any changes could be measured. Moreover, though on higher ground, Wilton Park is some 5-6km from the site and the origin of water to Burnham Beeches is not conclusively known.

- 3.33 A detailed description of the geology and groundwater is given in Evans & Day (2011) and is briefly summarised here. In relation to groundwater, the geology of the catchment is complex with sands, silts and clays of the Woolwich and Reading Beds underlying the drift deposits of Winter Gravels which are the predominant superficial geology on the site. The different underlying geological layers beneath the site and the majority of the catchment, together with the London Clays underlying the upper part of the catchment, tilt predominantly towards the south-west. Beneath the Beds and Clays, the chalk aquifer may also be having an impact of the local groundwater.
- 3.34 Evans and Day (2011) also analysed the borehole logs from eight boreholes in the south-east of the site. The boreholes ranged from 7-10m in depth and penetrated sands and silts with little evidence of chalk. The profiles suggested a perched aquifer. They also analysed some data on water levels in the boreholes from Sept 1993 and May 2001 and found that that the pattern suggested a slow deep groundwater recharge, typical of chalk aquifers; and the water table was closest to the surface in the north-east and furthest in the south-west in September. The pattern of borehole water table levels showed a distinct 8-9 year oscillation over 21 years with the lowest levels in 1989/90, 1996/97 and 2005/6. This pattern suggests that water tables levels could be lower in 2013/14. In addition, the Environment Agency monitors a bore hole north-east of Burnham Beeches at Yew Tree Tower (T. Rolls pers. comm.).
- 3.35 The Environment Agency's assessment of ground water quantity and quality² gives the current quantitative quality as poor, and chemical quality as good, with the predictions for 2015 for quantitative quality also as poor and chemical as good except for a small area to the south-east as poor. There is no explanation for this change in chemical status for this small area.
- 3.36 The situation with respect to water abstraction in the area is contained within the Catchment Abstraction Management Strategy (CAMS) prepared by the Environment Agency. The CAMS covering the Burnham Beeches site is the Maidenhead to Sunbury CAMS. There are currently 89 ground water abstraction licences in the area of which 53% are for the public water supply.
- 3.37 The Maidenhead and Sunbury CAMS is to be incorporated into the Thames Corridor CAMS and effectively the surface water Resource Availability Status over the whole area is now classified as 'no water available'. Any applications for ground water abstraction will only be issued subject to having no effect on surface water flows and

² <http://www.environment-agency.gov.uk/homeandleisure/37793.aspx>

are likely to have some form of seasonal or level restriction reflecting the 'no water available' status.

- 3.38 Designated sites are not covered by the Maidenhead to Sunbury CAMS, which is concerned only with water resources and licensing, and although the Thames Corridor CAMS mentions a number of SACs by name, Burnham Beeches has not yet been included.
- 3.39 The Water Framework Directive specifies that areas requiring special protection under other EC Directives, and waters used for the abstraction of drinking water, are identified as protected areas. Article 6 requires Member States to establish a register of protected areas which include areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites.
- 3.40 However, the Natura 2000 sites which are included for this purpose are only those that have been classified as water dependent. In England, SACs which have been identified wholly or partly as water-dependent under Article 6 of the Water Framework Directive include rivers, lakes, canals, estuaries and coastal waters, as well as wetlands (bogs, fens and grazing marshes) which do not qualify as 'water bodies'. Burnham Beeches has not been classified as water dependent and therefore does not come within the protected sites category in Article 6 of the Water Framework Directive.

Air Quality

- 3.41 An examination of the APIS³ data for Burnham Beeches, shows that acid deposition is slightly above, and nutrient N deposition is substantially above, the critical load. Ammonia concentrations and ozone exposure are both slightly above minimum critical levels and exposures respectively, while NoX (as NO₂) and sulphur dioxide are below critical levels (Table 1). The main problems therefore appear to be from N and acid depositions, ammonia concentrations and ozone exposure.
- 3.42 Acid depositions are caused by a mix of air pollutants that lead to the acidification of soils and freshwaters with the main contributing pollutants being SO₂, NO_x and NH₃. Low pH levels can lead to foliage damage and changes to seed production, viability and germination. Particularly at risk are bryophytes and lichens.

³ Air Pollution Information System- <http://www.apis.ac.uk/>

Table 1: Critical loads and levels for Acid acidophilous beechwood with Ilex, and levels recorded for Burnham Beeches by the Air Pollution Information System-APIS

Pollutant	Critical Load	Critical level	Concentration at Burnham Beeches	Exceedance
Acid deposition	1.71 CLmin N			
N deposition	10-20 Kg/N/ha/yr*		35.36	15.36-25.36
Ammonia		1.0-3.0 µg m-3	1.07 µg m-3	0.07 to -1.93µg m-3
NO _x (as NO ₂)		30 µg NO _x m-3	25.18 µg NO _x m-3	
Ozone		5000pbb hours	5206.3 pbb hours	206.3 pbb hours
Sulphur Dioxide		10 µg m-3**	1.42 µg m-3	

*Critical levels for acidophilous oak woods and epiphytic lichens are 10-15 kg/N/ha/yr

** Critical level for lichens

- 3.43 Nitrogen depositions derive mainly from nitrogen oxides NO_x and ammonia NH₃. NO_x is primarily emitted from road traffic, power stations and industrial and domestic combustion processes, and NH₃ from intensive agriculture. Nitrogen deposition can cause increased acidification of soils particularly already acid soils with minimal buffering. Communities rich in bryophytes are most at risk but inputs of atmospheric N can also lead to an increased risk of damage from drought or frost, increased damage from pests and disease where there are increased N concentrations in foliage, damage to below ground ecto-mycorrhiza communities and decomposer populations.
- 3.44 Ozone concentrations in the troposphere (lower atmosphere) have doubled since the beginning of the last century. They are emitted from road, sea and rail transport, power stations, industry and agriculture, and higher exposures can lead to altered species composition of semi-natural communities and foliage damage.
- 3.45 Sulphur dioxide deposition mostly derives from electricity generation industry and domestic fuel consumption. Levels have generally been falling although some SO₂ can be transported long distances in the atmosphere. Bryophytes and lichens are particularly susceptible to high levels of SO₂ but generally levels are now too low to cause plant damage.
- 3.46 Burnham Beeches is part of the developing Environmental Change Biodiversity Network (ECBN) where aspects of air pollution will be monitored together with

aspects of biodiversity, such as vegetation composition and populations of selected animal groups. Some ongoing monitoring is now in place (Read 2011).

- 3.47 Dust particles can also cause problems for vegetation and at Burnham Beeches the main source of dust particles is from the nearby East Burnham Quarry which is not operating at present but is likely to re-open in 2012 (Read 2011). Dust can cause localised damage to vegetation by covering leaves, blocking pores and inhibiting photosynthesis, can be particularly damaging to lichens and other epiphytes and can affect invertebrate communities. Where the origins of the dust are from a different pH environment it can increase acidity or alkalinity of soils.
- 3.48 There have been several reports and investigations into aspects of air pollution threats to Burnham Beeches going back to the 1990s. In 2004, Atkins (2004) produced a multifunctional in-combination assessment for Burnham Beeches which included details, summary and recommendations on air pollution.
- 3.49 Atkins examined the potential for damaging impacts from particulates, NO_x, SO₂, volatile organic carbons and heavy metals and looked at the local sources for these and their likely spread, using nationally derived figures for travel distances and information on local wind direction.
- 3.50 It concluded that:
- 3.51 *“It has been shown that there are no significant in combination additive effects from EA consents with respect to VOCs, NO_x, SO₂, heavy metals or particulate releases. Synergistic effects however, have been harder to assess. Further data on ozone and acid deposition (particularly ammonia) are required to assess whether critical levels are exceeded. However, from the arguments presented above, it appears that Environment Agency permissions could make only a very minor contribution to any synergistic effects. Recent correspondence with English Nature (pers. comm. March 2003) confirmed that Burnham Beeches cSAC remains in a favourable condition. Results from the lichen monitoring programme at Burnham Beeches suggest that there has been an increase in abundance and diversity of lichens in response to decreasing SO₂ levels. However, an increased abundance of nitrophilous species has been detected. This appears to be as a direct consequence of the new pollution climate in which traffic emissions (NO_x and particulates) predominate (NHM, 2001)”.*
- 3.52 There are potential problems with this report if used as a guide to the general effects of air pollution on Burnham Beeches. The report was commissioned only to look at EA consented emissions and was not required to investigate details of other sources (traffic emission for example), there was a reliance on wind direction and the likelihood that emissions from different sources would not impact Burnham Beeches at the same time, and the critical loads were reliant on those published by APIS for broadleaved woodland, not the lichen community associated with the woodland where critical load levels are lower (although the report recognised this point).

Critical loads for epiphytic lichen communities are now set at 10-15 kg N ha/yr and for SO₂ at 20(Hall, Bealey, & Wadsworth 2006).

