

Habitats Regulations Assessment of the Revised Growth Strategy for Wokingham

Wokingham Borough Council

Project number: 60610735

60613744

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	November 2021	Draft for Council comment	JR	James Riley	Technical Director
1	November 2021	Revision response to client comments	in JR to	James Riley	Technical Director

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1. Background

1.1 Introduction

In February 2020, AECOM undertook a Habitats Regulations Assessment (HRA) of the Regulation 18 Wokingham Draft Local Plan Update, which allocated a minimum of 13,901 net new dwellings and additional employment space to be delivered across the Borough in the period up to 2036. However, Wokingham Borough Council (hereafter referred to as 'WBC') is now consulting on an updated approach to managing / delivering growth across the Borough in the period up to 2037/38 – the Revised Growth Strategy. The revisions to the growth strategy make the following important changes to the quantum and distribution of growth across the Borough:

- Removal of the proposed garden town at Grazeley;
- Inclusion of a new strategic garden village (including significant parkland) on land known as Hall Farm / Loddon Valley;
- Inclusion of additional smaller housing sites across Wokingham;
- Allocation of additional Local Green Spaces; and
- Extension of the Plan period to 2038.

Therefore, AECOM has been commissioned to subject the Revised Growth Strategy to HRA, focussing specifically on key changes that may have implications for European sites. The Regulation 18 HRA involved a screening assessment and identified impact pathways for which LSEs on European sites could not be excluded. Consequently, an Appropriate Assessment was undertaken of recreational pressure in the Thames Basin Heaths SPA and the Thursley, Ash, Pirbright & Chobham SAC, as well as atmospheric pollution effects in the Thames Basin Heaths SPA and Chilterns Beechwoods SAC. Since the impact pathways requiring Appropriate Assessment have already been identified, this stage of HRA will not be repeated here. Instead, this HRA will focus on the implications of the Revised Growth Strategy for recreational pressure and atmospheric pollution in the above-named sites. Furthermore, background detail will only be reproduced for the impact pathways and European sites taken forward to Appropriate Assessment.

Overall, the objective of this Revised Growth Strategy HRA is to identify any aspects of the Revised Growth Strategy that would potentially cause an adverse effect on the integrity of European sites, otherwise known as European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), candidate Special Areas of Conservation (cSACs), potential Special Protection Areas (pSPAs) and, as a matter of Government policy, Ramsar sites), either in isolation or 'in-combination' with other plans and projects, and to advise on appropriate policy mechanisms for delivering mitigation where such effects were identified. The UK is bound by the terms of the Conservation of Habitats and Species Regulations 2017 (as amended), which requires an Appropriate Assessment to be undertaken, where a plan or project is likely to result in LSEs on European sites, either individually or 'in-combination' with other plans and projects.

A full updated HRA will be produced to accompany the Pre-Submission Local Plan when it goes for consultation in 2022.

1.2 Legislative Context

The UK left the European Union (EU) on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"). While the UK is no longer a member of the EU, a requirement for Habitats Regulations Assessment will continue as set out in the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019¹. Figure 1 below sets out the legislative basis for Appropriate Assessment.

¹ these don't replace the 2017 Regulations but are just another set of amendments

The HRA process applies the 'Precautionary Principle'² to European sites. Plans and projects can only be permitted having ascertained that there will be no adverse effect on the integrity of the European site(s) in question. Plans and projects with predicted adverse impacts on European sites may still be permitted if there are no alternatives to them and there are Imperative Reasons of Overriding Public Interest (IROPI) as to why they should go ahead. In such cases, compensation would be necessary to ensure the overall integrity of the site network.

In order to ascertain whether or not site integrity will be affected, an Appropriate Assessment should be undertaken of the plan or project in question:

Conservation of Habitats and Species Regulations 2017 (as amended)

The Regulations state that:

"A competent authority, before deciding to ... give any consent for a plan or project which is likely to have a significant effect on a European site ... shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives... The authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site".

Figure 1: The legislative basis for Appropriate Assessment

Over time the phrase 'Habitats Regulations Assessment' (HRA) has come into wide currency to describe the overall process set out in the Regulations from screening through to IROPI. This has arisen in order to distinguish the process from the individual stage described in the law as an 'Appropriate Assessment'.

1.3 Scope of the Project

There is no pre-defined guidance that dictates the physical scope of an HRA of a Plan document. Current guidance suggests that the following European sites should be included in the scope of an HRA assessment:

- All European sites within the boundary of Wokingham Borough; and,
- Other European sites within 10km shown to be linked to development in Wokingham through a known 'pathway' (discussed below).

Generally, it is uncommon for development plans to be deemed to have a significant effect on European sites situated more than 10km from areas of growth. For example, most core recreational catchments (except for some coastal sites) are under 10km in size, there are few bird species that make extensive use of functionally linked habitats located more than 10km from their core areas, and the average vehicle commuting distance of a UK resident is approx. 10km. It should be noted that the presence of a conceivable impact pathway linking the Revised Growth Strategy to a European site does not mean that impacts will occur.

Briefly defined, impact pathways are routes by which the implementation of a policy within a Plan document can lead to an effect upon a European site. An example of this would be new residential development resulting in an increased population and thus increased recreational pressure, which could then affect European sites by, for example, disturbance to breeding birds or trampling damage to vegetation. Guidance from the Ministry of Housing, Communities and Local Government (MHCLG) states that the HRA should be '*proportionate to the geographical scope of the [plan policy]*' and that '*an AA need not be done in any more detail, or using more resources, than is useful for its purpose*' (MHCLG, 2006, p.6).

² The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as: "*When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis*".

This basic principle has also been reflected in court rulings. The Court of Appeal³ has ruled that providing the Council (competent authority) was duly satisfied that proposed mitigation could be 'achieved in practice' to satisfy that the proposed development would have no adverse effect, then this would suffice. This ruling has since been applied to a planning permission (rather than a Core Strategy document)⁴. In this case the High Court ruled that for '*a multistage process, so long as there is sufficient information at any particular stage to enable the authority to be satisfied that the proposed mitigation can be achieved in practice it is not necessary for all matters concerning mitigation to be fully resolved before a decision maker is able to conclude that a development will satisfy the requirements of Reg 61 of the Habitats Regulations*'.

The HRA of the 2020 Wokingham Draft Local Plan Update identified that an Appropriate Assessment regarding recreational pressure and atmospheric pollution was required in relation to the following sites:

- Thames Basin Heaths SPA;
- Thursley, Ash, Pirbright & Chobham SAC; and
- Chilterns Beechwoods SAC.

The distribution of the above European sites in relation to Wokingham Borough is shown in Appendix A. An introduction to, the qualifying features (species and habitats), Conservation Objectives, and threats and pressures to the integrity of these sites are set out in the Appendix B of this report.

In order to fully inform the Appropriate Assessment, several pieces of evidence have been consulted to determine adverse effects that could arise from the Revised Growth Strategy. These include:

- Future development proposed (and, where available, HRAs) for Windsor and Maidenhead, Bracknell Forest, Surrey Heath, Hart, Basingstoke and Deane, West Berkshire, Reading, South Oxfordshire and the area of Buckinghamshire formerly known as Wycombe;
- Air Quality Impact Assessments for air quality-sensitive European sites (*note that these are not yet available*);
- Thames Basin Heaths Visitor Survey 2012 / 2013;
- The UK Air Pollution Information System (www.apis.ac.uk); and
- The Multi Agency Geographic Information for the Countryside (MAGIC) and its links to the JNCC website (www.magic.gov.uk)

³No Adastral New Town Ltd (NANT) v Suffolk Coastal District Council Court of Appeal, 17th February 2015

⁴High Court case of R (Devon Wildlife Trust) v Teignbridge District Council, 28 July 2015

2. Methodology

2.1 Introduction

The HRA has been carried out with reference to the general EC guidance on HRA⁵ and that produced in July 2019 by the UK government⁶; Natural England has produced its own internal guidance⁷. These have also been referred to in undertaking this HRA.

Figure 2 below outlines the stages of HRA according to EC guidance. The stages are essentially iterative, being revisited as necessary in response to more detailed information, recommendations and any relevant changes to the plan until no significant adverse effects remain.

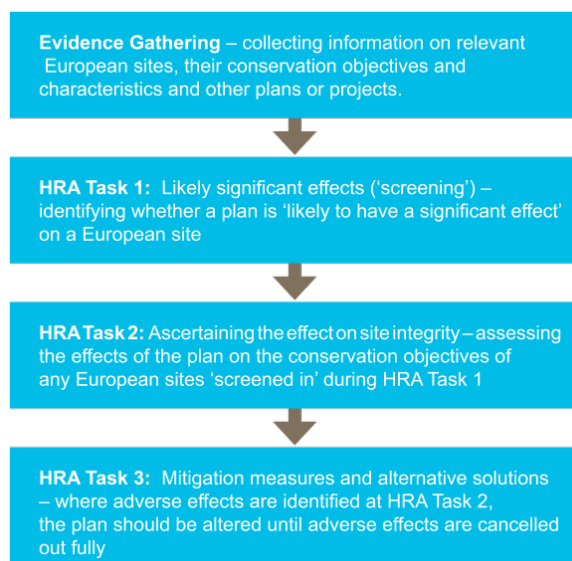


Figure 2. Four Stage Approach to Habitats Regulations Assessment. Source EC, 2001¹.

2.2 Description of HRA Tasks

2.2.1 HRA Task 1 – Likely Significant Effects (LSEs) Screening

The Revised Growth Strategy consultation focuses on the areas of change from the Draft Local Plan consultation (2020), that is those policies relating to the amount of development required and how this is proposed to be met across the borough. Additional areas are therefore proposed for housing development which were not included in the Draft Local Plan consultation, notably strategic development at Hall Farm / Loddon Valley. Given this focus, most of the development management style policies included in the Draft Local Plan are not repeated in the consultation, but vision and objectives remain consistent, in addition to the approach towards policy areas such as net zero carbon development, affordable housing, and biodiversity net gain, are retained. As a result, these policy approaches have been used to inform this HRA, in recognising that they will also form part of managing future development, including in forthcoming stages of the Local Plan.

The first stage of HRA is the Test of Likely Significant Effects. The essential question is: *"Is the project, either alone or in combination with other relevant projects and plans, likely to result in a significant effect upon European sites?"* The objective is to 'screen out' those plans and projects that can, without any detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction with European sites. The previous HRA already screened in relevant policies allocating growth (except for Policy SS3 – Hall Farm / Loddon Valley Strategic Development Location, which replaces Grazeley Garden Town and is also screened

⁵ European Commission (2001): Assessment of plans and projects significantly affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and 6(4) of the Habitats Directive.

⁶ <https://www.gov.uk/guidance/appropriate-assessment>

⁷ http://www.ukmpas.org/pdf/practical_guidance/HRGN1.pdf

in). Therefore, screening for Likely Significant Effects (LSEs) will not be repeated in this HRA which will instead focus on Appropriate Assessment.

2.2.2 HRA Task 2 – Appropriate Assessment (AA)

Since it is determined that a conclusion of ‘no likely significant effect’ cannot be drawn, the analysis has proceeded to the next stage of HRA known as Appropriate Assessment. Case law has clarified that ‘appropriate assessment’ is not a technical term. In other words, there are no particular technical analyses, or level of technical analysis, that are classified by law as belonging to appropriate assessment rather than determination of likely significant effects.

By virtue of the fact that it follows the screening process, there is a clear implication that the analysis will be more detailed than undertaken at the LSEs stage. One of the key considerations during appropriate assessment is whether there is available mitigation that would entirely address the potential effect. In practice, the Appropriate Assessment would take any policies or allocations that could not be dismissed following the high-level Screening analysis and analyse the potential for an effect in more detail, with a view to concluding whether there would actually be an adverse effect on the integrity of European sites (in other words, disruption of the coherent structure and function of the European site(s) and interference with the sites ability to achieve its conservation objectives).

A decision by the European Court of Justice⁸ in 2018 concluded that measures intended to avoid or reduce the harmful effects of a proposed project on a European site may not be taken into account by competent authorities at the Likely Significant Effects or ‘screening’ stage of HRA. That ruling has been taken into account in producing this HRA.

Also, in 2018 the Holohan ruling⁹ was handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that ‘*As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, ... typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area*’ [emphasis added]. This ruling has been taken into account in the HRA process, particularly regarding the qualifying bird species of the Thames Basin Heaths SPA (e.g. nightjar, Dartford warbler, woodlark), which may nest in heathland, acid grassland and rotationally-managed conifer plantation beyond the SPA boundary.

2.2.3 HRA Task 3 – Avoidance and Mitigation

Where necessary, measures are recommended for incorporation into the Plan in order to avoid or mitigate adverse effects on European sites. There is considerable precedent concerning the level of detail that a Local Plan document needs to contain regarding mitigation for recreational impacts on European sites. The implication of this precedent is that it is not necessary for all measures that will be deployed to be fully developed prior to adoption of the Plan, but the Plan must provide an adequate policy framework within which these measures can be delivered.

In evaluating significance, AECOM has relied on professional judgement as well as the results of previous stakeholder consultation regarding development impacts on the European sites considered within this assessment. When discussing ‘mitigation’ for a Local Plan document, one is concerned primarily with the policy framework to enable the delivery of such mitigation rather than the details of the mitigation measures themselves since the Local Plan document is a high-level policy document.

2.3 Physical Scope of the HRA

There are no standard criteria for determining the ultimate physical scope of an HRA. Rather, the source-pathway-receptor model should be used to determine whether there is any potential pathway connecting development to any European sites. In the case of the Revised Growth Strategy, it was decided that this HRA would focus on the following European sites (the Windsor Forest & Great Park SAC was screened out in the HRA of the 2020 Draft Local Plan Update):

⁸ People Over Wind and Sweetman v Coillte Teoranta (C-323/17)

⁹ Case C-461/17

- Thames Basin Heaths SPA;
- Chilterns Beechwoods SAC; and
- Thursley, Ash, Pirbright and Chobham SAC.

An introduction to these sites, their qualifying features, their conservation objectives, and the current pressures and threats to site integrity are provided in chapter 3. Appendix 1 shows these European sites in relation to Wokingham Borough's boundary, and the site allocations provided for in the Revised Growth Strategy.

3. Relevant European Sites

3.1 Chilterns Beechwoods SAC

3.1.1 Introduction

The Chilterns Beechwoods represent a very extensive tract of *Asperulo-Fagetum* beech forests in the centre of the habitat's UK range. The SAC comprises a number of semi-natural component woodlands in which beech is the most prominent and / or dominant canopy tree. The woodland components occur in a variety of settings, including a variety of soil types ranging from nutrient-poor, highly calcareous soils to clay-rich, poorly drained soils on the plateaus. One distinctive feature in the woodland flora is the occurrence of the rare coralroot *Cardamine bulbifera*.

As a result of the diverse location of the SAC parcels, their woodland character varies substantially and is also greatly influenced by the woodlands' past management history. Many of the component woodlands were formerly an important source of timber for furniture production. However, in recent times the Chilterns Beechwoods SAC has become a highly valued recreational resource, particularly for hiking and cycling. The closest component part of the Chilterns Beechwoods SAC, Pullingshill Wood, lies approx. 2.8km to the north-east of Wokingham Borough in the Buckinghamshire Unitary Authority.

3.1.2 Qualifying Features¹⁰

The site was designated as being of European importance for the following features:

Annex I habitats that are a primary reason for selection of this site:

- *Asperulo-Fagetum* beech forests

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*; important orchid sites)

Annex II species present as a qualifying feature, but not a primary reason for selection of this site:

- Stag beetle *Lucanus cervus*

3.1.3 Conservation Objectives¹¹

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

¹⁰ <https://sac.incc.gov.uk/site/UK0012724> [Accessed on the 08/11/2021]

¹¹ <http://publications.naturalengland.org.uk/publication/4808896162037760> [Accessed on the 08/11/2021]

3.1.4 Threats & Pressures to Site Integrity¹²

The following threats and pressures to the site integrity of the Chilterns Beechwoods SAC have been identified in Natural England's Site Improvement Plan:

- Forestry and woodland management
- Deer
- Changes in species distributions
- Invasive species
- Disease
- Public access / disturbance
- Air pollution: Impact of atmospheric nitrogen deposition

3.2 Thames Basin Heaths SPA

3.2.1 Introduction

The Thames Basin Heaths Special Protection Area (SPA) consists of 8,274ha of lowland heathland spanning 11 authorities. It predominantly comprises dry and wet heath but also includes area of deciduous woodland, gorse scrub, acid grassland and mire, as well as associated conifer plantations. Historically, these habitats were almost continuous, but they are now fragmented by roads, housing and farmland. Most importantly from a conservation perspective, this heathland complex supports important breeding bird populations, such as the ground-nesting species nightjar and woodlark and the Dartford warbler, which nests close to the ground in heather or gorse.

Around 75% of the SPA has open public access being either common land or designated as open country under the Countryside and Rights of Way Act 2000. The location of the Thames Basin Heaths amidst a highly populated area has resulted in the site being subject to high recreational pressure. Natural England published a Draft Delivery Plan for the Thames Basin Heaths SPA in May 2006, partly in response to the European Court of Justice ruling of October 2005. This was updated by the 'Thames Basin Heaths Special Protection Delivery Framework' published by the Thames Basin Heaths Joint Strategic Partnership Board in January 2009. These documents allow a strategic approach to accommodating development by providing a method through which local authorities can meet the requirements of the Habitats Regulations through avoidance and mitigation measures. The closest component parts of the Thames Basin Heaths SPA lie approx. 58m to the south of Wokingham borough (in Hart District) and approx. 158m to the south-east of Wokingham borough (in Bracknell Forest District).

3.2.2 Qualifying Features¹³

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Annex I breeding species:

- European nightjar *Caprimulgus europaeus*: 7.8% of the GB population
- Dartford warbler *Sylvia undata*: 27.8% of the GB population
- Woodlark *Lullula arborea*: 9.9% of the GB population

¹² <http://publications.naturalengland.org.uk/publication/6228755680854016> [Accessed on the 08/11/2021]

¹³ <http://publications.naturalengland.org.uk/publication/4952859267301376> [Accessed on the 08/11/2021]

3.2.3 Conservation Objectives¹⁴

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

3.2.4 Threats & Pressures to Site Integrity¹⁵

The following threats and pressures to the site integrity of the Thames Basin Heaths SPA have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance
- Undergrazing
- Forestry and woodland management
- Hydrological changes
- Inappropriate scrub control
- Invasive species
- Wildfire / arson
- Air pollution: Impact of atmospheric nitrogen deposition
- Military
- Habitat fragmentation

3.3 Thursley, Ash, Pirbright and Chobham SAC

3.3.1 Introduction

The Thursley, Ash, Pirbright and Chobham SAC is located in south-east England and comprises various habitats, including heath and scrub (75%), bogs and marshes (10%), coniferous woodland (10%) and inland water bodies (5%). Most important from an HRA perspective is the complex of heaths, which includes both wet and dry heath, acid mire and bog pools. The underlying geology of the SAC allows little drainage, which gives rise to the mire systems. The complex supports an outstanding assemblage of valley mire systems with high diversity of wetland invertebrates, bryophytes and other scarce species. The SAC also provides important habitat to breeding birds such as curlew and snipe. Component heathlands of the SAC are managed as nature reserves with public access, while other parts have military training ranges and are off-limit to the public.

At Thursley Common the wet heath is NVC type M16 *Erica tetralix* – *Sphagnum compactum* and contains several rare plants, including great sundew *Drosera anglica*, bog hair-grass *Deschampsia setacea*, bog orchid *Hammarbya paludosa* and brown beak-sedge *Rhynchospora fusca*. Thursley

¹⁴ <http://publications.naturalengland.org.uk/publication/4952859267301376> [Accessed on the 08/11/2021]

¹⁵ <http://publications.naturalengland.org.uk/publication/6249258780983296> [Accessed on the 08/11/2021]

Common is particularly important for invertebrates, such as the nationally rare white-faced darter *Leucorrhinia dubia*.

The SAC also contains a series of large fragments of dry heathland, a key representative of NVC type H2 *Calluna vulgaris* – *Ulex minor*. The dry heathland components include transitions to wet heath, valley mire, scrub, woodland and acid grassland and harbour numerous rare invertebrate species. They also harbour European nightjar *Caprimulgus europaeus*, Dartford warbler *Sylvia undata*, sand lizard *Lacerta agilis* and smooth snake *Coronella austriaca*. The closest component part of the SAC lies approx. 6.9km to the south-east of Wokingham borough in the authority of Surrey Heath.

3.3.2 Qualifying Features¹⁶

The site was designated as being of European importance for the following features:

- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- Depressions on peat substrates of the *Rhynchosporion*

3.3.3 Conservation Objectives¹⁷

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which qualifying natural habitats rely.

3.3.4 Threats & Pressures to Site Integrity¹⁸

The following threats and pressures to the site integrity of the Thursley, Ash, Pirbright and Chobham SAC have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance
- Undergrazing
- Forestry and woodland management
- Hydrological changes
- Inappropriate scrub control
- Invasive species
- Wildfire / arson
- Air pollution: Impact of atmospheric nitrogen deposition
- Military
- Habitat fragmentation

¹⁶ <http://archive.incc.gov.uk/default.aspx?page=2051> [Accessed on the 08/11/2021]

¹⁷ <https://sac.incc.gov.uk/site/UK0012793> [Accessed on the 08/11/2021]

¹⁸ <http://publications.naturalengland.org.uk/publication/6249258780983296> [Accessed on the 08/11/2021]

4. Impact Pathways

4.1 Impact Pathways Considered

The following impact pathways are considered relevant to the Revised Growth Strategy for Wokingham (note that the impact pathways loss of functionally linked land and water quantity, level and flow were screened out in the 2020 Wokingham Draft Local Plan Update HRA and are not reassessed here):

- Recreational pressure; and
- Atmospheric pollution.

4.2 Background to Recreational Pressure

4.2.1 Disturbance to breeding birds

There is concern about the cumulative impacts of recreation on key nature conservation sites in the UK, as most sites must fulfill conservation objectives while also providing recreational opportunity. This applies to any habitat, but the key qualifying features in lowland heathland are particularly vulnerable to human disturbance. An English Nature (the predecessor of Natural England) Research Report summarizes the key urban effects on heathland as habitat fragmentation, human disturbance, disturbance by animals linked to human presence (i.e. dogs and cats), increased risk of fires and trampling damage¹⁹. Various research reports have provided compelling links between changes in housing and access levels and impacts on European protected sites^{20 21}.

Particular concern applies to recreation effects on ground-nesting birds, with many studies concluding that more urban sites support lower densities of key species, such as stone curlew and nightjar^{22 23}. This is a direct consequence from the fact that birds are expending energy avoiding the stressor and this is time that is not spent feeding or incubating the eggs²⁴. Overall, disturbance is likely to increase energetic output while reducing energetic input, which can adversely affect the 'condition' and ultimately survival of the birds.

Evidence in the literature suggests that the magnitude of disturbance clearly differs between different types of recreational activities. For example, dog walking leads to a significantly higher reduction in bird diversity and abundance than hiking²⁵. Scientific evidence also suggests that key disturbance parameters, such as areas of influence and flush distance, are significantly greater for dog walkers than hikers²⁶. A UK meta-analysis suggests that important spatial (e.g. the area of a site potentially influenced) and temporal (e.g. how often or long an activity is carried out) parameters differ between recreational activities, suggesting that these are factors that should ideally be considered in ecological assessments²⁷. In addition, displacement of birds from one feeding site to others can increase the feeding pressure on available resources, which need to sustain greater numbers of birds²⁸. Importantly, recreational disturbance is generally higher in summer than in winter (due to more people engaging in outdoor activities) and this is also when the qualifying bird features are breeding in the SPA.

¹⁹ Underhill-Day, J. 2005. A literature review of urban effects on lowland heaths and their wildlife. English Nature Research Reports 623. 56pp.

²⁰ Liley D, Clarke R.T., Mallord J.W., Bullock J.M. 2006a. The effect of urban development and human disturbance on the distribution and abundance of nightjars on the Thames Basin and Dorset Heaths. Natural England / Footprint Ecology.

²¹ Liley D., Clarke R.T., Underhill-Day J., Tyldesley D.T. 2006b. Evidence to support the appropriate Assessment of development plans and projects in south-east Dorset. Footprint Ecology / Dorset County Council.

²² Clarke R.T., Liley D., Sharp J.M., Green R.E. 2013. Building development and roads: Implications for the distribution of stone curlews across the Brecks. PLOS ONE. doi:10.1371/journal.pone.0072984.

²³ Liley D., Clarke R.T. 2003. The impact of urban development and human disturbance on the numbers of nightjar *Caprimulgus europaeus* on heathlands in Dorset, England. Biological Conservation 114: 219-230.

²⁴ Riddington, R. et al. 1996. The impact of disturbance on the behaviour and energy budgets of Brent geese. *Bird Study* 43:269-279

²⁵ Banks P.B., Bryant J.Y. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. *Biology Letters* 3: 14pp.

²⁶ Miller S.G., Knight R.L., Miller C.K. 2001. Wildlife responses to pedestrians and dogs. 29: 124-132.

²⁷ Weitowitz D., Panter C., Hoskin R., Liley D. The spatio-temporal footprint of key recreation activities in European protected sites. Manuscript in preparation.

²⁸ Gill, J.A., Sutherland, W.J. & Norris, K. 1998. The consequences of human disturbance for estuarine birds. *RSPB Conservation Review* 12: 67-72

Disturbance can also arise from a much wider urbanisation effect that presents itself as a much more direct threat to survival, such as in the case of predation by dogs and cats. Dogs are often exercised off-lead and roam out of sight of their owners and have been documented to kill ground-nesting birds. Cats tend to roam freely at night, potentially hunting prey many kilometres away from their home.

4.2.2 Trampling damage, erosion and nutrient enrichment

Most terrestrial sites can be affected by trampling and other mechanical damage, which in turn causes soil compaction and / or erosion. Multiple research studies have experimentally shown the effects of trampling on plant community structure, often comparing several recreational activities:

- Wilson & Seney²⁹ examined the degree of track erosion caused by hikers, motorcycles, horses and cyclists from 108 plots along tracks in the Gallatin National Forest, Montana. Although the results proved difficult to interpret, it was concluded that horses and hikers disturbed more sediment on wet tracks, and therefore caused more erosion, than motorcycles and bicycles.
- Cole et al³⁰ conducted experimental off-track trampling in 18 closed forest, dwarf scrub and meadow & grassland communities (each tramped between 0 – 500 times) over five mountain regions in the US. Vegetation cover was assessed two weeks and one year after trampling, and an inverse relationship with trampling intensity was discovered, although this relationship was weaker after one year than two weeks indicating some recovery of the vegetation. Differences in plant morphological characteristics were found to explain more variation in response between different vegetation types than soil and topographic factors. Low-growing, mat-forming grasses regained their cover best after two weeks and were considered most resistant to trampling, while tall forbs (non-woody vascular plants other than grasses, sedges, rushes and ferns) were considered least resistant. The cover of hemicryptophytes and geophytes (plants with buds below the soil surface) was heavily reduced after two weeks but had recovered well after one year and as such these were considered most resilient to trampling. Chamaephytes (plants with buds above the soil surface) were least resilient to trampling. It was concluded that these would be the least tolerant of a regular cycle of disturbance.
- Cole³¹ conducted a follow-up study (in 4 vegetation types) in which shoe type (trainers or walking boots) and trampler weight were varied. Although immediate damage was greater with walking boots, there was no significant difference after one year. Heavier trampers caused a greater reduction in vegetation height than lighter trampers, but there was no difference in the effect on cover.
- Cole & Spildie³² experimentally compared the effects of off-track trampling by hiker and horse (at two intensities – 25 and 150 passes) in two woodland vegetation types (one with an erect forb understorey and one with a low shrub understorey). Horse trampling was found to cause the largest reduction in vegetation cover. The forb-dominated vegetation suffered greatest disturbance but recovered rapidly. Generally, it was shown that higher trampling intensities caused more disturbance.
- In heathland sites, trampling damage can also affect the value of a site to wildlife. For example, heavy use of sandy tracks loosens and continuously disturbs sand particles, reducing the habitat's suitability for invertebrates³³. Species that burrow into flat surfaces such as the centres of paths, are likely to be particularly vulnerable, as the loose

²⁹ Wilson, J.P. & J.P. Seney. 1994. Erosional impact of hikers, horses, motorcycles and off road bicycles on mountain trails in Montana. *Mountain Research and Development* 14:77-88

³⁰ Cole, D.N. 1995a. Experimental trampling of vegetation. I. Relationship between trampling intensity and vegetation response. *Journal of Applied Ecology* 32: 203-214

Cole, D.N. 1995b. Experimental trampling of vegetation. II. Predictors of resistance and resilience. *Journal of Applied Ecology* 32: 215-224

³¹ Cole, D.N. 1995c. Recreational trampling experiments: effects of trampler weight and shoe type. Research Note INT-RN-425. U.S. Forest Service, Intermountain Research Station, Utah.