- 3.53 Following this report a further report was commissioned (Scriven 2006). This reported the impacts of the NO_x, NH₃, SO₂ and particulates, their critical levels (although this did not take account of critical levels for N on epiphytic lichens) and data from monitoring at Burnham Beeches. The report concluded that there were concerns over higher NO_x levels at site 2, with the possibility that this could be impacted by the Slough Heat and Power (SHP) plant in winter, and that there were seasonal peaks in ammonia, possibly caused by local agricultural operations. Site 2 also raised concerns over SO₂ peaks, but dust levels over the previous 12 years were not a cause for concern. Scriven recommended that an additional monitoring point be set up for NO_x and SO₂, that local agricultural operators be contacted to discuss working practices, and that the then existing monitoring programmes be continued and where applicable re-established.
- 3.54 Scriven also reported on the traffic data from count points at three locations around Burnham Beeches which had been operating since 1995 and had shown an overall increase of 6.6% annualised to 0.64%. He noted that the fluctuations in NO_x and SO₂ did not correlate with the relatively stable traffic figures and suggested that this supported the view that such peaks were due to the SHP plant.
- 3.55 A later summary of traffic data by Jacobs (2009) noted that the increase in traffic since 1995 was 9.9% (0.73 compounded pa) with an increase during 2005-2007 of 4.3% and an decline of 0.1% in 2008. On the A355, traffic flows had decreased by 2.4% between 1995-2007 with traffic levels relatively stable to 2009 (UE Associates Ltd 2010).
- 3.56 As noted above, Burnham Beeches has recently been incorporated into the Environmental Change Network, which has funding from Natural England for limited monitoring. The monitoring systems presently in place at Burnham Beeches are (Read 2011):
- Ammonia is being monitored under the ECN
 - Buckinghamshire CC monitors nitrogen levels (diffusion tubes) at five sites within Burnham Beeches, though this may not continue in the long term
 - Dust monitoring was carried out between 1996 and 2011 and it is the intention of Burnham Beeches staff to recommence this if/when the quarry re-opens
 - Traffic levels on the roads around Burnham Beeches has been monitored since 1995

Deterioration of surrounding countryside, fragmentation and loss of large gardens

- 3.57 Reduction in previously undeveloped land, both immediately surrounding Burnham Beeches and in the wider area, removes supporting habitat for the Burnham Beeches ecosystem. A wider network of agricultural land, gardens and greenspaces provides opportunities for wildlife to forage, commute and breed, and also facilitates the expansion of ranges when populations increase, conversely providing additional reserves when populations decline. The residential area in close proximity to Burnham Beeches has traditionally included expansive gardens providing valuable supporting habitat, yet in recent years there has been a loss of these garden refuges to development.
- 3.58 An additional indirect effect of urbanisation in close proximity to Burnham Beeches, and reduction in surrounding green-field land is the change in visitor perception. If the site is increasingly becoming a doorstep urban greenspace, in easy walking distance from new homes, its use will be exactly that; a daily greenspace for daily activities such as morning dog walking. Burnham Beeches should be seen as a 'destination,' where visits are made to specifically see and enjoy its special and exceptional qualities, with daily greenspace use directed to other off-site locations.

Cat predation

- 3.59 Information on ranging behaviour of domestic cats and the use of semi-natural habitats by domestic cats remains relatively limited and we are not aware of specific studies relating to Burnham Beeches. General studies indicate that cat predation can have marked impact on bird population sizes (Beckerman, Boots, & Gaston 2007). The only publication that sets out to determine how large a cat exclusion zone should be around sites is Metsers *et al.* (2010) who used GPS tracking data from 38 different cats in New Zealand to look at maximum distances travelled. The results of the study indicate that zones need to be 2.4km in rural areas and around half that distance in urban-fringe locations.

Other Impacts

- 3.60 Other urban impacts, relevant to Burnham Beeches could include direct casualties from road collisions, light pollution, noise pollution and changing public perceptions of the site as an urban greenspace rather than an internationally important wildlife site.

Summary

Urban development has the potential to impact the nature conservation interest at Burnham Beeches in a variety of ways. We highlight the following:

- Increased access resulting in increases in:
 - Trampling and soil compaction
 - Climbing of veteran trees
 - Dog fouling
 - Disease spread
 - Disturbance (not particularly relevant to SAC interest features)
 - Introduction/spread of alien species
 - Litter/fly-tipping
 - Vandalism
 - Fire incidence
- Reduction in water levels/supply
- Reduction in air quality
- Increased fragmentation and isolation of the site
- Increase in cats visiting the site (not particularly relevant to SAC interest features)

The long-term effects of these impacts, operating together, are difficult to assess. It is clear that synergistically they will result in increased habitat stress and in combination with other pressures on the site (such as from climate change) are likely to have long term consequences. There is considerable concern at Burnham Beeches because the number of old/veteran trees has declined quite markedly in recent years.



Figure 1: Selection of images from Burnham Beeches. Top left: Beech Pollard. Top right: example of graffiti damage on trunk of beech. Centre: children playing in vicinity of veteran trees. Note the children going inside the trees and the bare trampled ground in the foreground. Lower two images: example of signs relating to access management within the site.

4. Current Visitor Management Measures

- 4.1 In recent years, the City of London Corporation has put in place a number of measures to manage visitor use of the site and influence how visitors move within the site and how they behave. In this section we briefly summarise these measures.
- 4.2 A two-phased approach to preventing car access through the site has been implemented which is perhaps the most notable change in recent years and has had a dramatic effect upon vehicle presence within the heart of the SAC. Initially a car-free zone was created in the northern part of the site in 2000, and then the western end of Lord Mayor's Drive was closed in 2007. In total three car parks have been closed (Pumpkin Hill, Park Lane and Egypt Lane) and roadside parking has been restricted on the roads around the site. Signposts clearly indicate no parking at gateways etc. (see Figure 1) and ditches/banks/posts prevent vehicles parking along roads. This serves to further concentrate access around the main car parks, facilitating management of visitor flows.
- 4.3 The main visitor facilities have now been relocated to the eastern part of Lord Mayor's Drive, adjacent to East Burnham Common, providing a central focus of activity slightly away from sensitive SAC features. The site now incorporates a new visitor information point and cafe with toilet facilities, all of which was built in September 2007, using green oak and resource efficient features, along with a green roof. This is located relatively close to the main site entrance along Lord Mayor's Drive, purposefully situated next to East Burnham Common. The added benefit of the open grassland area of the common immediately adjacent to the parking area, cafe and toilets is that family groups can spend time on the common, where there is ample space for children to play and dogs to roam. This is likely to have redirected a proportion of the visitor pressure away from the beech woodland.
- 4.4 The main car-park near the visitor centre has a series of bays and a looped section, with the options to close gates ensuring parking is close to the visitor centre and facilitating the better management of parking. Car-park charges have been introduced, with ticket machines and the requirement to pay for parking at the busier times, at weekends and bank holidays. Outside these times parking charges are not compulsory, but visitors are encouraged to pay to park and a series of information boards explain about the parking charges. This system serves to potentially encourage people not to visit at the busier times and also, perhaps crucially, makes it clear to visitors they are visiting somewhere special where there are costs involved in management and maintenance. This helps to convey to visitors that Burnham Beeches is more than a local greenspace or park.
- 4.5 Under the City of London (Open Spaces) Act 1878, full and open access on foot is allowed to all areas of Burnham Beeches. This means that there is no requirement to stay to footpaths, as access is permitted across the 220ha part of the site owned by the City of London Corporation. Use of footpaths is however actively

encouraged, with surfaced paths provided and low key signage around the site. Burnham Beeches also links into two long distance walks 'Beeches Way' and 'Shakespeare Way.' Access in the private estate part of the site is restricted to the small number of public footpaths there.

- 4.6 With respect to dog fouling and other dog issues there is a dedicated code of conduct for dog owners, which is in the form of a concise leaflet available around the site and on-line. There are dog bins and bags provided at all the main entrances and signage around the site clearly explains why fouling is an issue. Site bylaws require dogs to be under effective control (clearly defined as within sight of the owner), not to chase wildlife and wearing a collar and tag.
- 4.7 There is a series of leaflets and other excellent interpretation material that provides visitors with information about the site, highlighting the importance of the site for nature conservation and ensuring visitors are aware of the sensitivities of the site.
- 4.8 Site staff regularly spend time on site, and their presence helps to influence how people behave. Directly approaching individuals – for example those whose dogs are not under control – helps ensure regular visitors know how to act responsibly and creates a dialogue between visitors. Events and consultation days also help to communicate messages to local people and visitors.
- 4.9 Within the site certain routes are promoted through maps and signage and at least one path, a boardwalk through the mire, is seasonally closed to limit disturbance at the sensitive times of year (see Figure 1).
- 4.10 Several treatments have been used to reduce the impacts of trampling, especially around some of the feature trees. Fencing around a tree, such as in the case of Druids Oak, largely prevents all access to a zone of a few metres around the trunk but this is probably not a technique that could be applied very widely, both for reasons of cost and landscape. It largely works for one or two notable trees but might be less effective or ignored if used extensively. Within the fenced zone scrub of bramble and holly can become dense and this is not necessarily good for the tree and/or dependent species such as invertebrates or lichens that often require open, warm or sunlit trunks.
- 4.11 Placing cut branches on the ground in a halo around key trees is frequently undertaken in parts of the site. It can effect a similar reduction in access to the trunk, but generally is not so exclusive of people. The branches in time allow bramble to grow which itself forms the barrier. This is a less obvious and obtrusive way reducing trampling near the feature tree and is much cheaper, but the effect may not be so long lasting or so complete as with fencing. Application of mulch around some tree bases has also been tried, to deter or soften the effects of trampling. It is felt this may have a more beneficial effect on the relevant trees but the mulch is vulnerable to being dispersed, so needs to be frequently replaced or re-positioned.

- 4.12 A fire action plan is in place and clearly sets out, for site based staff, how they should respond and deal with any fire incidents, how such incidents are recorded and also how to work with the fire brigade in case of a fire. The fire brigade are aware of the fire fighting equipment stored at Burnham Beeches and a grid map is held which allows rangers to accurately report fires.

Summary

The team of staff managing the Burnham Beeches site has, in the last decade, put in place significant measures to manage visitor use of the site. In many ways the management of the access at Burnham Beeches is exemplary and serves as a potential model to other sites. The closure and redirection of parking appears to have been particularly successful. The various measures have been carefully planned, resourced and implemented over a long time period in response to the visitor pressure and sensitivities on the site. Access on the site and the visitor experience has been enhanced while also serving to reduce the impacts of visitors. In many ways most of the options for limiting visitor impacts on-site (measures adopted elsewhere as mitigation measures, funded by developer contributions) have already been implemented, and hence there is a need to look more widely at measures to reduce visitor pressure and other urban impacts.

5. Current Levels of Recreation Use and Visitor Survey Work

- 5.1 Burnham Beeches is a very attractive and well known greenspace, providing high quality visitor facilities, beautiful scenery and a ‘close to nature’ visitor experience.
- 5.2 Two visitor surveys have been undertaken in recent years involving direct counts of visitors and analysing data from automated counters (Wheater & Cook 2003, 2012). These surveys cover the City of London Corporation owned area only. The 2002/3 visitor survey identifies an estimated 560,000 visitors per year, which increases to around 585,000 (accompanied by c.215, 000 dogs) in 2010/11. This represents an increase of towards 3,000 additional visitors, year-on-year between the two surveys, and shows that visitor numbers have not decreased, even with changes to the site (three car-park closures and implementation of parking charges at weekends/bank holidays).
- 5.3 The visitor surveys focus on counts and estimates of visitor numbers. It is rare to have such robust assessments of visitor numbers to a site, with the data from automated counters carefully calibrated and scaled up to derive total visitor estimates.
- 5.4 Additional information on visitor use comes from public consultation (Wheater 2009). The last event, in 2009, used a marquee near the main car-park and visitors were asked to complete questionnaires relating to perceptions of the site, views about management and in addition questions also covered how people access the site.
- 5.5 The results of the visitor studies indicate that car travel is the most important route to the site (56% of all visits). The majority of visitors (70%) come to walk, many (29% of respondents) with a dog. Cycling is not an insignificant mode of transport for either adults (4%) or children (nearly 5%) and both cycling and running are undertaken on site by many visitors.
- 5.6 It is interesting to note that according to the Management Plan consultation, 38% of visitors come to Burnham Beeches at least twice per week. Based on the sample questioned, it could therefore be suggested that at least 38% of visitors are using the site to meet their local regular greenspace needs, rather than seeing the site as a visitor ‘destination.’
- 5.7 There is relatively little information on where visitors actually travel from, and this link between housing and access patterns is a clear gap in our understanding. One question from the public consultation asked how far people travelled and this revealed that the majority (66%) lived within 5 miles, with peaks below 1 mile and between 3 and 5 miles. This was reasonably consistent across the days surveyed, although a higher proportion came from further afield on weekend afternoons. These results suggest that most access is relatively local, but it would be useful to know more precise information on where different users actually travelled from.

Such information has been pivotal in underpinning strategic mitigation in other areas such as the Thames Basin Heaths (Liley, Jackson, & Underhill-Day 2006b).

- 5.8 Some postcode data was available from 1999, and despite being very dated we have plotted these within the GIS (Map 2). A total of 344 postcodes were provided by Burnham Beeches staff and of these, 301 were successfully geo-coded. The 43 that could not be mapped were predominantly postcode stems rather than whole postcodes. Given the age of the data there is little merit in doing any detailed analysis, but the results are useful in providing an indication of where people travel from. A total of 130 (i.e. 43% of geo-coded postcodes) fell within 1km of the SAC boundary and a further 41% came from within 5km. Just over two-thirds of visitors originated from South Bucks District (Table 2).

Table 2: Local planning authorities and number of postcodes. Data from 1999 and therefore dated.

District/Borough	Number (%) of postcodes
South Bucks District	208 (69)
Slough (B)	44 (15)
Wycombe District	16 (5)
Windsor and Maidenhead	14 (5)
Ealing London	7 (2)
Chiltern District	7 (2)
Hillingdon London	2 (1)
Runnymede District	1 (0)
Bracknell Forest	1 (0)
Wokingham	1 (0)
Total	301 (100)

- 5.9 Use of the site as local greenspace is likely to increase, as new growth comes forward in accordance with the housing allocations in the South Bucks Core Strategy and those for surrounding districts. This is discussed in more detail in subsequent sections. If pressure from increased growth is to be mitigated, the distance to the site from which that potential impact is coming is an essential piece of information to determine which development needs to ensure that it adequately mitigates for its potential impact.
- 5.10 Another gap in our understanding in relation to access on the site is how people distribute within the site and how this relates to the interest features of the site. Maps showing the spatial distribution of visitors within sites, either modelled or using real data (e.g. from GPS units or direct interviews) have proved useful at other sites in understanding links between access patterns and impacts of access (e.g. Sharp, Lowen, & Liley 2008; Clarke, Sharp, & Liley 2010; Cruickshanks, Liley, & Hoskin 2010; Lake 2010). At Burnham Beeches it would be useful to be able to map visitor pressure within the site and consider this in relation to ecological/impact data such as soil compaction or tree deaths.

Summary

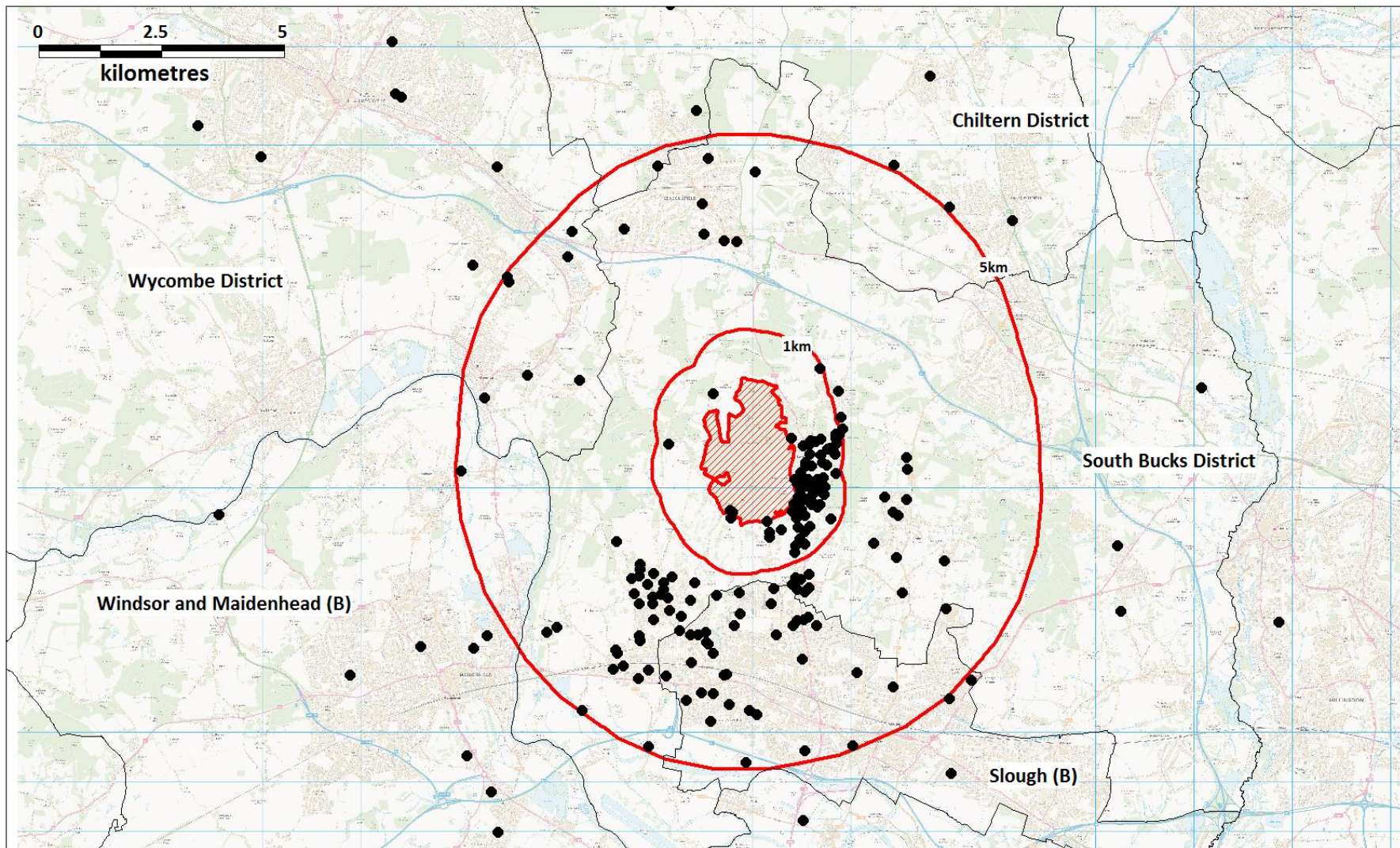
Burnham Beeches site is in multiple ownership and includes some 220ha of public open space, with the remaining c.160ha being mainly in private ownership. The key SAC features, and also the most sensitive – the ancient pollards – are restricted to the area with public access. This publicly accessible area of Burnham Beeches provides an excellent greenspace resource and current estimates are of 585,000 visitors per annum, with some 215,000 dogs.