³² Cole, D.N., Spildie, D.R. 1998. Hiker, horse and llama trampling effects on native vegetation in Montana, USA. *Journal of Environmental Management* 53: 61-71

³³ Taylor K., Anderson P., Liley D. & Underhill-Day J.C. 2006. Promoting positive access management to sites of nature conservation value: A guide to good practice. English Nature / Countryside Agency, Peterborough and Cheltenham.

sediment can no longer maintain their burrow. In some instances, nature conservation bodies and local authorities resort to hardening paths to prevent further erosion. However, this is concomitant with the loss of habitat used by wildlife, such as sand lizards and burrowing invertebrates.

Prolonged or repeated excessive trampling and the resulting erosion may, over time, lead to the exposure of tree roots. It has been demonstrated that recreational trails with high usage are subject to significantly more erosion and root exposure³⁴. Due to their size such root systems might not immediately appear to be sensitive to trampling damage. Indeed, a research study in 2002 showed that recreational trampling led to significant damage in the vegetation layer, particularly the beech seedlings and their fine mycorrhizal roots, but that the roots of mature trees were resilient to trampling³⁵. However, it has also been found that tree root exposure is associated with a higher risk of infection and rot. Furthermore, while trampling may not directly damage the tree roots, it does affect the soil structure around the root zones of mature and ancient trees, which in turn determines root growth, associations with mycorrhizal fungi and overall tree growth. Soil compaction leads to a loss of space for air and water molecules, both of which are integral to tree health³⁶. Due to their enhanced ecological value, this can be a particular issue for ancient and veteran tree assemblages, such as those present in Windsor Forest & Great Park SAC. For Chilterns Beechwoods SAC the Site Improvement Plan specifically identifies a target to reduce visitor impact on dead wood, as removal of dead wood by the general public is an issue on some parts of the SAC. However, this is more a matter of individual behaviour, rather than an inevitable corollary of an increasing population.

A major concern for nutrient-poor habitats (e.g. heathlands, bogs and fens) is nutrient enrichment associated with dog fouling, which has been addressed in various reviews (e.g.³⁷). It is estimated that dogs will defecate within 10 minutes of starting a walk and therefore most nutrient enrichment arising from dog faeces will occur within 400m of a site entrance. In contrast, dogs will urinate at frequent intervals during a walk, resulting in a more spread out distribution of urine. For example, in Burnham Beeches National Nature Reserve it is estimated that 30,000 litres of urine and 60 tonnes of dog faeces are deposited annually³⁸. While there is little information on the chemical constituents of dog faeces, nitrogen is one of the main components³⁹. Nutrient levels are the major determinant of plant community composition and the effect of dog defecation in sensitive habitats (e.g. heathland) is comparable to a high-level application of fertiliser, potentially resulting in the shift to plant communities that are more typical for improved grasslands.

The available baseline information suggests that the Thames Basin Heaths SPA and the Thursley, Ash, Pirbright & Chobham SAC are the most vulnerable of the sites to recreational pressure. In the SPA the main risk of recreational pressure is a reduced breeding success of nightjar, Dartford warbler and woodlark, all of which nest on or close to the ground. In the SAC recreational disturbance might lead to trampling damage of heathland plants, track erosion and nutrient enrichment. Wokingham Borough lies only approx. 158m from the SPA and the spatial distribution of residential dwellings is likely to affect the contribution of growth in the borough to this impact pathway, with allocations in the northern part of Wokingham Borough likely having a much lower recreational footprint in this European site than allocations in the south.

The Thames Basin Heaths SPA is a 8,274ha site in south-eastern England, an area of the country which is highly populated and where housing growth will lead to a further increase in the population of Boroughs and Districts surrounding the SPA. Recognising this as a key issue, English Nature (the predecessor of Natural England) commissioned a visitor survey in 2005 to establish a baseline level of recreational use in the SPA⁴⁰. This initial survey provided an estimate of approx. 5 million annual visits

³⁴ Leung Y.-F. & Marion J. F. (2000). Recreation impacts and management in wilderness: A state-of-knowledge review. USDA Forest Service Proceedings 5: 23-48.

³⁵ Walther B., Wiemken V., Rusterholz H.-P., Boller T. & Baur B. (2002). Disturbance of forest by trampling: Effects on mycorrhizal roots of seedlings and mature trees of *Fagus sylvatica*. Plant and Soil 243: 143-154.

³⁶ Natural England Site Conservation Objectives Supplementary Advice Note for the Windsor Forest & Great Park SAC. Available at: <http://publications.naturalengland.org.uk/publication/5175000009015296> [Accessed on the 08/11/2021].

³⁷ Taylor K., Anderson P., Taylor R.P., Longden K. & Fisher P. 2005. Dogs, access and nature conservation. English Nature Research Report, Peterborough.

³⁸ Barnard A. 2003. Getting the facts – Dog walking and visitor number surveys at Burnham Beeches and their implications for the management process. Countryside Recreation 11:16-19.

³⁹ Taylor K., Anderson P., Liley D. & Underhill-Day J.C. 2006. Promoting positive access management to sites of nature conservation value: A guide to good practice. English Nature / Countryside Agency, Peterborough and Cheltenham.

⁴⁰ Liley D., Jackson D.B. & Underhill-Day J.C. (2006). Visitor Access Patterns on the Thames Basin Heaths. English Nature Research Reports, N682, Peterborough.

to the SPA, highlighting it as a recreational honeypot resource in the region. Due to the ongoing issue of housing growth in the region, and to monitor potential changes in recreational pressure within the SPA, Natural England commissioned a repeat visitor survey in 2012 / 2013, and again in 2018, aiming as much as possible to repeat the methodology used in the 2005 survey⁴¹. Data from these studies will be used to assess the potential recreational impact of the Revised Growth Strategy for Wokingham on the Thames Basin Heaths SPA and the Thursley, Ash, Pirbright & Chobham SAC.

Overall, the following European sites within 10km of Wokingham Borough are sensitive to recreational pressure:

- **Thames Basin Heaths SPA (the closest parcel of the SPA lies only approx. 58m to the south of Wokingham Borough in the Hart District)**
- **Thursley, Ash, Pirbright & Chobham SAC (the closest parcel is located approx. 6.9km to the south-west of Wokingham Borough in the authority of Surrey Heath)**
- Chilterns Beechwoods SAC (the closest parcel is located approx. 2.8km to the north-east of the authority's boundary) – screened out in the HRA of the 2020 Wokingham Draft Local Plan Update regarding recreational pressure
- Windsor Forest and Great Park SAC (the closest parcel is located approx. 8.5km to the east of Wokingham Borough's boundary) – screened out in the HRA of the 2020 Wokingham Draft Local Plan Update regarding recreational pressure

4.3 Background to Atmospheric Pollution

The following table (Table 1) sets out the main sources and effects of air pollutants on habitats and species.

Table 1: Main sources and effects of air pollutants on habitats and species⁴²

Pollutant	Source	Effects on habitats and species
Sulphur Dioxide (SO ₂)	The main sources of SO₂ are electricity generation, and industrial and domestic fuel combustion. However, total SO₂ emissions in the UK have decreased substantially since the 1980's. Another origin of sulphur dioxide is the shipping industry and high atmospheric concentrations of SO₂ have been documented in busy ports. In future years shipping is likely to become one of the most important contributors to SO₂ emissions in the UK.	Wet and dry deposition of SO₂ acidifies soils and freshwater and may alter the composition of plant and animal communities. The magnitude of effects depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species. However, SO₂ background levels have fallen considerably since the 1970's and are now not regarded a threat to plant communities. For example, decreases in Sulphur dioxide concentrations have been linked to returning lichen species and improved tree health in London.
Acid deposition	Leads to acidification of soils and freshwater via atmospheric deposition of SO₂, NOx, ammonia and hydrochloric acid. Acid deposition from rain has declined by 85% in the last 20 years, which most of this contributed by lower sulphate levels. Although future trends in S emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced S levels.	Gaseous precursors (e.g. SO₂) can cause direct damage to sensitive vegetation, such as lichen, upon deposition. Can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds / plants.

⁴¹ Fearnley H. & Liley D. (2013). Results of the 2012/13 visitor survey on the Thames Basin Heaths Special Protection Area (SPA). Natural England Commissioned Reports, No. 136. 107pp.

⁴² Information summarised from the Air Pollution Information System (<http://www.apis.ac.uk/>)

Pollutant	Source	Effects on habitats and species
		Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible.
Ammonia (NH ₃)	Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock, although at a local scale traffic also contributes to ammonia emissions. Ammonia reacts with acid pollutants such as the products of SO₂ and NO_x emissions to produce fine ammonium (NH₄⁺) - containing aerosol. Due to its significantly longer lifetime, NH₄⁺ may be transferred much longer distances (and can therefore be a significant trans-boundary issue). While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.	The negative effect of NH₄⁺ may occur via direct toxicity when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is its contribution to eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen. However, it is also toxic to vegetation in low concentrations. As emissions mostly occur at ground level in the rural environment and NH₃ is rapidly deposited, some of the most acute problems of NH₃ deposition are for small relict nature reserves located in intensive agricultural landscapes.
Nitrogen oxides (NO _x)	Nitrogen oxides are mostly produced in combustion processes. Half of NO _x emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g. roadside verges) but only when sulphur dioxide is also elevated. A critical level of NO_x for all vegetation types has been set to 30 ug/m³. Deposition of nitrogen compounds (nitrates (NO₃), nitrogen dioxide (NO₂) and nitric acid (HNO₃)) contributes to the total nitrogen deposition and may lead to both soil and freshwater acidification. The main ecologically significant role of NO_x is through its contribution to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.
Nitrogen deposition	The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g. NO_x) or reduced (e.g. NH₃) nitrogen emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices. The N pollutants together are a large contributor to acidification (see above).	All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally. Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species. N deposition can also increase the risk of damage from abiotic factors, e.g. drought and frost.
Ozone (O ₃)	A secondary pollutant generated by photochemical reactions involving NO _x , volatile organic compounds (VOCs) and sunlight. These precursors are mainly	Concentrations of O₃ above 40 ppb can be toxic to both humans and wildlife, and can affect buildings. High O₃ concentrations are widely documented to cause damage to vegetation, including visible leaf

Pollutant	Source	Effects on habitats and species
	released by the combustion of fossil fuels (as discussed above). Increasing anthropogenic emissions of ozone precursors in the UK have led to an increased number of days when ozone levels rise above 40ppb ('episodes' or 'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	damage, reduction in floral biomass, reduction in crop yield (e.g. cereal grains, tomato, potato), reduction in the number of flowers, decrease in forest production and altered species composition in semi-natural plant communities.

As highlighted in Table 1, the main pollutants of concern for European sites are oxides of nitrogen (NO_x), ammonia (NH₃) and sulphur dioxide (SO₂). Ammonia can have a directly toxic effect upon vegetation even at low concentrations, particularly at close distances to the source such as near road verges⁴³. NO_x can also be toxic at high concentrations although generally only in the presence of elevated sulphur dioxide. Increased NO_x and NH₃ is likely to increase the total N deposition to soils, potentially leading to deleterious knock-on effects in resident ecosystems. Increases in nitrogen deposition from the atmosphere can, if sufficiently great, enhance soil fertility and lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats^{44 45}. In woodlands exceedance of the critical nitrogen load may lead to a nutrient imbalance, decrease in mycorrhiza, loss of epiphytic lichens and bryophytes, changes in ground vegetation and a change in soil fauna. In mires and fens increased nitrogen deposition may lead to increase in the abundance and percentage cover of sedges and vascular plants, and the reduction of bryophytes. In heathlands, the primary concern associated with eutrophication is a shift towards the dominance of more competitive graminoids, a decline in lichens, changes in the plant biochemistry and an increased sensitivity to abiotic stress.

Sulphur dioxide emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as (particularly on a local scale) shipping⁴⁶. Ammonia emissions originate particularly from agricultural practices⁴⁷, but some chemical processes and certain vehicles also make notable contributions. NO_x emissions are dominated by the output of vehicle exhausts (more than half of all emissions). A 'typical' housing development will contribute by far the largest portion to its overall NO_x footprint (92%) through the associated road traffic. Other sources, although relevant, are of minor importance in comparison⁴⁸. The total nitrogen deposition is a metric that represents the cumulative nitrogen addition from several sources and is perhaps most useful from an HRA perspective because it allows a habitat-specific assessment of air quality impacts⁴⁹. Given the origin of nitrogen-derived atmospheric pollutants, it is considered that the Revised Growth Strategy might be associated with an increase in such atmospheric pollutants.

Critical thresholds are now available for most atmospheric pollutants. For example, according to the World Health Organisation, the critical NO_x concentration (critical threshold) for the protection of vegetation is 30 µgm⁻³; while the threshold for sulphur dioxide is 20 µgm⁻³. In addition, ecological studies have determined 'critical loads'⁵⁰ of atmospheric nitrogen deposition (that is, NO_x combined with ammonia NH₃).

The Department of Transport's Transport Analysis Guidance highlights that, beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant⁵¹ (Figure

⁴³ http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm.

⁴⁴ Wolseley, P. A.; James, P. W.; Theobald, M. R.; Sutton, M. A. **2006**. Detecting changes in epiphytic lichen communities at sites affected by atmospheric ammonia from agricultural sources. *Lichenologist* 38: 161-176

⁴⁵ Dijk, N. **2011**. Dry deposition of ammonia gas drives species change faster than wet deposition of ammonium ions: evidence from a long-term field manipulation *Global Change Biology* 17: 3589-3607

⁴⁶ http://www.apis.ac.uk/overview/pollutants/overview_SO2.htm.

⁴⁷ Pain, B.F.; Weerden, T.J.; Chambers, B.J.; Phillips, V.R.; Jarvis, S.C. 1998. A new inventory for ammonia emissions from U.K. agriculture. *Atmospheric Environment* 32: 309-313

⁴⁸ Proportions calculated based upon data presented in Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. <http://www.airquality.co.uk/archive/index.php>

⁴⁹ As opposed to the generic NO_x limit set for all vegetation.

⁵⁰ The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur

⁵¹ <http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013> [Accessed on the 08/11/2021]

3). The same 200m distance is utilised by Highways England in their road assessments⁵² and is cited in recently published guidance from the Institute of Air Quality Management⁵³. This is therefore the distance that has been used throughout this HRA in order to determine whether European sites are likely to be significantly affected by development outlined in a Plan document.

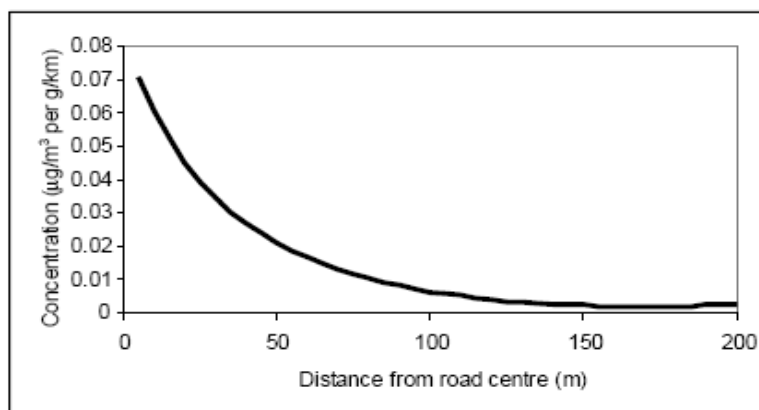


Figure 3: Traffic contribution to concentrations of pollutants at different distances from a road
(Source: DfT⁵⁴)

Exhaust emissions from vehicles are capable of adversely affecting both woodland and heathland habitats. Considering this, an increase in the net population and employment growth within Wokingham Borough is likely to result in increased traffic flows past European sites that are sensitive to atmospheric pollution, which is particularly important where major roads lie within 200m of the protected site boundary. Atmospheric pollution is a particularly pertinent issue for Wokingham Borough, because it lies close to European sites that are designated for heathland and ancient trees. For example, heathland is particularly sensitive to nitrogen deposition, because its component plant species are adapted to very low nutrient conditions and are therefore at a competitive disadvantage to grasses and other plants, which grow much faster under increased nutrient concentrations.

The following European sites within 10km of Wokingham Borough are sensitive to atmospheric pollution resulting from an increase in the number of car-based commuter journeys and these may be affected by changes in vehicle numbers and commuter journeys in Wokingham Borough depending on the key journey to work routes out of the borough and the proximity of sensitive habitats to those routes:

- **Chilterns Beechwoods SAC (located approx. 2.3km to the north-east of Wokingham Borough)**
- **Thames Basin Heaths SPA (located approx. 58m to the south of Wokingham Borough)**
- Thursley, Ash, Pirbright and Chobham SAC (located approx. 6.9km to the south-east of Wokingham Borough) – screened out in the 2020 Wokingham Draft Local Plan Update HRA
- Windsor Forest & Great Park (located approx. 8.6km to the east of Wokingham Borough) – screened out in the 2020 Wokingham Draft Local Plan Update HRA

The Air Pollution Information System (APIS)⁵⁵ indicates that some of the qualifying features of the Chilterns Beechwoods SAC are sensitive to atmospheric pollutants. For example, the *Asperulo-Fagetum* beech forests have a critical nitrogen limit of 10-20 kg N/ha/yr. Equally, the semi-natural dry grasslands and scrubland facies on calcareous substrates (important orchid sites) are sensitive to atmospheric pollution, with an empirical critical nitrogen load of 15-25 kg N/ha/yr. In contrast, the stag beetles themselves would not be affected by nitrogen deposition according to APIS.

The Thames Basin Heaths SPA is designated for its breeding populations of specialist heathlands birds, including European nightjar, woodlark and Dartford warbler. APIS classifies the SPA as susceptible to atmospheric pollution, due to negative impacts on the habitats (particularly heathland and acid

⁵² http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA_105_Air_quality-web.pdf

⁵³ <http://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf>, paragraph 5.3.6

⁵⁴ <http://www.dft.gov.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf>

⁵⁵ <http://www.apis.ac.uk/src/select-a-feature?site=UK0012724&SiteType=SAC&submit=Next> [Accessed on the 08/11/2021]

grassland) in which the qualifying birds' nest. Dwarf shrub heath has a critical load of 10-20 kg N/ha/yr. Nightjar and woodlark also nest within rotationally-managed conifer plantation⁵⁶ but it is likely that plantation management (the sequential process of ground preparation, tree planting, weed suppression, tree thinning and clear-felling) is the primary influence on the suitability of a plantation for nesting by either species.

4.4 Summary

In summary, therefore, this HRA will focus upon recreational pressure on the Thames Basin Heaths SPA and atmospheric pollution impacts on the Thames Basin Heaths SPA and the Chilterns Beechwoods SAC.

⁵⁶ Rotationally-managed conifer plantation is generally suitable for nesting woodlark during the first 5-6 years, and for nesting nightjar during the first c. 20 years, of a typical growth cycle. After that time the woody growth is too mature and dense to be suitable and the birds nest elsewhere until the trees are felled and the plantation cycle starts again.

5. Appropriate Assessment

5.1 Recreational Pressure

The HRA has identified several policies in the Revised Growth Strategy that provide for new residential development within Wokingham Borough, which will increase the local population and result in increased recreational pressure in the borough and beyond. The following policies need to be considered in relation to the impact pathway recreational pressure:

- Policy SS1 – Spatial Strategy: Provides for 15,513 net additional dwellings over the plan period 2018-2038
- Policy SS3 – Hall Farm / Loddon Valley: Provides for at least 2,200 net new dwellings within the Plan period, and 4,500 in total
- Policy SS5 – South of the M4 Strategic Development Location: Provides for an additional 366 net new dwellings (see Table 2)
- Policy SS6 – North Wokingham Strategic Development Location: Provides for an additional 33 net new dwellings and a care home (see Table 2)
- Policy SS7 – South Wokingham Strategic Development Location: Provides for an additional 889 net new dwellings (see Table 2)
- Policy H1 – Housing Provision: Provides for a minimum of 15,513 net new dwellings in the Plan period between 2018 and 2038
- Policy H2 – Sites allocated for residential / mixed use development: Lists 24 proposed residential sites retained from the 2020 Wokingham Draft Local Plan Update and proposes to allocate an additional 19 new sites as part of the Revised Growth Strategy (totalling 967 dwellings)

Several policies retained in the Revised Growth Strategy are not being consulted upon, but need to be considered in the context of recreational pressure:

- Policy SS2 – Settlement Hierarchy: Identifies the location of major development throughout Wokingham Borough
- Policy ER10 – Whiteknights Campus: Provides for additional student accommodation
- Policy H11 – Gypsies and Travellers and Travelling Showpeople provision: Provides for 24 net new gypsy and traveller pitches

5.1.1 Thames Basin Heaths SPA

The HRA of the 2020 Wokingham Draft Local Plan Update established that LSEs of the Plan on the Thames Basin Heaths SPA from an increase in recreational pressure could not be excluded. Natural England's Site Improvement Plan for the SPA highlights recreational disturbance as a threat to the qualifying birds for the site, particularly because the SPA species nest on (or close to) the ground and are therefore highly sensitive to recreational disturbance (such as from dog walkers). The main parcels of the SPA that are most likely to be accessed by new residents lie to the south and the south-east of the Wokingham Borough boundary, including the Bramshill SSSI and Broadmoor to Bagshot Woods and Heaths SSSI.

Much of the available evidence base relating to the in-combination recreational pressure in the Thames Basin Heaths SPA, stems from three visitor surveys undertaken in 2005, 2012 / 2013 and 2018. The 2005 visitor survey was commissioned by English Nature (the predecessor of Natural England) to provide a baseline on recreational pressure in the SPA. Given the significant housing growth in south-east England, a further visitor survey was then undertaken on behalf of Natural England in 2012 / 2013⁵⁷, and again in 2018⁵⁸, replicating the original methodology where possible. The results of these

⁵⁷ Fearnley H. & Liley D. (2013). Results of the 2012/13 visitor survey on the Thames Basin Heaths Special Protection Area (SPA). Natural England Commissioned Reports, Number 135. 107pp.

⁵⁸ Visitor Access Patterns on the Thames Basin Heaths 2018 (EPR for Natural England). Available at: <https://surreyheath.moderngov.co.uk/documents/g3273/Public%20reports%20pack%2019th-Sep-2019%2010.00%20Thames%20Basin%20Heaths%20Joint%20Strategic%20Partnership%20Board.pdf?T=10>

visitor surveys (as relevant to Wokingham Borough) are discussed in the following to assess whether the Revised Growth Strategy for Wokingham might affect the recreational footprint in the SPA.

5.1.1.1 Overview of In-Combination Visitor Survey Results as Relevant to Wokingham Borough

The most relevant access points to the SPA for Wokingham Borough's residents covered by the visitor surveys, based on proximity to Wokingham Borough and good accessibility via main road links, are the following:

- Broadmoor to Bagshot Woods & Heaths SSSI, and Bracknell Forest (survey locations 3 and 30 respectively), which are easily accessible via the A322 and the B3430 (in Bracknell Forest)
- Wildmoor Heath near Sandhurst (covered by survey locations 19 and 20 respectively) (in Bracknell Forest)
- Bramshill Plantation and Warren Heath (survey locations 7 and 8 respectively) are two parcels of the SPA that lie immediately south of Wokingham Borough and are easily accessible via the A327 and Bramshill Road. (in Hart District)
- Castle Bottom to Yateley & Hawley Common (survey locations 9 and 10 respectively) are components of the SPA that lie along the A30 to the south of Wokingham Borough (in Hart District)

The 2012 tally counts indicate that survey points 3 and 30, which provide access to the Broadmoor and Bagshot Woods & Heaths SSSI, are very popular for recreational users. Survey point 3 (The Lookout) was the second most popular of all sites surveyed in the Thames Basin Heaths SPA, totalling 541 adults and 153 dogs entering over a 32-hour survey period. Survey point 30 was slightly quieter with 188 adults and 201 dogs entering over a similar timeframe. The fact that more dogs than adults were counted as entering in this location, likely means that this location is used by professional dog walkers, who are often accompanied by multiple dogs. It is considered that these two locations are among the most likely to be visited by residents from Wokingham Borough, because they can be conveniently reached via the A322 that connects this part of Bracknell Forest with Wokingham Borough.

In contrast, on Warren Heath (survey point 8) just south of Wokingham Borough in Hart District, only 40 adults and 34 dogs were entering over a 32-hour period. No count data were available for the nearby Bramshill Plantation. This area of the SPA appears to be considerably less busy than the 'honeypot' component parcels in Bracknell Forest. Survey points 9 and 10, which are the main access points to Yateley Common Country Park, were slightly busier than the SPA sites around Bramshill. Seventy-six people and 37 dogs were observed entering at survey point 9, whereas 140 people and 87 dogs entered at survey point 10 (both over 16-hour periods). These parts of the SPA are a short distance south of Wokingham Borough but can be relatively easily accessed via the A327 and the A30 road link. It is likely that most recreational use would arise from residents originating from Hart, but due to the proximity of these parts of the SPA to Wokingham Borough, some additional recreational usage might arise from the Revised Growth Strategy.

More generally, the data from the visitor surveys in May / June and August 2012 indicate that most interviewees visit the SPA daily (929 interviewees, 38%) or more than once a week (833 interviewees, 34%). Notably, most visitors undertake dog walking as their main activity (1,939 interviewees, 66%), followed by walking (614 interviewees, 21%) and cycling (124 interviewees, 4%). Furthermore, only 10% of interviewees have visited the site for less than a year, while 26% have been using the SPA between 1 and 5 years and a further 25% having visited between 5 and 10 years. 75% of interviewees visit the site by car and 22% travel on foot, the latter being local residents that live within walking distance of the SPA. These results are important because they demonstrate that the Thames Basin Heaths SPA is subject to high levels of repeat recreational pressure, most notably from dog walkers, which is the user group that is likely to have the highest disturbance impact to ground-nesting birds.

The 2012 visitor survey showed that of 2,316 interviewees giving a valid postcode, 2,177 (94%) lived within a 5km radius from the SPA. Only 6% of visitors travelled from beyond a 5km catchment zone. Interestingly, in comparison to the earlier visitor survey undertaken in 2005, the number of visitors from within the 5km zone increased from 88% to 93%. This is most likely due to an increase in the number of dwellings within 5km of the Thames Basin Heaths SPA in that 7-year timeframe. 75% of car-based

visitors that were on a short visit from home, lived within 4.61km of the survey location. Importantly, the 2012 visitor survey also identified which Local Planning Authorities interviewees lived in. Unsurprisingly, most visitors originate from districts that encompass significant areas of the SPA, including Surrey Heath (540 interviewees, 23%), Woking (355 interviewees, 15%) and Hart Districts (341 interviewees, 15%). Wokingham Borough's contribution to the overall recreational footprint in the SPA was considerably lower, with only 112 interviewees (5%) coming from this authority. According to the map showing the distribution of visitor postcodes, most visitors from the borough come from the wider area surrounding the market town of Wokingham. While this evidence indicates that Wokingham Borough is not one of the top five contributors to recreational pressure in the SPA, due consideration to its impact must be given, particularly in-combination with the residential growth in other authorities surrounding the SPA.