Car travel is the most important route to the site (56% of all visits). The majority of visitors (70%) come to walk, many (29%) with a dog. In total some 215, 000 visits with dogs take place per year. Cycling is not an insignificant mode of transport for either adults (4%) or children (nearly 5%) and both cycling and running are undertaken on site by many visitors. From the visitor information available at present, it is apparent that 66% of visitors live within 5 miles of the site, and that 38% of visitors come to Burnham beeches at least twice per week.

Two gaps in our current understanding of access patterns are:

- 1) Better data on the home postcodes of visitors, which would provide a more detailed assessment of where visitors come from;
- 2) data on where people go within the site and how access pressure is spread within the site. This would be useful to link to ecological data/impacts such as soil compaction, tree deaths etc.

Urban development and Burnham Beeches SAC



Map 2: Visitor Postcodes (from 1999) and District Boundaries

Contains Ordnance Survey data © Crown copyright and database right 2012

● Home postcodes of visitors (data from 1999)	□ District boundaries
□ 1 & 5km buffers around SAC	▨ Burnham Beeches SAC

6. Comparison with other European Sites

- 6.1 In this section we consider how the impacts of urban development have been addressed at other European sites and we consider the implications for Burnham Beeches.
- 6.2 The Habitats Regulations were amended in 2007 (and now consolidated into the 2010 Regulations) to properly reflect the Habitats Directive in the need to assess the implications of land use plans for European sites, in light of their conservation objectives, in the same way that such assessment is required for projects and all other types of plan. Previous failure to fully transpose the requirements with regard to land use plans was recognised by the European Court of Justice’s ruling in 2005, and since that date, formally rectified by the amendments to the Habitats Regulations. Proper attention has now been given to the potential for land use plans to put in place programmes, allocations and policies that may significantly affect European sites. Habitats Regulations assessments of emerging land use plans have been formally undertaken, removing or modifying potentially damaging elements of plans coming forward.
- 6.3 In recent years, particularly since the establishment of Regional Plans giving a region-wide emphasis to meeting economic and housing needs, the assessment of the allocations, quantum of growth and housing numbers set out within land use plans has emerged as the main element of land use plan HRA work. There has been a steady growth in research and assessment considering the impacts of recreational pressure upon European sites.
- 6.4 Although now abolished, regional plan level HRA lead to a number of successful strategic mitigation strategies, which have been written and agreed at a plan level, often incorporating several local planning authorities working together in a collaborative way. Improvements in the quality and outcomes of land use plan HRAs continues, and the strength of each new strategy to mitigate for potential impacts has in many ways been as a result of the ability to draw on the experience of strategies developed previously, along with an increasingly comprehensive evidence base.

Other European Wildlife Site Strategies to Mitigate for Visitor Impacts

- 6.5 One of the most advanced and large-scale European site mitigation strategies is that applied in the Thames Basin, providing mitigation for the impact of recreational pressure on the Thames Basin Heaths SPA. This was developed alongside a similar scheme for the Dorset Heathlands. Both schemes incorporate a multi LPA partnership, with a co-ordinated contributions tariff, funding pool and mitigation projects to be funded.
- 6.6 For these two heathland strategies in particular, mitigation has included the provision of offsite alternative, natural greenspaces, which attract people away from the sensitive European site habitats and provide a similar recreational experience of

natural habitats, a wilderness feeling and a close proximity to nature. Visitor survey work (Clarke *et al.* 2006; e.g. Liley *et al.* 2006a; b; Liley, Mallord, & Lobley 2006c; Liley, Underhill-Day, & Sharp 2009) has been necessary to understand the visitor requirements and inform the design of these alternative sites, referred to as SANGs (Suitable Alternative Natural Greenspace).

6.7 Besides SANGs a variety of other measures is also included in both areas. In Dorset these have included a wide range of different projects, such as:

- Core funding for a mobile team of wardens, patrolling sites, maintaining an on-site presence and undertaking proactive community work such as schools visits
- Provision of fire breaks, fire hydrants, back-packs and other fire-fighting equipment and enhanced fire access etc. on sites
- Additional dog bins on sites
- Temporary barriers and other infrastructure to help manage access on sites
- Boardwalks and path changes to help divert/redirect people within sites
- Modifications to parking and other infrastructure
- New signs

6.8 The Thames Basin Delivery Framework (Thames Basin Heaths Joint Strategic Partnership Board 2009) was published in 2009 and sets out the recommendations on measures to enable development to take place without a significant effect on the SPA as a whole. By contrast to Dorset, where the local authorities will adopt a joint DPD, in the Thames Basin each local authority will prepare, or has prepared its own individual planning document. There is a larger number of local authorities (some 13) and each of these will refer to the Delivery Framework in the preparation of local or joint mini-plans, DPDs and/or SPDs. Key elements within the Framework are:

- There are two zones: 0-400m (no development) and 400m – 5km (mitigation required through developer contributions), measured ‘as the crow flies’. Large developments beyond the 5km boundary will require individual appropriate assessment.
- The Framework addresses residential (use Class C3) and staff residential (Use Class C1 and C2A) development
- Avoidance measures and mitigation involve a three-pronged approach: SANGs provision, access management and habitat management
- SANGs should be provided by individual local authorities or by groups of local authorities. SANGs can be created through the enhancement of existing sites or the provision of new sites, with 8ha per 1000 residents (calculated using 2.4 residents per household) the required area. SANGs

are recommended to be of at least 2ha in size, and located within a wider open space or network of spaces (although smaller spaces may form part of a wider SANG network). A range of types and sizes of SANG should be provided, offering a range of experiences, including large sites. Guidelines for catchments for different sizes of site are given, for example a SANG of 2-12ha will have a catchment of 2km. Developments of less than 10 dwellings do not need to be within a specified distance of SANG provided that a sufficient quantity and quality of SANG land to cater for the consequent increase in population is identified and available in that district or agreed in an adjoining district, and functional in advance of completion

- Access management should be provided by existing landowners and managers with the funding (for perpetuity) provided through developer contributions. The access management should be coordinated strategically, by Natural England working with the local authority and land managers, in line with an overarching strategy for access management on the SPA and SANGs. The management should focus on soft measures (as opposed to closures and restrictions) and should include a consistent SPA/SANG message.
- Monitoring should take place strategically and address: i) Habitat condition and birds; ii) The provision of SANGs and delivery of dwellings; iii) Access Management; iv) Visitor Surveys.

6.9 From this successful, and at the time innovative and ground breaking approach to European site mitigation, other authorities across the country are gathering information to identify the potential impacts of growth upon European sites, and put in place strategies to prevent those impacts occurring. Strategic, developer-funded European site mitigation schemes are currently either being considered, developed or being put in place for the following European sites or groups of sites: Breckland, New Forest, the River Mease, Poole Harbour, Cannock Chase, Dawlish Warren/Exe Estuary/Pebblebeds, the Solent and Southampton Water/ Chichester Harbour/ Portsmouth and Langstone Harbours, the North Kent Marshes (i.e. The Swale, the Medway, the Thames Estuary and Marshes) and Ashdown Forest. The majority of these sites are SPAs, designated for their bird interest and the impacts of disturbance to the bird interest a key part of the evidence base, and most of the sites are coastal or heathland.

6.10 In the Thames Basin Heaths and Dorset Heaths, a 5km zone was selected for developer contributions as visitor work indicated, for both areas, that most visitors (around 75%) came from within this distance, and it also worked as a pragmatic and practical choice that was easy to apply. The 400m zone was equally a pragmatic choice, reflecting a zone within which it was believed impossible to mitigate the impacts of development, due to the proximity of development to the European Site Boundary. 400m was considered effective in terms of the typical catchment for local visitors walking from home and was also believed an effective distance with respect

to cats. Other sites have applied different zones or approaches. For example Breckland District has established a zone of 1500m around those parts of the Breckland SPA that support stone curlews (an interest feature of the SPA), based on research that has shown that stone curlews occur at lower densities within 1500m of housing (Sharp *et al.* 2008b). Within this zone development is largely excluded and can only take place if it fulfils particular criteria. There is also a 400m zone around those parts of the SPA that support nightjars and woodlarks. This is a 'no development' zone and has been established for the same reasons as in Dorset and the Thames Basin Heaths. The Breckland Core Strategy was subject to various criticisms from developers (promoting sites within the 1500m zone) but has been formally adopted following examination in public.

- 6.11 It can be seen that the various schemes are founded on site-specific information relating to interest feature condition and the nature of the impact, the former being derived from ecological survey work and the latter from visitor/development related survey work. In each case the mitigation schemes provide a range of projects to be funded by developer contributions that relate to the nature of the potential impact. For recreational pressure, there may be a number of on-site measures, and off site measures will feature where they are likely to meet their objectives and are capable of practical implementation.
- 6.12 It should also be noted that in the majority of European site mitigation schemes, whilst visitor survey data is in the main comprehensive, the ecological information is not always complete, and the precautionary principle, as embedded in the Habitats Directive and Habitats Regulations, is applied. For example in the case of stone curlews in the Brecks, while a clear link is shown in relation to housing, we still lack an understanding of what factors underlie the observed pattern, for example whether the avoidance of development relates to noise, lights, presence of people, presence of pets, different land management etc.

Comparison of Burnham Beeches Visitor Pressure Levels with other European Wildlife Sites

- 6.13 To improve our understanding of visitor pressure to Burnham Beeches SAC we considered the number of houses surrounding the site in different buffer zones and compared the volume of housing around Burnham Beeches with other European designated sites which were either geographically near, of similar type (beech woodland), or for which visitor information is easily available. For Burnham Beeches we made the comparisons using two different boundaries: we used the SAC boundary (383 ha) and we also used the boundary representing the Corporation of London managed part of the SAC, where the old trees and the access are concentrated. For all other sites we used the designated site boundary.

- 6.14 The selected sites were buffered at various distance bands using GIS (MapInfo v10) and using data on housing numbers⁴. The number of residential postal delivery points per distance band was extracted.
- 6.15 The results are summarised in Table3. It can be seen that the sites closest to the capital are those with the highest numbers of houses surrounding them. Looking at Burnham Beeches, within 500m of the SAC we estimate there to be approximately 1,200 residential dwellings and within 25km of the site around 1,150,000 residential properties.
- 6.16 Burnham Beeches SAC is a modest sized European site (383ha total area, with public access focused within 200ha). Although there is a relatively low level of housing immediately around the site (within 500m) at the greater distance bands the level of housing is high. For the selected European sites we considered how many houses are present per hectare of each site across the different distance bands. Table 4 shows that for every hectare of Burnham Beeches (using the 200ha area managed by the Corporation of London) there are 241 houses between 1km and 5km from the SAC. This is far higher than the number of houses (in the same distance band) for Windsor Great Park SAC (34) Thames Basin Heaths SPA (27) and Thursley, Ash, Pirbright & Chobham SAC (30).
- 6.17 Visitor work on other European sites such as the Dorset Heaths and Thames Basin Heaths (Clarke *et al.* 2006; Liley *et al.* 2006b) shows that 75% of visitors live within 5km of their visit location and the Management Plan consultation data from Burnham Beeches suggests a similar but slightly lower percentage (66% within 5km). Within a 5km distance band of Burnham Beeches (again using the 200ha part managed by the Corporation of London) there are 50,044 houses which equates to 250 houses per hectare, a value far higher than the other European sites which have strategic on and off-site mitigation strategies (Figure 2).
- 6.18 The numbers of visitors to different European sites and also to a range of other high profile countryside or heritage sites were collated and visitor numbers standardised by site size (Table 3 5Table). While the ways in which visitor numbers are estimated vary markedly across the sites, and considerable caution is required in drawing direct comparisons, the figures are useful in providing some context as to the comparative recreation pressure at the different sites. Per hectare, Burnham Beeches receives a higher number of visitors than Richmond Park, Sherwood Forest, Windsor Great Park, The Thames Basin Heaths, The Dorset Heathlands and The New Forest.

⁴ Derived from Postzon and code point using Royal Mail Postcode Address File and Ordnance Survey open data which maps postcode centres to 1m⁴

- 6.19 In drawing further comparison with other European sites we also highlight that there are no other sizeable areas of open access land or semi-natural habitat within the area bounded by the M4, M40, M25 and A4094. There are two country parks in the east of the area; Black Park Country Park (adjacent to Pinewood Studios) and Langley Park Country Park just south of the A412. This in contrast to areas such as the Dorset Heaths, where a variety of other greenspace sites, including beaches and seafront within Poole and Bournemouth, provides recreation opportunities for local residents.

Urban development and Burnham Beeches SAC

Table 3 Summary of selected SAC and SPA size, perimeter and housing volume within different distance bands. Sites ranked by number of houses within 25km. Note that we show data for the area of SAC that falls within the City of London ownership for Burnham Beeches (200ha) and the whole SAC separately. For all other sites we use the total area of the SAC.

SAC / SPA	Area of site (ha)	Perimeter of site (km)	Total number of houses per buffer distance					
			0-0.5km	0.5km-1km	1km-5km	5km - 10km	10km-25km	Within 25km
Wimbledon Common (SAC)	350	12	9,206	12,849	287,839	706,517	2,245,278	3,261,689
Richmond Park (SAC)	844	16	8,237	16,529	269,374	684,163	2,249,769	3,228,072
Epping Forest (SAC)	1,625	112	32,740	30,672	302,218	651,182	2,118,379	3,135,191
Thames Basin Heaths (SPA)	8,287	328	40,073	43,390	227,062	193,110	1,328,488	1,832,123
Wormley-Hoddesdonpark Woods (SAC)	335	29	481	898	51,508	159,951	1,603,245	1,816,083
Windsor Forest & Great Park (SAC)	1,681	111	2,418	5,555	57,827	180,709	1,185,604	1,432,113
Thursley, Ash, Pirbright & Chobham (SAC)	5,140	185	13,915	13,289	152,033	204,351	954,380	1,337,968
Chilterns Beechwoods (SAC)	1,282	96	2,797	6,662	111,608	194,064	989,522	1,304,653
Burnham Beeches (whole SAC)	383	13	1,233	747	54,736	120,434	983,050	1,160,200
Burnham Beeches (part SAC)	200	8	1,183	728	48,133	118,754	980,912	1,149,710
The New Forest (SAC)	29,177	467	16,423	10,928	87,752	215,654	493,209	823,966
Cannock Chase (SAC)	1,240	49	1,486	2,644	52,937	60,054	641,324	758,445
Ashdown Forest (SPA)	3,197	149	3,285	2,108	23,183	43,235	357,260	429,071
Ashdown Forest (SAC)	2,720	133	3,187	2,166	21,805	43,866	350,603	421,627
Dorset Heaths (SAC)	5,705	500	46,502	36,922	159,736	47,495	127,596	418,251
Dorset Heathlands (SPA)	8,165	618	42,539	35,251	170,521	42,343	127,412	418,066
Dorset Heaths (Purbeck & Wareham) & Studland Dunes (SAC)	2,225	169	1,549	2,284	39,310	104,572	155,578	303,293
Breckland (SPA)	39,284	921	11,843	9,242	34,543	51,144	190,709	297,481
Cotswold Beechwoods (SAC)	588	56	604	290	31,828	116,887	100,797	250,406
Breckland (SAC)	7,515	185	2,492	3,945	31,793	22,767	159,963	220,960

Urban development and Burnham Beeches SAC

Table 4: Summary of selected SAC and SPA size, perimeter with number of houses per hectare of EU site in different distance bands. Sites are ranked according to the number of houses per hectare of site using a 25km buffer around each site. Note that we show data for the area of SAC that falls within the City of London ownership for Burnham Beeches (200ha) and the whole SAC separately. For all other sites we use the total area of the SAC.

SAC / SPA	Area of site (ha)	Perimeter of site (km)	Total number of houses per hectare of site					
			0-0.5km	0.5km-1km	1km-5km	5km - 10km	10km-25km	Within 25km
Wimbledon Common (SAC)	350	12	26	37	822	2017	6410	9311
Burnham Beeches (part SAC)	200	8	6	4	241	594	4905	5,749
Wormley-Hoddesdonpark Woods (SAC)	335	29	1	3	154	477	4780	5415
Richmond Park (SAC)	844	16	10	20	319	811	2666	3825
Burnham Beeches (whole SAC)	383	13	3	2	143	315	2570	3033
Epping Forest (SAC)	1625	112	20	19	186	401	1303	1929
Chilterns Beechwoods (SAC)	1282	96	2	5	87	151	772	1018
Windsor Forest & Great Park (SAC)	1681	111	1	3	34	108	705	852
Cannock Chase (SAC)	1240	49	1	2	43	48	517	611
Cotswold Beechwoods (SAC)	588	56	1	0	54	199	172	426
Thursley, Ash, Pirbright & Chobham (SAC)	5140	185	3	3	30	40	186	260
Thames Basin Heaths (SPA)	8287	328	5	5	27	23	160	221
Ashdown Forest (SAC)	2720	133	1	1	8	16	129	155
Dorset Heaths (Purbeck & Wareham) & Studland Dunes (SAC)	2225	169	1	1	18	47	70	136
Ashdown Forest (SPA)	3197	149	1	1	7	14	112	134
Dorset Heaths (SAC)	5705	500	8	6	28	8	22	73
Dorset Heathlands (SPA)	8165	618	5	4	21	5	16	51
Breckland (SAC)	7515	185	0	1	4	3	21	29
The New Forest (SAC)	29177	467	1	0	3	7	17	28
Breckland (SPA)	39284	921	0	0	1	1	5	8

Table 5: Visitor numbers across a range of different sites. The annual visitor rate was divided by the number of days and the area of the site. Sites which were only open for part of the year are indicated with an * and the estimated visitors/ha/day relate only to time of year the site was open for visits.