5.1.1.2 In-Combination Approach to Mitigation in the Thames Basin Heaths SPA

The evidence base from the aforementioned visitor surveys has fed into HRAs of numerous of the SPA's adjacent authorities and has culminated in the Thames Basin Heaths (TBH) Joint Strategic Partnership Board (JSPB), comprised of eleven local authorities and two County Councils.

Most importantly, visitor catchment data from the visitor surveys have informed several TBH SPA Avoidance Strategies (such as the Guildford Borough Council Avoidance Strategy⁵⁹). These are effectively Supplementary Planning Documents agreed with Natural England), which detail how authorities propose to avoid adverse effects on the site integrity of the SPA. Primarily, these strategies identify buffer zones around the SPA, which are associated with specific conditions and / or mitigation requirements. For the Thames Basin Heaths SPA, these zones have been identified as follows:

- a 400m exclusion zone, where no additional development is permitted
- the SPA's primary visitor catchment zone between 400m and 5km, where additional residential development must be mitigated through a combination of Suitable Alternative Natural Greenspace (SANG) and Strategic Access Management and Monitoring (SAMM)
- the 5-7km zone where residential development over 50 dwellings must be mitigated as above, on a case-by-case basis

The 2020 Wokingham Draft Local Plan Update proposed new land for development, including smaller residential sites across Wokingham Borough, and most importantly the large residential allocation at Grazeley Garden Town providing for 3,750 dwellings within the Plan period (and a minimum of 10,000 dwellings in Wokingham Borough in total). The key change between the 2020 Wokingham Draft Local Plan Update and the Revised Growth Strategy is the removal of Grazeley and the addition of the SDL at Hall Farm / Loddon Valley (allocating 2,200 dwellings in the period to 2038). The new SDL lies in the south-western part of the Borough, partly within the 5km and 5-7km buffer zones surrounding the TBH SPA, adjoining the existing conurbation of Shinfield. Therefore, the Hall Farm / Loddon Valley SDL will need to provide SANG and SAMM to protect the Thames Basin Heaths SPA from an increase in recreational pressure.

A series of smaller housing sites have been included in the Revised Growth Strategy in order for the Council to meet its assigned Local Housing Need (LHN; the overall quantum of growth has increased from 13,901 dwellings in the 2020 Draft Local Plan Update to 15,513 in the Revised Growth Strategy). Table 3 lists the net increase or decrease in housing quantum delivered by SDLs, revised smaller housing allocations and new housing sites.

⁵⁹ Guildford Borough Council. (2017). Thames Basin Heaths Special Protection Area Avoidance Strategy 2017 – Supplementary Planning Document.

Table 2: List of changes in the number of allocated dwellings in Strategic Development Locations and smaller residential sites between the Revised Growth Strategy and the 2020 Wokingham Draft Local Plan Update.

Strategic Development Location (SDL)	Residential Allocations (within SDLs where relevant)	Net Change in Dwellings
Grazeley Garden Town	Deleted	- 3,750 (of overall quantum of 10,000 to be delivered including beyond the Plan period)
Hall Farm / Loddon Valley SDL	Added	+ 2,200 (total of 4,500 to be delivered including beyond the Plan period)
Arborfield SDL	Garrison Westward Cottage, Sheerlands Road	+ 10
South of the M4 SDL	Land north of Arborfield Road, Shinfield	+ 191
	Land east and west of Hyde Road	+ 175
North Wokingham SDL	Ashridge Farm	+ 3
	Land east of Toutley Depot	+ 30 and a care home
South Wokingham SDL	Land south of Waterloo Road	+ 835
	Land to the west of St Anne's Drive and south of London Road	+ 54
Changes in Smaller Residential Allocations (not part of SDLs)	Land north of the Shires, Barkham	-1
	Land east of Park View Drive North, Charvil	- 7
	Land west of Park Lane, Charvil	- 14
	Land to the rear of 9-17 Northbury Lane, Ruscombe	+ 5
	Land between 39-53 New Road, Ruscombe	+ 7
	Land at Bridge Farm, Twyford	+ 30
	Winnersh Plan Hire, Reading Road, Winnersh	+ 65
	Winnersh Farms, Winnersh	+ 37
	Station Industrial Estate, Oxford Road, Wokingham	- 52
	54-58 Reading Road, Wokingham	+ 22
Additional Proposed Sites in the Revised Growth Strategy which were not in the 2020 Draft	Rooks Nest Farm and 24 Barkham Ride, Finchampstead	+ 270
	31-33 Barkham Ride, Finchampstead	+ 66
	Greenacres Farm, Nine Mile Ride, Finchampstead	+ 100

**Strategic
Development
Location (SDL)**

Residential Allocations (within SDLs where Net Change in Dwellings relevant)

Local Plan (not part of SDLs)	Land north of London Road and East of A329(M)	+ 45
	Land east of Pound Lane, Sonning (Sonning Golf Club)	+ 24
	Land west of Trowes Lane, Swallowfield	+ 70
	Land to the rear of Bulldog Garage, Reading Road, Wokingham	+ 25
	69 King Street Lane, Winnersh	+ 25
	Land to the rear of Toutley Hall, north west of Old Forest Road, Winnersh	+ 15
	Former M&S, 26-36 Peach Street, Wokingham	+ 15
	Wokingham Library, Denmark Street, Wokingham	+ 15
	Suffolk Lodge, Rectory Road, Wokingham	+ 20
	Land at the corner of Wellington Road and Station Road (accessed via Park Road), Wokingham	+ 21
	Millars Business Park, Molly Millars Lane, Wokingham	+ 90
	Bridge Retail Park, Finchampstead Road, Wokingham	+ 59
	Land to the rear of Sandford Pumping Station, Mohawk Way, Woodley	+ 15
Total change in residential growth		+ 721

5.1.1.3 Relevant Mitigation identified in the 2020 Wokingham Draft Local Plan Update

Table 3 shows the allocated sites in the Revised Growth Strategy that provide for residential development within 7km of the Thames Basin Heaths SPA, the catchment zone that has been identified by Natural England as requiring mitigation for at least some residential sites. All allocations within 5km of the SPA, and those within 5-7km delivering more than 50 dwellings, must be mitigated (marked in orange). The Arborfield Garrison SDL was allocated, assessed and mitigated as part of the adopted Core Strategy and its HRA, and therefore does not require mitigation (marked in green, see * in Table 3 for reference). Allocations within the 5-7km zone with less than 50 dwellings also do not require mitigation (also marked in green).

The bulk of this growth will be delivered through five SDLs, most notably the new Hall Farm / Loddon Valley SDL, which allocates 2,200 new residential dwellings in Wokingham Borough in the Plan period to 2038. All SDLs lie within 5km of the Thames Basin Heaths SPA (or in the case of Hall Farm / Loddon Valley, South of the M4 and North Wokingham SDLs partially in the 5-7km zone), in the core mitigation zone surrounding the SPA. **Policy H2** (Sites allocated for residential / mixed uses) also allocates 25 smaller residential sites within Natural England's 7km wider mitigation zone (four of these allocations are within the 5-7km zone but comprise more than 50 dwellings). Overall, the Revised Growth Strategy

for Wokingham proposes to deliver 5,191 net new residential dwellings within the wider 7km mitigation boundary, equating to 11,420 new residents⁶⁰.

Using Natural England's SANG standards and the average occupancy rates in the UK, Table 4 shows the total amount of SANG that would be needed to mitigate the overall residential growth surrounding the Thames Basin Heaths SPA. According to Natural England advice these allocations will also require mitigation in the form of Strategic Access Management and Monitoring (SAMM).

Table 3: Residential site allocations proposed in the Revised Growth Strategy within 7km of the Thames Basin Heaths SPA. Residential allocations that require mitigation are marked in orange, because they either fall within the 5km catchment zone, or they lie between 5-7km away and allocate over 50 dwellings.

*** For an explanation of why this site is shaded green please see the main body of text.**

+ The Revised Growth Strategy includes these residential sites in Strategic Development Locations, but they are listed here separately for clarity.

Site Type	Site Reference ⁶¹	Site Address	Number of Dwellings	Approx. Shortest Distance (m) to the Thames Basin Heaths SPA boundary
Strategic Development Allocations	NA	Arborfield Garrison	3,479*	817.91
	5FI028	Westwood Cottage, Sheerlands Road ⁺	10	1,903.47
	NA	South Wokingham	2,899	2,063.9
	5WK006	Land South of Gipsy Lane	17	4,551.84
	5WW030	Land South of Waterloo Road ⁺	835	2,072.87
	5WK043	Land to the west of St Anne's Drive and south of London Road ⁺	54	3,678.4
	NA	North Wokingham	1,537	3,502.4
	5WK002	Ashridge Farm, Warren House Road ⁺	153	5,442.88
	5WK051	Land east of Toutley Depot ⁺	130	6,435.53
	NA	South of M4	2,436	3,678.4
	SH011	Land End House	5	5,717.71
	5SH025	Land north of Arborfield Road, Shinfield	191	4,734.22
	5SH023, 27	Land east and west of Hyde Road	175	4,136.05
	NA	Hall Farm / Loddon Valley	2,200	3,674.11
	5SW019	Land west of Trowes Lane, Swallowfield	70	2,342.6

⁶⁰ Note this assumes an average occupancy rate of 2.4 people per dwelling. This number is typically used in SANG capacity calculations.

⁶¹ The site boundaries of the proposed residential allocations are set out in the Revised Growth Strategy. As part of the plan making process, the proposed site allocation boundaries do not always match those of the land promoted.

Site Type	Site Reference ⁶¹	Site Address	Number of Dwellings	Approx. Distance (m) to the Thames Basin Heaths SPA boundary
Smaller Housing Allocations	5FI004	Greenacres Farm, Nine Mile Ride, Finchampstead	100	2,659.47
	5FI024	Jovike, Lower Wokingham Road	15	2,676.27
	5BA032, 33	Rooks Nest Farm and 24 Barkham Ride, Finchampstead	270	3,426.4
	5HU051	Land north of London Road and East of A329	45	3,538.33
	5FI015	Land to the rear of 166 Nine Mile Ride	4	3,813.95
	5FI001	Tintagel Farm, Sandhurst Road	5	3,985.06
	5FI003	31-33 Barkham Ride, Finchampstead	66	4,066.7
	5BA013	Woodlands Farm, Wood Lane	15	4,180.56
	5WK006	Land South of Gipsy Lane	17	4,531.67
	5WK050	Former M&S, 26-36 Peach Street, Wokingham	15	4,933.33
	5WK047	Wokingham Denmark Library, Street, Wokingham	15	4,990.56
	5WK045	Bridge Retail Park, Finchampstead Road, Wokingham	59	5,020.17
	5WK048	Suffolk Lodge, Rectory Road, Wokingham	20	5,223.18
	5WK030	Millars Business Park, Molly Millars Lane, Wokingham	90	5,539.57
	5WK029	Station Industrial Estate, Oxford Road	40	5,649.89
	5BA024	Land North of The Shires	5	5,641.85
	5WK012	54 - 58 Reading Road	31	5,731.35
	5SH031	Rustlings', 'The Spring' and land to the rear of 'Cushendall', Shinfield Road	10	6,348.99
	5WI011	Wheatsheaf Close	25	6,392.53
All Residential			11,423 dwellings	

Site Type	Site Reference ⁶¹	Site Address	Number of Dwellings	Approx. Distance (m) to the Thames Basin Heaths SPA boundary	Shortest
Sites Requiring Mitigation					

Table 4 below draws on the data in Table 3 to determine the total SANG capacity that will be required to mitigate all allocations in the 5km and 7km zones (the latter only including allocations of 50 or more dwellings). It uses a worst-case scenario of SANG at 8ha/1000 population for all development within 5-7km of the SPA, whereas in practice a standard of 2ha/1000 population has been used for that zone on a case-by-case basis.

Table 4: Calculation of SANG capacity requirements to mitigate the residential growth allocated in the Revised Growth Strategy within the agreed mitigation zone for the Thames Basin Heaths SPA. This is based on average occupancy rate of residential housing and Natural England SANG standards.

Mitigation Requirement	Natural England Requirement	SANG Requirement
Number of Dwellings: 11,423	8ha per 1000 new residents	Required Total SANG area: 219.32ha
Number of Residents*:27,415	0.008ha per every 1 new resident	
According to average occupancy of 2.4 residents / dwelling		

The Revised Growth Strategy does not consult on most policies from the 2020 Draft Local Plan Update, but proposes to retain the policy framework, and the aims and objectives set out in the earlier consultation and therefore an adequate mitigation framework in policy text remains. Recognition to SANG and SAMM is given in **Policy NE2** (Thames Basin Heaths Special Protection Area), which introduces the agreed mitigation zones around the SPA and details Natural England's SANG criteria. Specifically, the policy states that *'the Council has identified sufficient SANG provision as part of the avoidance and mitigation measures required for the Development Plan'*. Furthermore, the policy also specifies that *'Proposals will be required to make financial contributions towards avoidance and mitigation measures, including SANG and SAMM'*. Overall, this policy provides additional details about the mitigation measures to be delivered regarding the SPA. Wokingham Borough Council has estimated future SANG requirements based on current information and capacities. As a result, future options and opportunities will be considered and investigated, and the council is confident that a solution to provide suitable mitigation can be found prior to submission of the Local Plan Update to the Secretary of State.

The Revised Growth Strategy also acknowledges the need for both SANG and SAMM mitigation in the policies for the Strategic Development Locations, the allocations that propose the main residential growth in Wokingham. The necessity of SANG is referred to in **Policies SS4** (Arborfield Garrison Strategic Development Site), **SS5** (South of the M4 Strategic Development Site), **SS6** (North Wokingham Strategic Development Site) and **SS7** (South Wokingham Strategic Development Site). This is most important with respect to the Hall Farm / Loddon Valley SDL, which allocates 2,200 net new residential dwellings within the core mitigation zone surrounding the SPA (distributed between the 5km and 5-7km mitigation zones surrounding the SPA). **Policy SS3** stipulates that one of the site's development principles is to *'deliver a comprehensive strategic landscape and connectivity strategy, and a network of multi-functional green and blue infrastructure, incorporating River Loddon and Barkham Brook, to create a country park supplemented by ecological networks and habitats and promote high levels of connectivity, including to the Loddon long distance footpath and greenways'*. SANG and SAMM requirements for new housing are already mandatory through other policies in the

Revised Growth Strategy. However, it is recommended that specific SANG requirements are incorporated to all strategic development policies to ensure that the Revised Growth Strategy is compliant with the requirements of the Conservation of Habitats and Species Regulations 2017 (as amended).