Site	Yearly visitor rate (people per year)	Area (ha)	Visitors per ha per day	Notes / Source
Open access land	21.6 million	865,260	0.07	(Natural England 2008)
Skomer	14,325	315	0.19*	* Visitors per hectare between March and October when islands open for visitors Taylor (2010)
Minsmere (RSPB)	90,000	935	0.26	Personal communication from RSPB at Minsmere (2012)
Lundy Island	20,000	445	0.3*	* Visitor rates calculated assuming all visitors arrive between April and October when full transport service to island (Day, White, & Cruickshanks 2011)
Arne (RSPB)	80,000	500	0.4	(Lake, Liley, & White 2011)
All National Nature Reserves in England	16.7 million	91,343	0.5	http://www.english-nature.org.uk/special/nnr/nnr_what.htm
New Forest National Park	13.3 million	30,000	1.2	Sharp et al (2008); area figure from http://www.newforestnpa.gov.uk/index/lookingafter/la-access/countryside_access.htm
Dorset Heaths	5 million	7,348	1.9	Liley <i>et al</i> (2006), see also Sharp <i>et al</i> (2008). Estimate includes coastal sites.
Thames Basin Heaths	7.5 million	8,906	2.3	7.5 million is crude estimate based on mid point between two estimates in Liley <i>et al</i> (2006), see also Sharp <i>et al</i> (2008).
Windsor Great Park	2.5 million	2,020	3.4	http://www.thecrownestate.co.uk/windsor/parkland/windsor-great-park/
Epping Forest	4 million	2,428	4.5	(Alison Millward Associates Ltd 2010)
Sherwood Forest (visitor centre)	350,000	182	5.3	http://www3.nottinghamshire.gov.uk/enjoying/countryside/countryparks/sherwood/
Richmond Park	2.3 million	955	6.3	(Hitchcock, Curson, & Parravicini 2008)
Burnham Beeches	585,000	200	8.01	Wheater and Cook 2012
Coltswold Wildlife Park and Gardens	312075	65	13.2	http://thecotswoldgateway.co.uk/farm_parks.htm , Mills (2010)
Berry Head	200,000	40.4	13.6	Personal communication from Access Officer for Torbay Coast and Countryside Trust
Moors Valley Country Park	81,8910	304	16.4	www.moors-valley.co.uk ; Mills (2010)
Royal Botanic Gardens (Kew)	1.1 million	132	23.7	www.kew.org , Mills (2010)
Eden Project	1 million	14.2	194	Area (http://www.mevagissey.net/eden.htm), Mills (2010)
Central Park (USA)	35 million	341	281	http://www.centralpark.com/guide/faq.html#faq_4
Stonehenge	1 million	1	2767	Mills (2010)

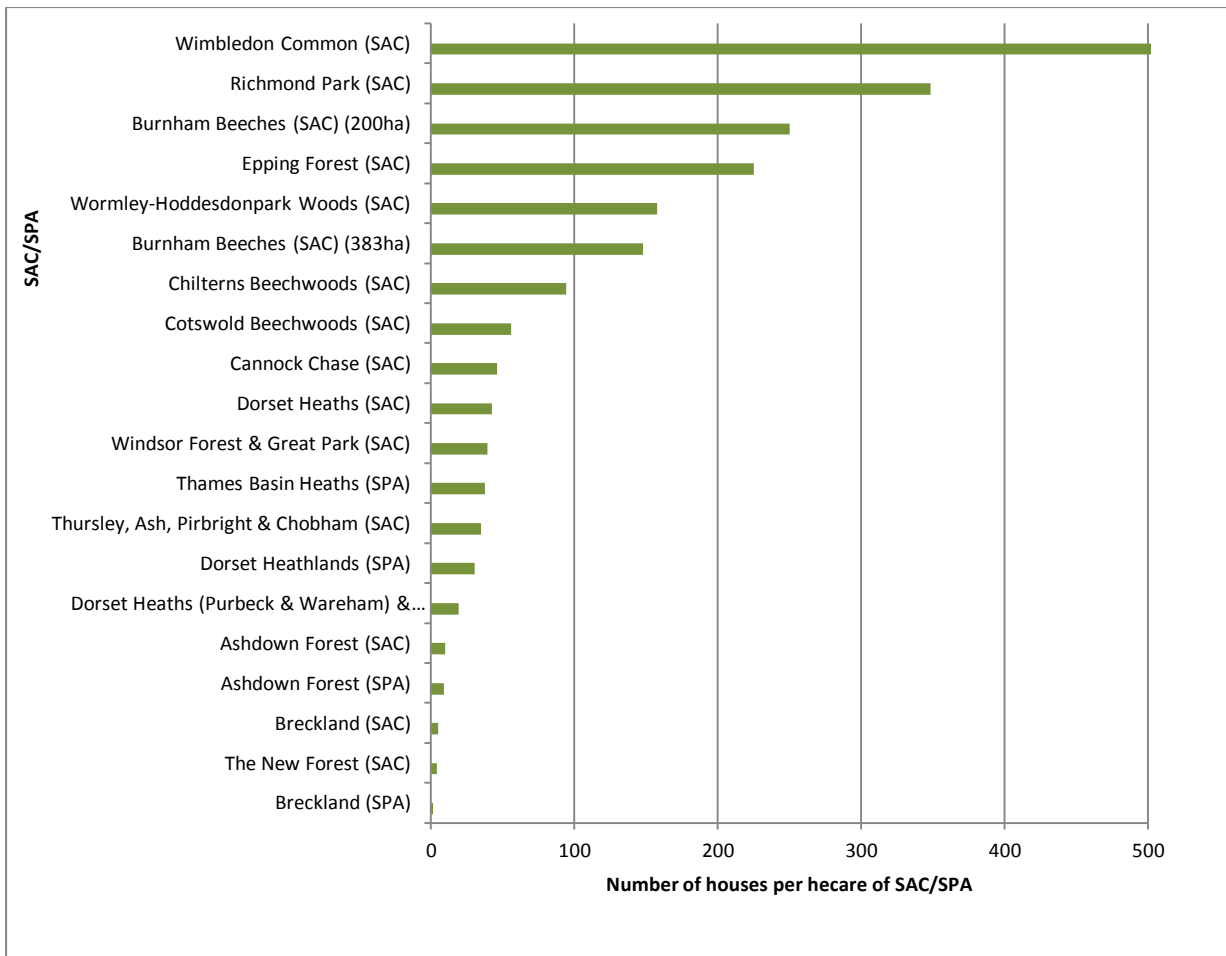


Figure 2: The number of houses per hectare of each site generated from the total number of houses within 5km of each site. The graph was truncated at 500 houses with the value for Wimbledon Common SAC at 855. Data from Table 3

Summary

The application of strategic level mitigation for European site impacts arising from new growth is now an established and accepted approach to ensure plans and projects relating to new growth are compliant with the requirements of the Habitats Regulations.

An analysis of site area, perimeter and number of houses within 5km, along with the number of houses for every hectare of site for other European sites, indicates that the 220 ha of Burnham Beeches with public access and all of the old pollards is likely to have a level of visitor pressure that is comparable with a number of European sites where strategic mitigation schemes are in place or being put in place. This lends support to the need for similar measures to be implemented at Burnham Beeches SAC.

7. Application of a Mitigation Scheme to Burnham Beeches

Introduction

- 7.1 The comparison with other European sites indicates that, although the total number of visitors per day is low for Burnham Beeches (according to the 2002/3 and 2010/11 visitor data), the much smaller area of the site means that the density of visitors is high. Burnham Beeches has a roughly comparable level of pressure to Epping Forest and Richmond Park, about double the pressure experienced by the Thames Basin Heaths and Dorset Heaths and roughly four times the pressure on the New Forest. In addition Burnham Beeches is relatively small, which means a greater 'edge', less ecological connectivity and fewer opportunities within the site to create areas with low visitor pressure.
- 7.2 Whilst deterioration of the SAC has not been formally recognised, there are indications of stress and possibly woodland ill health, with a habitat complex of European importance that is also particularly susceptible to climate change, air pollution and drought. This needs to be considered alongside a steadily increasing visitor number, and potential for further growth in the surrounding area.
- 7.3 Maintaining integrity of a European site is not simply a case of allowing deterioration to the point at which Natural England advises that it will cross the threshold into failing its conservation objectives. Rather competent authorities must seek to ensure that the ecological robustness of the site and its ability to function as a thriving ecosystem into the long term, alongside fluctuating natural cycles and processes, is not compromised. It is this objective, alongside the proper application of the precautionary principle in the current absence of information, which leads this report to conclude that it is appropriate and necessary to put in place a strategy for the protection of the SAC and the prevention of further impacts relating to new growth. Strategies are in place or being put in place for a number of European sites throughout the country, including those where the recreational pressure is possibly less significant than is calculated for Burnham Beeches.
- 7.4 A mitigation scheme would potentially need to include additional on-site measures to reduce visitor pressure, a range of additional research and information gathering (which in turn could highlight the need for further measures for mitigation), and a series of off-site measures.

Forward Planning and Development Management: South Bucks Local Development Framework

- 7.5 Burnham Beeches SAC lies within the administrative boundary of South Bucks District Council, within the County of Buckinghamshire. The District is bordered by large urban areas in most directions, and is to the west of Greater London. In considering the impacts of additional growth and urbanisation on Burnham Beeches, there is potentially a need to look wider than the District boundary itself. At present it is difficult to define a 'zone of influence'. The 1999 visitor data provides some

scope and highlights that over two thirds of visitors originate from South Bucks, with Slough Borough the only other planning authority with any significant volume of visitors. More up-to-date visitor data is required to clarify the current situation, and further information is also required with respect to water and air quality issues.

- 7.6 The South Bucks Core Strategy was adopted in February 2011, providing the key overarching document in the South Bucks Local Development Framework. As a land use plan, the Core Strategy was the subject of Habitats Regulations Assessment, progressively through the plan's development, until its submission for Examination.
- 7.7 The adopted Core Strategy identifies an indicative scale of housing development over the plan period to be in the region of 2,200 to 2,800 houses. This includes two significant urban extensions; Wilton Park and Mill Lane, both of which are approximately 5km from Burnham Beeches, and this is the distance that some 66% of visitors currently travel to visit the Beeches site. Project level Habitats Regulations Assessment will be required for both sites, taking account of all currently available information. This will be particularly important for Wilton Park where provision of extensive on site greenspace may need to form part of the mitigation measures to adequately ensure that Burnham Beeches is not adversely affected by the proposal.
- 7.8 At least 180 new dwellings are proposed for Burnham itself. Farnham Common, which is immediately adjacent to Burnham Beeches, is identified as one of the secondary settlements of the District, where there is more limited but unspecified potential for growth but potential for infilling and re-development. Development around the Farnham Common and Burnham area will need to be a particular focus for some of the suggestions for mitigation made in this report, including the restrictions that may need to be considered. In considering the totality of growth in the area, it is also highlighted that administrative areas surrounding South Bucks have set significantly higher housing targets. Slough for example sets a housing target of 6,300 houses over its plan period.
- 7.9 It should be noted that the Core Strategy advises that the identified quantum of housing is likely to come forward early in the plan period, given the level of development already approved. This therefore highlights the need for close working between South Bucks District Council and the City of London Corporation as the Core Strategy is reviewed in due course, as any changes to housing numbers would need to be considered in light of all work undertaken and being undertaken with regard to Burnham Beeches SAC. The HRA of any Core Strategy review will need to particularly focus on the volume of housing being proposed for inclusion in a revised Core Strategy.
- 7.10 Returning to the currently adopted South Bucks Core Strategy, with regard to Burnham Beeches SAC, the Habitats Regulations Assessment supporting the Core Strategy advises that *“the quantity and spatial distribution of residential development set out by the Core Strategy is not expected to significantly increase the number of people visiting the site. In addition, the plan contains specific measures*

aimed at improving access to open space, such as at the opportunity site at Wilton Park, as well as implementing the Buckinghamshire Green Infrastructure Strategy across the District."

- 7.11 In the assessment of potential impacts arising from visitor pressure, the HRA concludes that the Burnham Beeches management plan is in place to deal with on site impacts, that visitor numbers are not expected to increase with the quantum of housing proposed, and that the Core Strategy aims to improve and expand greenspace through its Green Infrastructure Strategy. On revisiting this issue for this report, it appears that this approach fails to consider whether there are greenspace options in viable locations to deter use of Burnham Beeches, does not build upon the management in place with additional measures, and does not substantiate the assumption that visitor numbers will not increase. Visitor survey work at Burnham Beeches (Wheater 2012) indicates that visitor numbers are increasing, and we recommend that further visitor survey work on a larger scale to support the mitigation strategy for Burnham Beeches is required.
- 7.12 In the assessment of impacts arising from reduced water resources, although it is identified that the area is generally under serious water stress, the HRA concludes that the Core Strategy has an ambitious water consumption reduction target and promotes the use of sustainable drainage systems. On revisiting this issue for this report, it appears that there is a lack of recommendation for further investigation, and as the measures are general and more aspirational in nature, there no certainty that the proposed measures will protect Burnham Beeches from drought stress.
- 7.13 Urbanisation is not covered by the HRA, but air quality impacts are ruled out on the grounds of current air quality monitoring results. However, current monitoring results (see 3.41) appear to show critical thresholds currently exceeded for N and acid depositions, ammonia concentrations and ozone exposure.
- 7.14 In drawing together this report, a comparison with other European sites, an analysis of visitor pressure and an exploration of the full range of potential impacts have been undertaken. Having regard to the requirements of the Habitats Regulations, the precautionary principle and with an awareness of a notable evidence gap, this report concludes that the HRA findings may not have gone far enough to inform the emerging Core Strategy and identify specific measures to be applied or areas for further investigation.
- 7.15 However, despite the lack of clear guidance in the HRA, the supporting text for Core Policy 9 within the Core Strategy recognises that the Core Strategy HRA found the Core Strategy would not generate any significant impacts likely to affect the Burnham Beeches SAC, but goes on to state that where there is the potential for specific development projects to have a significant effect, a project level HRA will be undertaken, in accordance with the requirements of Regulation 48 (now Regulation 61 of the 2010 Regulations).

- 7.16 Core Policy 9 itself places the highest priority on the ‘conservation of the integrity of Burnham beeches SAC.’ It goes on to state that this will be achieved through restricting the amount of development in close proximity to the site and ensuring that development that does proceed does so without causing any adverse effects upon the integrity of the SAC, to be set out in further detail in the Development Management DPD. This DPD is yet to be taken forward, but is timetabled for commencement in Spring 2012, with submission for Examination in 2013. Its purpose is to provide a clear and concise set of development management policies relating to all development in the District, setting criteria against which development proposals will be considered.
- 7.17 It is therefore suggested that the Core Strategy has recognised the potential impact of development upon the Burnham Beeches SAC, and that the proposed DPD provides an ideal opportunity to build upon the findings of this report, and take forward the principle of a mitigation strategy in policy. Burnham Beeches site management staff, in conjunction with Natural England, should work in partnership with the forward planning officers at South Bucks District Council to develop the necessary policy wording for the Development Management DPD to take forward a mitigation strategy for Burnham Beeches. This should encompass the following: onsite visitor management; off-site green infrastructure that secures supporting and connecting habitat for the site and alternative recreational spaces for people; further research and investigations; and measures to restrict urbanisation and housing intensification in the immediate vicinity of Burnham Beeches.
- 7.18 The Development Management DPD should set out the principles of these requirements. Discussions with South Bucks District Council should explore the options for both the detailed mitigation scheme and developer contributions, and the detailed policy restrictions and opportunities for green infrastructure. It is suggested that these could be taken forward in a Supplementary Planning Document, or an area-specific plan such as an Area Action Plan. Any option would need to fit into the plans that South Bucks District Council has for the direction of the Local Development Framework. An initial option may be to secure a level of detail in the Development Management DPD, supported by a mitigation strategy document that is interim in nature until it can be appropriately encompassed in the Local Development Framework portfolio.
- 7.19 Natural England has indicated that there are significant concerns with regard to the lack of information relating to water resources, and has started to request more detailed information when development proposals come forward. It is also understood that discussions between Burnham Beeches staff and Natural England have explored the issue of increased urbanisation and housing intensification in the immediate vicinity of the SAC, and potential opportunities to address this. Natural England’s view on the potential impacts arising from increased visitor pressure on the SAC is also required.

Summary

A justification for the preparation and implementation of a strategic mitigation scheme for Burnham Beeches SAC is presented.

Burnham Beeches SAC lies within the administrative boundary of South Bucks District Council and the relatively simple analysis conducted earlier in the report (see Map 2) suggests that around two thirds of visitors originate from this District. It may be necessary to involve other local authorities but additional data is required to ascertain accurately where future development is likely to contribute to impacts.

Specific concerns regarding the impacts of visitor pressure and increased urbanisation are raised in this report, which go further than the findings of the South Bucks Core Strategy HRA. Core Policy 9 of the South Bucks Core Strategy itself recognises the potential impact of development on the SAC, and provides the foundation for the progression of more detailed policy wording and a mitigation strategy for the protection of the ecological integrity of the Burnham Beeches site.

It is suggested that, Burnham Beeches site management staff, with Natural England, should work with South Bucks District Council in the development of the emerging Development Management DPD, seeking to set in place the right level of policy wording to facilitate a mitigation strategy, restrict urbanisation and housing intensification within the immediate vicinity of the SAC and provide opportunities for green infrastructure provision. The value of any future documents, such as SPD or AAP should be considered.

8. Components of a Mitigation Strategy

8.1 In this section we tentatively consider the potential components of a mitigation strategy. These recommendations are wide ranging and include: On-site management of visitors; off-site provision of supporting green infrastructure; off-site provision of alternative greenspaces (SANGs); restrictions in policy to prevent further impacts from urbanisation and housing intensification in the immediate vicinity of the SAC; and a notable requirement for further research and investigations. These elements need further detailed consideration by Burnham Beeches staff and other stakeholders, and are therefore set out as a starting point and initial ideas only.

On site management

8.2 Significant large-scale changes have already been made on site, and a comprehensive management plan is in place. There are therefore relatively few on-site management options that are available and those that remain are relatively small compared to the major infrastructure changes that have already taken place.

8.3 A key element with the on-site management will be to ensure that resources are available for continued on-site wardening presence, with community work, face-to-face contact with visitors, regular patrolling, rapid response to vandalism etc. all taking place. In the long-term, with increasing access pressure it may be necessary to ensure additional resources are available to ensure these measures continue.

8.4 With respect to trampling there is potential to increase the level of dead hedging or mulching around the base of vulnerable trees and there is potential to consider further fencing for the most vulnerable trees and add deterrents to existing fencing where they are being climbed (renew signs, plant vegetation at climbing points). Such measures have their limitations however. Increasing the degree of shading around the trunks of old pollards may not favour dependent epiphytes and invertebrates, and one of the rarest species – the Red Data Book Knothole yoke-moss – grows on the base of old beech trunks as much as the vertical trunks and may be adversely impacted by the use of too much mulch or dead hedging.

8.5 Site visits highlighted that children are playing on the common area whilst parents oversee from the cafe. A small clump of trees was a particular focus of activity, with chasing, climbing, hiding and jumping off taking place. It is suggested that there may be the potential to replicate the climbing experience of the veteran trees by providing a climbing opportunity in the visitor facilities area that could reduce this pressure on the trees themselves. To the immediate north of Lord Mayor's Drive just before the visitor facilities is a stand of younger woodland that is relatively open to allow parents to view, but is enclosed enough to create an 'adventure' feel. A climbing feature, made from natural materials and predominantly constructed from wood, interwoven into the trees and providing opportunities for hiding, climbing, moving from the ground to above ground structures and back again could be created. Alternatively a low-key climbing opportunity could be encouraged, in the same way that the existing clump in this area has naturally arisen, by managing some

of the birch or willow scrub in this area to create a low, branching form where climbing would be acceptable.