The current iteration of the Revised Growth Strategy does not include specifics on the amount and location of SANG that is to be delivered. Based on the allocated number of residential dwellings within the SPA's 7km mitigation zone, a total of 219.32ha of SANG would be required (see Table 4; assuming that a 8ha / 1,000 population would also be required for dwellings in the 5-7km mitigation zone) to ensure that there is sufficient capacity to absorb the residential growth. However, there are several SANGs within the borough, several of which have remaining unused capacity. In addition, SANGs already provided as part of the SDLs will continue to provide on-site mitigation for existing committed development. Due regard should be given to the geographic siting of the SANGs for them to represent a realistic alternative destination for local residents. For example, ideally a SANG should be situated closer to the proposed residential development than any component parcel of the SPA. This is because increasing distance from home is negatively correlated with the likelihood of visiting and the SANG's lower appeal (compared to the TBH SPA, which is an iconic destination) is more likely to be compensated for. It is to be noted that SANGs can be created from existing open space with no prior access or a greenspace that is already in publicly accessible. If a proposed SANG is already in public use, a discounting exercise is required to establish the current level of use and to confirm the residual capacity. Furthermore, SANGs would need to conform to Natural England standards, including a circular walk of 2.3-2.5km, adequate parking (for SANGs over 4ha in size) and a well-maintained path network.

Despite the provision of appropriately sized and located SANG, a small proportion of new Wokingham Borough residents would still visit the Thames Basin Heaths SPA, because:

- Some of the proposed residential site allocations are located in the south of Wokingham Borough and lie within a relatively short driving distance from component parcels (e.g. Bramshill SSSI) of the Thames Basin Heaths SPA
- The SPA has a unique draw (e.g. habitats, wildlife interest, feeling of openness) that is difficult to replicate in SANGs

The Revised Growth Strategy recognises that developers should provide financial contributions to SAMM delivery. SAMM is a programme of Strategic Access Management and Monitoring measures that was set up by the Thames Basin Heaths Joint Strategic Partnership Board (JSPB) in 2009. The Outline Business Plan for the project established a set of strategic avoidance measures, namely:

- A team of on-site full-time and voluntary wardens to mitigate the impacts of recreational pressure
- A long-term monitoring programme of visitor numbers in the component parcels of the SPA
- A long-term monitoring programme of the SPA's qualifying bird species to ensure that breeding bird numbers are not affected by the increasing visitor pressure

Previously, it was agreed that the SAMM delivery would be funded by developer contributions. SAMM contributions are currently calculated on the basis of the number of bedrooms per dwelling⁶², depending on whether they lie in the 5km or 5-7km mitigation zone, with Local Authorities collecting the contributions from developers. However, Natural England is continually reviewing the appropriate per-dwelling tariff for SAMM contributions in line with emerging evidence.

Overall, the SANG and SAMM mitigation package was developed by Natural England to avoid adverse effects on the integrity of the Thames Basin Heaths SPA. Therefore, it is considered that given the adequate recognition of SANG and SAMM in the Revised Growth Strategy for Wokingham, the Plan would not have significant negative impacts on the SPA. Specifically, given the adequate provision of SANG, the residual number of new Wokingham Borough residents visiting the TBH SPA would result in only a small overall increase in the recreational footprint within the site.

⁶² Up-to-date developer contributions can be accessed at: <https://www.wokingham.gov.uk/planning-policy/planning-policy-information/environment-evidence/> [Accessed on the 18/11/2021]

In addition to recognising the requirements for SANG and SAMM mitigation, the Draft Local Plan consultation (2020) contained further policies that are likely to reduce recreational pressure in the Thames Basin Heaths SPA by enhancing connectivity in the borough, promoting physical activities and providing more recreational greenspace. For example, **Policy SS12** (Improvements to Transport Routes) identifies several schemes that provide for better connections and accessibility, including East – West pedestrian and cycle links to villages of Three Mile Cross and Spencers Wood, upgrades to the accessibility of Green Park, and general enhancements of the footpath and cycle networks. Importantly, **Policy C8** (Green and Blue Infrastructure and Public Rights of Way) identifies that development projects themselves should also contribute to projects enhancing the residents' ability to access and use greenspaces. The policy states that *'development proposals should improve or contribute towards: a) The establishment of a Loddon / Blackwater riverside footpath and bridleway... b) The establishment of a riverside footpath and cycleway to accommodate dual use for all users along the Emm brook... c) The establishment of a linear 'canal corridor' at Grazeley garden town to integrate the existing Foudry Brook with development to provide informal recreation'*.

Policy HC3 (Open Space, Sports, Recreation and Play Facilities) stipulates that *'existing open space, sports and recreation and play facilities will be protected, maintained and where possible enhanced'*. Furthermore, *'Development proposals for new residential development, will be required to provide or contribute to the provision of open space, sport and recreation and play facilities'*, such as 1.1ha of parks and gardens, 2.84ha of natural / semi-natural greenspace, 1.66ha of outdoor sports facilities and 0.98ha of amenity greenspace per 1,000 population. Delivering public outdoor spaces close to new residential development engages people locally and maximises the capacity for the local absorption of recreational pressure. This might further aid in discouraging Wokingham Borough's residents from travelling outside the Borough to visit the SPA. Setting out the types of recreational spaces to be delivered per set amount of population increase, ensures that an appropriate amount of additional recreation space is delivered. Importantly, this play space is delivered **in addition** to any SANG delivered in Wokingham Borough, further increasing the amount of recreational pressure that can be absorbed. **Policy HC4 (Local Green Space)** protects areas designated as Local Green Space (e.g. Barkham Recreation Ground, Fox Hill, Joel Park and Holt Copse) from development, other than where such development is undertaken to enhance its functions, such as improvements to accessibility. The Revised Growth Strategy proposes to designate an additional 80 areas as Local Green Spaces, which are set out in the Local Green Space Topic Paper.

5.1.1.4 Recommendations

It is advised that the Council develop a record of SANG availability, including the key characteristics of size and geographic location, that can be submitted to the Examination process as evidence for the deliverability of the anticipated residential development, to demonstrate that adequate mitigation of recreational pressure in the TBH SPA is provided and that Natural England guidelines are followed. It is to be noted that most Strategic Development Locations (except for Hall Farm / Loddon Valley) are existing commitments deriving from the Core Strategy and are committed or under construction. Individual developers would have already undertaken significant groundwork with the Council and Natural England to devise appropriate SANG provision. Furthermore, if a bespoke SANG provided for Hall Farm / Loddon Valley was also to serve as a strategic SANG for other smaller residential developments, this would have to be agreed with the developer. Any developments that were to be addressed by a SANG could not become occupied until the SANG was functioning.

The specifics relating to the provision of SANG and SAMM, such as the amount and location of SANGs and the per-dwelling SAMM contribution, can be set out in a separate strategic Supplementary Planning Document (SPD), as has been developed for other authorities such as Surrey Heath.

Overall, it is concluded that, given the provision of adequate SANG and SAMM, there will be no adverse effects of the Revised Growth Strategy for Wokingham on the site integrity of the Thames Basin Heaths SPA regarding the impact pathway recreational pressure.

5.1.2 Thursley, Ash, Pirbright & Chobham SAC

The LSEs screening in the 2020 Draft Local Plan Update HRA highlighted that the Thursley, Ash, Pirbright & Chobham SAC is sensitive to recreational pressure. The habitats comprising the SAC, mainly the wet and dry heath habitat elements (which support qualifying breeding birds of the Thames Basin Heaths SPA), are vulnerable to trampling and nutrient enrichment that is associated with dog

walking. Large parts of the SAC are overlapping with the Thames Basin Heaths SPA, including the Lightwater Country Park, Sandpit Hill and the Bagshot Heaths. Therefore, the 2012 / 2013 visitor survey undertaken in the Thames Basin Heaths SPA can be drawn upon for data regarding the in-combination recreational pressure in the SAC. Importantly, while the survey does not cover all component parcels of the SAC, it covers the above listed sites (e.g. the Lightwater Country Park) that are closest to the Borough of Wokingham and are therefore likely to be the most relevant destinations for Wokingham residents.

5.1.2.1 Overview of In-Combination Visitor Survey Results as Relevant to Wokingham Borough

The most relevant access points to the SAC for Wokingham Borough's residents that were covered by the visitor surveys are the following:

- Lightwater Country Park, Ockham & Wisley Commons (survey location 14), which lies approx. 6.9km to the south-east of Wokingham Borough (in Surrey Heath)
- Sandpit Hill, Colony Bog & Bagshot Heaths (survey location 15), which lies approx. 7.4km to the south-east of Wokingham Borough (in Surrey Heath)

It is noted that these component sites of the SAC lie beyond typical core recreational catchments for European sites (approx. 5km), so the SAC is discussed here as a precautionary measure. This particularly applies to Sandpit Hill, which is a recreational hotspot in the area. It is considered that any of the SAC's other parcels, which lie well beyond 7km from Wokingham Borough, are unlikely to be important destinations for residents from the authority. Given that the SAC covers the same types of scenery and habitats than the SPA, there is no reason to expect that the SAC's core visitor catchment will significantly differ. The SAC parcels listed above (i.e. survey locations 14 and 15 in the visitor survey) are the only ones within approx. 7km of the Wokingham Borough boundary and are therefore considered further below.

The 2012 tally counts indicate that Lightwater Country Park (survey location 14) is moderately busy with 99 adults and 119 dogs entering over two survey days (one weekday and one weekend day). In contrast, Sandpit Hill (survey location 15) was much busier with 238 adults and 238 dogs entering over a similar timeframe. The high number of dogs counted at each of the survey locations was corroborated by the fact that most interviewees gave dog walking as their activity (71% of interviewees in Lightwater Country Park and 85% at Sandpit Hill). Notably, a significant proportion of visitors to both survey points travel to the site by car (48% in Lightwater Country Park and 61% at Sandpit Hill). This is important because visitors coming by car are likely to travel further from home and could be originating from Wokingham Borough. Most importantly, the visitor survey also assessed the linear distance to home postcodes of visitors that travelled to Lightwater Country Park and Sandpit Hill by car. At Lightwater Country Park, the linear distance to home postcodes for 75% of car visitors was 3.5km. At Sandpit Hill the linear distance to home for 75% of car visitors was 3.8km, slightly further than for the Country Park. This is significant because the 75th percentile of visitor data is usually defined as the core recreational catchment for European sites. These data indicate that the allocated residential sites in Wokingham Borough lie relatively far beyond the core recreational catchments that have been identified for the component parcels of the SAC closest to the authority (and that are most likely to be visited).

5.1.2.2 Implications & Conclusions

The geographic location of the Thursley, Ash, Pirbright & Chobham SAC in relation to the Borough of Wokingham also needs to be set into the context of the agreed mitigation zones surrounding the Thames Basin Heaths SPA. Given the overlap between these European sites and identical habitats being present, it would be reasonable to assume a similar draw and mitigation requirement for the sites. The closest parcel of the SAC (Lightwater Country Park) lies 6.9km from Wokingham Borough and would therefore be beyond a 5km core mitigation zone. Only a very small proportion of Wokingham Borough would fall within the 5-7km extended mitigation zone (in which large residential developments over 50 dwellings require mitigation). The new residential sites allocated in the Revised Growth Strategy, in addition to the sites already allocated in the preceding iterations of the Plan (and assessed in accompanying HRAs), are primarily located in the west, south-west and central area of Wokingham Borough. Hall Farm / Loddon Valley, the largest strategic housing development delivering 2,200 new

dwelling in the Plan period, is in the south-west of the Borough and also located outside the extended 7km mitigation zone.

Furthermore, the SANG and SAMM that will be delivered to mitigate the recreational pressure in the Thames Basin Heaths SPA would also help to address recreational pressure in the Thursley, Ash, Pirbright & Chobham SAC. While the overall contribution of Wokingham Borough to the recreational footprint in the SAC is demonstrably low (see above and previous section on the TBH SPA), these measures would also further reduce the number of recreational visits to and visitor impacts in the SAC. Due regard must also be given to the protective policy framework that is already contained within the Revised Growth Strategy. **Policy NE1** (Biodiversity and Nature Conservation) states that '*Sites designated as of importance for nature conservation at an international or national level... will be maintained, conserved and enhanced and inappropriate development will be resisted*'. This protective policy wording provides high-level protection for all European sites, including SPAs, SACs and Ramsars, including the Thursley, Ash, Pirbright & Chobham SAC. Furthermore, other policies already discussed in relation to the Thames Basin Heaths SPA would also work towards mitigating recreational pressure in the SAC. This includes **Policy HC3** (Open Space, Sports, Recreation and Play Facilities), which identifies open space and recreational facility standards for new residential development and **Policy HC4 (Local Green Space)**, which provides for the protection and enhancement of Local Green Spaces.

Overall, it is considered that the SAC is unlikely to be a major destination for recreational activities for Wokingham Borough residents, mainly due to its relatively long distance from the Borough. The closest component parts of the SAC lie approx. 7km from the authority boundary, with most parcels lying beyond 10km. Several parcels of the Thames Basin Heaths SPA lie much closer to the Borough boundary and are easily reachable through the available road network. The Thames Basin Heaths SPA comprises similar habitats, wildlife, sceneries and nature feel to the Thursley, Ash, Pirbright & Chobham SAC. Therefore, it is very unlikely that new residents will undertake the longer journeys to the SAC. It is concluded that the Revised Growth Strategy for Wokingham will not result in adverse effects on the integrity of the SAC, either alone or in-combination. Specific mitigation measures (in the form of policy wording) for the site are therefore not required.

5.2 Atmospheric Pollution

Note that this section is preliminary and will be updated and expanded upon following completion of the Air Quality Impact Assessment being undertaken for the Pre-Submission Local Plan Update and its HRA.

The HRA has identified several policies in the Revised Growth Strategy that provide for new residential and employment development within Wokingham Borough, which is likely to result in more car travel within the Borough. The following policies need to be considered in relation to the impact pathway atmospheric pollution:

- Policy SS1 – Spatial Strategy: Provides for 15,513 net additional dwellings over the plan period 2018-2038
- Policy SS3 – Hall Farm / Loddon Valley: Provides for at least 2,200 net new dwellings within the Plan period, and 4,500 in total
- Policy SS5 – South of the M4 Strategic Development Location: Provides for an additional 366 net new dwellings and 18,500m² of new employment space
- Policy SS6 – North Wokingham Strategic Development Location: Provides for an additional 33 net new dwellings and a care home
- Policy SS7 – South Wokingham Strategic Development Location: Provides for an additional 889 net new dwellings (see Table 2)
- Policy H1 – Housing Provision: Provides for a minimum of 15,513 net new dwellings in the Plan period between 2018 and 2038
- Policy H2 – Sites allocated for residential / mixed use development: Lists 24 proposed residential sites retained from the 2020 Wokingham Draft Local Plan Update and proposes to allocate an additional 19 new sites as part of the Revised Growth Strategy (totalling 967 dwellings)

Several policies retained in the Revised Growth Strategy are not being consulted upon, but need to be considered in the context of recreational pressure:

- Policy SS2 – Settlement Hierarchy: Identifies the location of major development throughout Wokingham Borough
- Policy ER10 – Whiteknights Campus: Provides for additional student accommodation
- Policy H11 – Gypsies and Travellers and Travelling Showpeople provision: Provides for 24 net new gypsy and traveller pitches

5.2.1 Thames Basin Heaths SPA

As identified in the screening section of the 2020 Wokingham Draft Local Plan Update, LSEs of the Plan on the Thames Basin Heaths SPA regarding atmospheric pollution could not be excluded and the site was screened in for Appropriate Assessment. The SPA is designated for several bird species that depend on heathland habitats, which are sensitive to atmospheric pollution (critical nitrogen load of 10-20 kg N/ha/yr). Given the development allocated in the Revised Growth Strategy for Wokingham (expecting an additional 15,513 net new dwellings and an unspecified amount of net new employment space) and the growth to be delivered by surrounding districts over this time scale, the Plan might have significant air quality impacts alone and 'in-combination' with other Local Plans. This is because all development allocations will increase the local population and accordingly the need for motorised travel within the Borough. While it is to be noted that the Revised Growth Strategy increases the housing development compared to the 2020 Draft Local Plan Update (15,513 compared to 13,901 dwellings, noting the extension of the plan period to 2038), atmospheric pollution is an in-combination pathway, which inherently takes changes in the quanta and distribution of development into account. Therefore, the remainder of this section replicates the analysis that was undertaken in the previous HRA.

5.2.1.1 General Setting of the SPA

When assessing the potential atmospheric pollution impact of a Plan on a designated site, an initial assessment of the location of the site in relation to the major traffic infrastructure should be undertaken. In relation to Wokingham Borough the most important component parcels of the Thames Basin Heaths SPA lie along the A327 and the A30 in the Hart District just south of Wokingham Borough. Both of these are major roads with relatively high traffic flow.

Review of detailed habitat mapping within these SPA parcels shows that there is heathland within 200m at various points along these roads. For example, on Warren Heath, heathland habitat lies within 140m of the A327 (near Wood Farm). Furthermore, there are multiple locations where heathland directly borders on to the A30, such as east of Blackbushe Airport and in Yateley Common Country Park. Another major parcel of the SPA that is potentially relevant to the Revised Growth Strategy lies to the south of Bracknell, immediately adjacent to the A322. However, a review of the heathland distribution within the SPA indicates that there is no sensitive heathland within 200m of the A322, the majority of heathland in this parcel occurring in the south-western part of this parcel. Therefore, it is considered that the SPA parcels to the south of Wokingham Borough (along the A327 and A30) are the only ones to be realistically impacted by traffic resulting from the Plan.

5.2.1.2 Commuter traffic

It is to be noted that this analysis into the pattern of commuter traffic only reflects the current pattern of motorised travel of Wokingham Borough's residents and it is not necessarily the case that future residents will follow the same transport links. However, given that route choice is likely to be based on minimising journey time and that the prevailing road infrastructure is unlikely to change substantially, journey-to-work data is generally a useful starting point for assessing the potential impacts of development plans on the impact pathway atmospheric pollution.

According to Journey to Work data from the 2011 census⁶³, five of the ten most common destinations for journeys to work arising from Wokingham Borough are Reading (12,616 people, 29.3%), Bracknell Forest (6,371 people, 14.8%), Windsor and Maidenhead (3,124 people, 7.3%), West Berkshire (2,659 people, 6.2%) and Slough (1,767 people, 4.1%). Of these destinations, only commuters travelling to

⁶³ Available at <https://www.nomisweb.co.uk/census/2011/wu03uk> [accessed 12/04/2019]

Bracknell Forest are likely to use the A322 in significant numbers. However, given that there is no SPA heathland within 200m of this road (see previous section), an increase in traffic on this road arising from the 2020 Draft Local Plan Update is unlikely to affect the ability of the SPA to meet its Conservation Objectives.

The 2011 census data indicate that Hart District is among the top five authorities contributing to the inflow of commuter traffic into Wokingham Borough (1,235 of the total inflow of 30,855 people, 4%). The journey-to-work routes for Hart residents from the settlements of Fleet, Farnborough and Aldershot, might take commuters into Wokingham Borough along the A30 and A327 trajectory, bringing them within 200m of sensitive heathland habitat. The allocation of new employment development in Wokingham Borough might therefore lead to an increase in the number of car-based commuter journeys along this stretch of the SPA with potential air quality impacts on the adjacent heathland. However, a review of popular navigation systems indicates that local residents have a range of route choices with similar travel times. For example, depending on travel conditions, a journey from Fleet to Wokingham Borough via the A3095 might take a similar amount of time than using a combination of the A30 and A327.

It is to be noted that these data do not include journeys to work that both start and end in Wokingham Borough and the commuter journeys that are carried out on foot, by bike or by public transport. Therefore, the actual proportion of regular commuter journeys that might involve passing within 200m of component sites of the Thames Basin Heaths SPA is likely to be lower than the relative proportions of car travel that are summarised here.

Regarding the impact pathway atmospheric pollution, the Revised Growth Strategy already contains some broad protective policy wording. **Policy HC6 (Air Pollution and Air Quality)** addresses pollution levels by stating that *'Prevailing air quality and potential impacts upon air quality arising from airborne emissions, dust and odour associated with the construction and operation of a proposal (including vehicular traffic) will be considered when determining planning applications'*. The policy also states that an air quality assessment might become necessary for developments. Any further recommendations, such as the incorporation of additional policy wording and specific mitigation initiatives in relation to the Thames Basin Heaths SPA, will depend on the results of the AQIA and will be drawn up in collaboration with Wokingham Borough Council.

5.2.2 Chilterns Beechwoods SAC

As identified in the screening section of the HRA for the 2020 Wokingham Draft Local Plan Update, LSEs of the Plan on the Chilterns Beechwoods SAC regarding atmospheric pollution could not be excluded and the site was screened in for Appropriate Assessment. The SAC is designated for *Asperulo-Fagetum* beech forest (nitrogen Critical Load of 10-20 kg N/ha/yr) and semi-natural dry grassland (nitrogen Critical Load of 15-25 kg N/ha/yr), both of which are sensitive to atmospheric pollution, and particularly nitrogen deposition. It was also noted that the current deposition rates by far exceed this critical load, indicating that any further increase could result in adverse effects on the SAC's site integrity. Given the development allocated in the Revised Growth Strategy for Wokingham and the growth to be delivered by surrounding districts over this time scale, the strategy might have significant air quality impacts alone and 'in-combination' with these other Local Plans. This is because all development allocations will increase the local population and accordingly the need for motorised travel within the Borough. While it is to be noted that the Revised Growth Strategy increases the housing development compared to the 2020 Draft Local Plan Update (15,513 compared to 13,901 dwellings), atmospheric pollution is an in-combination pathway, which inherently takes changes in the quantity and distribution of development into account. Therefore, the remainder of this section replicates the analysis that was undertaken in the previous HRA.

5.2.2.1 General Setting of the SAC

The Chilterns Beechwoods SAC is a composite with numerous parcels. The only parcel of the SAC that is likely to be relevant to development in Wokingham Borough is Bisham Woods, a component part approx. 4.7km to the north-east of Wokingham Borough along the A404 in the adjoining authority of Windsor and Maidenhead. Detailed mapping of the priority deciduous woodland habitat on MAGIC indicates that the qualifying woodland is distributed across the entire SAC parcel. Therefore, it is considered that the entirety of Bisham Woods is sensitive to atmospheric pollution and could be impacted by an increase in traffic along this section of the A404.

5.2.2.2 Commuter traffic

According to Journey to Work data for Wokingham Borough from the 2011 census⁶⁴, Windsor and Maidenhead (the authority in which Bisham Woods lies) is a major contributor to and recipient of commuter traffic into and out of Wokingham Borough. For example, of the 23,329 people that commute into Wokingham Borough on a daily basis, 1,467 people (6.3%) come from Windsor and Maidenhead. Of 32,417 outward commuters from Wokingham Borough, 2,791 people (8.6%) travel to Windsor and Maidenhead. However, the SAC parcel is in the very north of the authority, such that commuters that end their journey in Windsor and Maidenhead, are unlikely to drive within 200m of Bisham Woods. The A404 runs directly on into Wycombe and it is therefore considered that commuter traffic between Wokingham Borough and Wycombe is most likely to affect this part of the SAC.

Census 2011 data highlights that some of Wokingham Borough's residents commute to Wycombe, although this is relatively small proportion of the overall commuter traffic. 574 (2.5%) of all commuters travelling into Wokingham Borough come from Wycombe. Conversely, 971 (3%) of all out-commuters travel into Wycombe. It is to be noted that in comparison to Reading (which accounts for 18.6% of the inflow and 24.8% of the outflow of commuters), this is an exceedingly small proportion. Notwithstanding this, the potential for adverse effects on the air quality within this SAC component requires assessment, particularly in-combination with the growth in the aforementioned Windsor and Maidenhead, and Wycombe (and other nearby authorities).

While Wycombe directly borders the north of the Wokingham Borough, there are no obvious road links between the authorities in this area. It is considered that travelling via Windsor and Maidenhead and using the A404 is the only commuter route between these authorities. This is supported by a review of the road suggestions on Google Maps. Even residents from Wargrave, which is the northernmost large settlement in Wokingham Borough and very close to the authority of Wycombe, travelling to Marlow (the southernmost large settlement in Wycombe) are most likely to commute via the A404, as this is given as the fastest route.

It is to be noted that the data presented here do not include journeys to work that both start and end in Wokingham Borough or commuter journeys that are carried out on foot, by bike or by public transport. Therefore, the actual proportion of regular commuter journeys that might involve passing within 200m of Bisham Woods (component part of the Chilterns Beechwoods SAC) is likely to be lower than the relative proportions of car travel that are summarised here.

Regarding the impact pathway atmospheric pollution, the 2020 Draft Local Plan Update already contains some broad protective policy wording. **Policy HC6 (Air Pollution and Air Quality)** addresses pollution levels by stating that *'Prevailing air quality and potential impacts upon air quality arising from airborne emissions, dust and odour associated with the construction and operation of a proposal (including vehicular traffic) will be considered when determining planning applications'*. The policy also states that an air quality assessment might become necessary for developments. Any further recommendations, such as the incorporation of additional policy wording and specific mitigation initiatives in relation to the Chilterns Beechwoods SAC, will depend on the results of the AQIA and will be drawn up in collaboration with Wokingham Borough Council.

⁶⁴ Available at <https://www.nomisweb.co.uk/census/2011/wu03uk> [accessed 12/04/2019]

6. Conclusions and Recommendations

This HRA assessed the potential impacts of residential and employment growth allocated in the Revised Growth Strategy on the following European sites:

- Thames Basin Heaths SPA;
- Thursley, Ash, Pirbright and Chobham SAC; and
- Chilterns Beechwoods SAC.

The impact pathways that were considered in this HRA include recreational pressure and atmospheric pollution. The impact pathways loss of functionally linked habitat and water quantity, level and flow had been screened out from Appropriate Assessment in the 2020 Wokingham Draft Local Plan Update HRA. The following key conclusions and recommendations derive from the Appropriate Assessment.

6.1 Impact pathway: Recreational pressure

The Revised Growth Strategy proposes to allocate 11,423 net new dwellings requiring mitigation in the 5km and 5-7km mitigation zones surrounding the Thames Basin Heaths SPA (discounting sites within the 5-7km zone that accommodate fewer than 50 dwellings), which would require the delivery of appropriate mitigation measures in the form of Suitable Alternative Greenspace (SANG) and Strategic Access Management & Monitoring (SAMM). An assessment of the policies in the Revised Growth Strategy showed that the document gives appropriate regard to the provision of SANG and SAMM.

However, given the relatively large amount of SANG required (219.32ha were identified in the Appropriate Assessment), it is advised that the Council develop a record of SANG availability, including the key characteristics of size and geographic location, that can be submitted to the Examination process as evidence for the deliverability of the anticipated residential development. This is to demonstrate that adequate mitigation of recreational pressure in the TBH SPA is provided and that Natural England guidelines are followed. It is to be noted that most Strategic Development Locations (except for Hall Farm / Loddon Valley, and the South Wokingham SDL extension) are existing commitments deriving from the Core Strategy and are committed or under construction. Individual developers would have already done significant groundwork with the Council and Natural England to devise appropriate SANG provision. If a bespoke SANG provided for the new SDL at Hall Farm / Loddon Valley was also to serve as a strategic SANG for other smaller residential developments, this would have to be agreed with the developer. Any developments that were to be addressed by a SANG could not become occupied until the SANG was functioning. The specifics relating to the provision of SANG and SAMM, such as the amount and location of SANGs and the per-dwelling SAMM contribution, should be set out in a separate strategic Supplementary Planning Document (SPD), as has been developed for other authorities such as Surrey Heath.