- 8.6 It would be essential to get the right balance between providing a climbing experience to allow children to expend their energy on this rather than the old trees, and ensuring that the scale of the adventure area remains such that it does not create a visitor attraction in itself that then draws further visits. This therefore requires further brainstorming and careful discussion.
- 8.7 With respect to dog fouling, a series of measures is already in place that includes a code of conduct, signage and dog bins, and it may be that drawing dog walkers to alternative sites may be the best long term approach. There is perhaps scope to review the success of current measures on-site and consider additional measures such as further increasing warden presence with staff spending more time watching dog walkers and approaching them. On some sites dog mess has been marked with flags or spray painted in particular areas as a way of highlighting to visitors the volume and scale of the issue.
- 8.8 With respect to fire, there is an established fire plan in place but it may be necessary to review the current procedures in relation to fire. Measures which could be checked and potentially enhanced (to ensure any fire incident in the future is rapidly contained and damage minimised) could include:
- Awareness of Burnham Beeches staff of procedures, emergency access routes, location of fire beaters etc.
 - Checks of access routes on-site for emergency vehicles
 - Ensuring local fire services understand (and maintain a record of) access routes and where to obtain water
 - Increased surveillance by local staff during prolonged dry spells
- 8.9 If *Phytophthora* or other diseases occur on the site, local staff will need to be prepared with measures to contain the spread of the disease. Contractors visiting the site now all routinely disinfect but a review of potential measures, clear guidance for staff and emergency procedures (public information, signage etc) should be prepared. Disinfectant should be held in stock as necessary.

Relevance of suitable accessible natural greenspace (SANGs) and green infrastructure

- 8.10 Other European site mitigation schemes have incorporated the concept of off-site alternative greenspaces to detract some visitor pressure away from sensitive European site habitat. As discussed earlier in this report, there is an increasing risk of the use of Burnham Beeches as a doorstep daily greenspace instead of a destination to travel to for its specific qualities. Whilst it is advised that there is more that can be done on site to manage visitor behaviour, it is also suggested that off-site suitable accessible natural greenspace or 'SANGs' could also add to measures to reduce recreational pressure. There are however various issues that would need

to be resolved in relation to the likely success of such greenspace in diverting some pressure away. Critically, the location would be an important factor in the success of diverting daily local greenspace needs.

- 8.11 Investigations during site visits suggested that options for alternative greenspaces in the vicinity of Burnham Beeches may be limited. In directions other than the eastern built up zone, land is essentially private estate and private working farmland in the wider area. It is envisaged that SANGS could form part of an overall mitigation strategy, but that it would not be the primary means of mitigating for the impact of new development. Rather, it could play a notable role in a broad range of measures, including those relating to further research needs.
- 8.12 In order to effectively divert the most immediate local daily greenspace use, SANGs may need to be located to the north or south of Burnham Beeches. A multi-partner approach to the consideration of potential SANGS opportunities is required. Land may be in the ownership of LPA/Parish Council, charitable body, or private business/developers, and all these options need to be explored.
- 8.13 At this point in time, without further investigation and discussion with relevant stakeholders, there is a small number of specific potential options for SANGs provision. East Burnham Quarry is a gravel extraction site to the south of Burnham Beeches, with a current proposal for mainly agricultural restoration. Here there are potential options for the development of a natural greenspace with attractive biodiversity features, and also some visitor facilities, including car parking.
- 8.14 A second potential option relates to land to the north west of Burnham Beeches, where a swathe of land in the ownership/tenancy of a number of bodies could provide multifunctional green infrastructure, creating an area of open access, supporting habitat for Burnham Beeches wildlife interest and a green link out to wider countryside.
- 8.15 Over time development in close proximity to Burnham Beeches, especially to the east and south, has diminished the character of the approach to the site and weakened the perception of travelling to and arriving at a very special place. It is recommended that measures are put in place to rectify this deterioration of the 'destination' experience. These should aim to reinforce the sense that the urban area is being left behind and a very different, rural woodland park is reached. Such measures might include creating a perception of countryside through planting locally distinctive trees and shrubs along the approaches and further consideration of the route options to get to Burnham Beeches.
- 8.16 Exploration of opportunities to create supporting habitat and wider green network connections should be explored, to reduce fragmentation effects.
- 8.17 The establishment of Suitable Accessible Natural Greenspace (SANGs) should also form part of a wide range of measures for mitigation. Specific options for this need to be investigated further.

Policy

- 8.18 The issue of urbanisation in close proximity to Burnham Beeches, particularly that taking previously undeveloped land or large gardens needs to be addressed through South Bucks District forward planning documents. An urgent policy-led approach to protecting undeveloped land and large gardens in close proximity to Burnham Beeches should be pursued.
- 8.19 It is recommended that the Burnham Beeches site management staff should work with South Bucks District Council in the development of the emerging Development Management DPD, seeking to set in place the right level of policy wording to facilitate a mitigation strategy, restrict urbanisation and housing intensification within the immediate vicinity of the SAC, and provide opportunities for green infrastructure provision. The value of any future documents, such as SPD or AAP should be considered.
- 8.20 It is suggested that the currently available visitor data (2x surveys and Management Plan questionnaire) should inform immediate decisions on site protection and management. This may take the form of an interim mitigation strategy for new growth. A more comprehensive visitor survey, working on a larger scale, should provide a basis for a longer-term approach to mitigation, refining the geographical zone to which it applies, if necessary.

Stakeholder discussions

- 8.21 Further discussions with Natural England are recommended to explore its emerging position relating to potential impacts on the SAC, in particular in relation to visitor impacts, water resources and issues and opportunities in the immediate vicinity of the SAC. It would be beneficial to establish Natural England's view on what habitats on site contribute to the favourable conservation status of the SAC interest, how critical are indications of ill health in younger woodland, etc.
- 8.22 The need for further discussions with the Environment Agency regarding air quality monitoring results from sites in the wider area is highlighted. These should explore whether monitoring can be specifically related to habitat sensitivities or whether human health thresholds are being applied, and examine whether a specific air quality monitoring station is required at Burnham Beeches.
- 8.23 Hydrological impacts from increased growth should be a priority for further investigation. It is suggested that a working group for this specific issue is formed, with the initial purpose of gathering together all available information and understanding. This will need to include the Environment Agency, relevant Water Utility companies, LPAs and Natural England as a minimum. Regular meetings involving City of London staff, local planning authority staff, Natural England and the Environment Agency should serve to reinforce awareness of the perceived threats to the SAC interest features from changes in water availability or quality, and to agree protocols for consultation over future changes or developments which could impact the SAC.

- 8.24 A partnership approach to exploring SANGs is required, given the limited opportunities in the right location. LPAs, National Trust, Wildlife Trust, Environment Agency, Water Utility companies, developers, industry, Parish Councils and local partnerships such as the Buckinghamshire Local Nature Partnership should work together to fully explore all options.

Further investigations and research

- 8.25 A larger-scale visitor survey is necessary to provide more robust data on visitor origins, length of time on the site, activities undertaken and routes within the site. Outputs of this work should show visitor catchments (e.g. for different activities) and maps of the visitor distribution ('footfall') within the site.
- 8.26 Linked to additional visitor work, it would be useful for obvious visitor-related damage (compacted soil, climbing wear and tear) and other ecological data (such as tree health) to be mapped to determine any correlation with areas of high visitor use.
- 8.27 Photographic evidence of the veteran trees is currently taken every 10 years and it is suggested that this is increased to the two-year management checks.
- 8.28 We recommend that a log of incidents, including fire incidence, litter, fly-tipping, distribution of alien species etc, is collected to allow comparison over time and to ensure resources are adequate to respond to any changes in the frequency of occurrence of different events. All fire incidents should be carefully mapped and documented.
- 8.29 A hydrological consultant could be appointed to: Analyse the borehole monitoring data from within and around Burnham Beeches; liaise with NE, EA and Thames Water as necessary; advise on the possibility of setting up supplementary monitoring of ground water levels and surface water flows within and into the SAC respectively,, and ascertain whether any further monitoring of water quality is necessary.
- 8.30 The existing monitoring for aerial pollutants should be continued. An expert review of the air quality monitoring programme should be undertaken to establish whether any additional monitoring is necessary (methodologies, additional pollutants, frequencies and spatial distribution of monitoring points), and what pollutant measurements should act as an early warning system for managers.
- 8.31 Monitoring of dust emissions from the Quarry workings should be reinstated, as is intended if and when the workings recommence.
- 8.32 Soil analysis should be carried out for sample sites within Burnham Beeches to establish a base line for nutrients, sulphur and pH.
- 8.33 Some monitoring of lichens has been in place for two decades, but only on oak since when started, beech trunks were not seen to support lichens. Lichens have been increasing as air quality has improved but the species now seen tend to be those tolerant of high nitrogen levels. There is potential to extend the monitoring

specifically to show changes in lichen distribution as a result of changes in air quality and potentially to check changes as a result of access or management. This extended monitoring will require careful design and specialist input.

- 8.34 Analysis should be carried out of a sample of leaves of trees in Burnham Beeches to establish a base line for future monitoring of nutrient and pollution levels.

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