Overall, it is concluded that, given the provision of adequate SANG and SAMM there will be no adverse effects of the Revised Growth Strategy on the site integrity of the Thames Basin Heaths SPA regarding the impact pathway recreational pressure.

6.2 Impact pathway: Atmospheric pollution

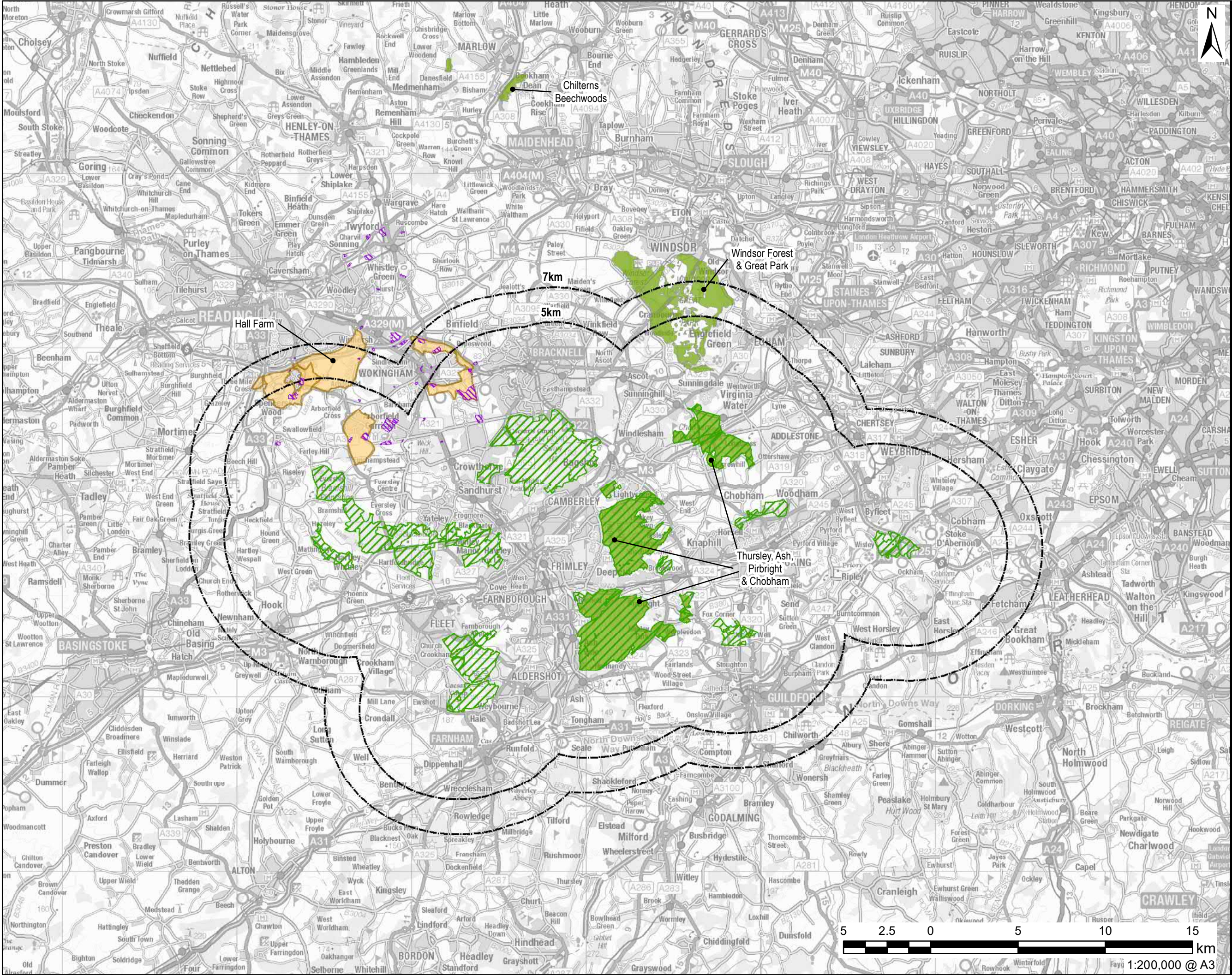
The Wokingham Draft Local Plan Update provides for 15,513 dwellings and an unspecified amount of employment space, which is likely to increase the number of car-based commuter journeys adjacent to European sites that are sensitive to atmospheric pollution. The Appropriate Assessment highlighted that two European sites within 10km from Wokingham Borough are sensitive to atmospheric pollution and lie within 200m of key commuter routes identified as relevant to the Local Plan Update, namely the Thames Basin Heaths SPA and the Chilterns Beechwoods SAC.

The in-combination atmospheric pollution effects of a Plan document are addressed through Air Quality Impact Assessments (AQIAs), which model the predicted air quality effects of the growth projected in several adjacent authorities. An AQIA in relation to these two European sites has been commissioned but has not yet been completed. Therefore, a firm conclusion regarding potential adverse effects of the Revised Growth Strategy on the two sites cannot be reached, until the air quality data is available.

Therefore, this HRA will be updated (both in terms of results and potential mitigation recommendations) once the AQIAs are available.

7. Appendices

Appendix 1: Map of the European sites in relation to the boundary of Wokingham Borough, and the proposed development allocations provided for in the Revised Growth Strategy for Wokingham. The map also shows the 5km and 7km mitigation zones defined for recreational pressure around the Thames Basin Heaths SPA.



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LEGEND

- Proposed Sites
- Strategic Development Location
- Thames Basin Heaths - 5km, 7km Buffer
- Special Protection Area - Thames Basin Heaths
- Special Areas of Conservation

NOTES

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ISSUE PURPOSE
DRAFT

PROJECT NUMBER
60610735

SHEET TITLE
Strategic Development Locations, residential and employment sites allocated in the Revised Growth Strategy in relation to European sites within 10km of the Wokingham Borough boundary

SHEET NUMBER
Figure 550

[← Advice for developers](#)

Last updated: 29th April 2025

Thames Basin Heath Special Protection Area

Protected wildlife habitat

What is it?

The Thames Basin Heath Special Protection Area is an internationally important habitat that is home to 3 rare species of ground nesting birds - the Dartford Warbler, Nightjar, and Woodlark. To protect these, the government has designated the Thames Basin Heaths as a Special Protection Area (SPA) under the European Commission Birds Directive and placed mitigation zones around the heaths to lessen the impact of human activity on them.

For more information about the SPA please see the [Thames Basin Heath's Partnership website](#).

How does it affect new development within Wokingham Borough?

A series of mitigation zones have been established around the SPA to protect it against the impact of development. The first zone is drawn to a buffer of 400m from the SPA, the second to 5km from the SPA and third to 7km. Parts of the borough lie within these zones. You can view the areas affected by this designation on the [planning constraints interactive map](#).

The national legislation that underpins the SPA seeks to ensure that any proposed development scheme or plan will not adversely affect the integrity of the SPA. Natural England is the Government agency that oversees the protection of nationally designated sites throughout England. They have advised all Local Authorities with land in the Thames Basin Heaths (TBH) that any new development within 5km of the SPA may harm the rare bird populations and that potential harm may occur from additional new development that lies within 400m of the

SPA. Where development will lead to an increase of 50 dwellings within the 5 to 7km zone, this is also considered likely to contribute to significant effects on the designated features of the SPA.

If you are intending to submit a planning application in the south of the borough, you will need to check to see if your land is within one of these zones. If so, there is a chance that you might be asked to make contributions towards mitigation.

The approach to mitigation

A small proportion of the borough lies within 400m of the SPA, and significant areas in the south of the borough lie within the 5km and 7km zones.

In order to allow new development while safeguarding the integrity of the TBH SPA, the Council has adopted a delivery framework of measures to mitigate harm to the SPA arising from new housing development. These measures include:

- The establishment of a 400 metre buffer around the SPA where no net new residential development will be permitted
- The provision of Suitable Alternative Natural Greenspace (SANG)
- Strategic Access Management and Monitoring (SAMM) measures - coordinated visitor management across the whole of the publicly accessible SPA

The Strategy is for relevant developments to provide SANGs, or more commonly, make financial contributions towards the provision of existing SANGs, to be managed in perpetuity as an alternative recreational location to the SPA. Additionally, relevant developments must provide financial contributions towards SAMM measures.

Suitable Alternative Natural Greenspace (SANG)

SANGs are new or existing open spaces designed to attract visitors away from the SPA by providing an enjoyable natural environment for recreation. The expectation is that by providing these alternative areas for outdoor recreation, there will not be an increase in recreation pressure on the SPA as new households can use the SANG instead of the protected heathland. SANGs are high quality open space that will remain in perpetuity.

Proposed developments that are located within one of our four Strategic Development Locations (see the [major developments](#) page for more info) will have to provide new SANG at a minimum of 8ha per 1,000 new residents for any dwellings within 5km of the TBH SPA, or SANG between 1.73 - 2.16ha per 1,000 new residents for any dwellings between 5 - 7km from the TBH SPA.

Proposed developments outside of the SDLs that cannot provide SANG to the required standard as part of the development will need to make a payment contribution towards strategic SANG.

A site at Rooks Nest Wood (formerly Rooks Nest Farm) in Barkham was approved for use as a strategic SANG in August 2009 and opened in 2011. Further details relating to this site can be viewed on the [Rooks Nest Wood Country Park page](#).

The SANG contributions relating specifically to purchasing capacity at Rooks Nest Wood SANG are as follows:

Within the 5km zone

- 1 bedroom: £1,567.98
- 2 bedroom: £2,049.59
- 3 bedroom: £2,690.93
- 4 bedroom: £3,546.86
- 5 bedroom: £4,240.62

Within the 5 - 7km zone

- 1 bedroom: £423.35
- 2 bedroom: £553.39
- 3 bedroom: £726.55
- 4 bedroom: £957.65
- 5 bedroom: £1,144.97

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Strategic Access Management and Monitoring (SAMM)

This is a project delivered by Natural England to implement standard messages and additional wardening and education across the TBH SPA and promote the use of SANGs. The project is overseen by the [Joint Strategic Partnershi](#)

Following engagement with Natural England, the Joint Strategic Partnership Board have agreed that an annual inflation linked uplift to the SAMM contribution is necessary to ensure sufficient income is raised to cover the costs of the SAMM project in perpetuity. Without this change the SAMM project would be at risk of being unable to deliver its objectives, and therefore secure positive outcomes for the SPA. Natural England have notified all 11 Local Authorities across the Thames Basin Heaths Partnership area of the average SAMM contribution required from 2024 onwards.

SAMM contributions are secured through s106 agreement. To provide a transitional period, the uplift applies to any s106 which is signed from 1 May 2025 onwards, regardless of whether the application was submitted prior to this date.

The level of contributions are calculated on a per bedroom basis and dependent on the zone within which the development falls. From 1 May 2025 the level of SAMM payments are calculated as follows (payments as existing prior to 1 May 2025 shown in brackets):

Within the 5km zone

- 1 bedroom: £582.00 (£563.00)
- 2 bedroom: £810.00 (£784.00)
- 3 bedroom: £1,077.00 (£1,042.00)
- 4 bedroom: £1,267.00 (£1,225.00)
- 5 bedroom: £1,447.00 (£1,400.00)

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Within the 5 - 7km zone

- 1 bedroom: £169.00 (£162.00)
- 2 bedroom: £234.00 (£225.00)
- 3 bedroom: £310.00 (£298.00)
- 4 bedroom: £365.00 (£352.00)
- 5 bedroom: £417.00 (£401.00)

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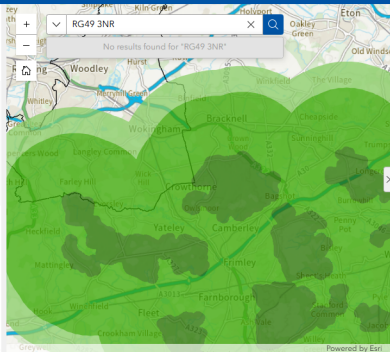
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- ☒ Thames Basin Heath SPA Mitigation Zones
- ☐ Buildings of Traditional Local Character
- ☐ Green Belt
- ☐ Sites of Urban



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Local Plans

English Nature Research Reports

Number 682

VISITOR ACCESS PATTERNS ON THE THAMES BASIN HEATHS

Durwyn Liley, Digger Jackson & John Underhill-Day

English Nature Thames & Chilterns Team



Footprint Ecology
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ISSN 0967-876X
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Recommended Citation:

Liley, D, Jackson, D. & Underhill-Day, J. (2005). Visitor Access Patterns on the Thames Basin Heaths. English Nature Research Report 682. English Nature, Peterborough.

Summary

Few studies of access patterns address levels and patterns of access within a particular landscape or across a number of sites in a particular area. Yet such an approach is usually required to provide the necessary understanding for strategic access management. Here we present information on patterns of access and the behaviour of visitors to the Thames Basin Heaths SPA. By looking across a range of access sites it is possible to understand the types of visitors, how frequently they visit, why they visit, the routes they take within the SPA and distance they travel to reach sites. Data such as these can help inform site management and be used to predict the changes in visitor numbers caused by future developments.

The SPA covers some 8,000 hectares of heathland and forestry, and includes 13 individual SSSIs. The SPA is surrounded by a high density of housing (there are some 288,000 houses within 5km of the SPA boundary) and there is a strong pressure to develop remaining open space. This study was commissioned by English Nature to provide the baseline understanding in order to underpin a strategic approach to access management across the SPA.

Interviews and counts of visitors were conducted at sample of 26 access points across the SPA in August 2005. Identical methods and timings were used at each access point, facilitating direct comparison between points. A total of 1144 interviews were conducted. As only one person was interviewed per group of people, the interviews provide data on the access patterns of 2062 people, 16% of whom were children.

More visitors were recorded at weekends than weekdays. There was little variation in the numbers of visitors in each time period, but early morning (0700 – 0900) at the weekend tended to be the time with the fewest visitors. Totals varied between sites, with the Lookout (a large car park, with a café, visitor centre, adventure playground and other attractions, located to the south of Bracknell) by far the busiest site, with 15% of all interviews being conducted at this site.

Although groups of up to 15 people were recorded, most people were visiting either on their own (29% of all interviews) or two people (36% of interviews). The majority of people visiting the heaths arrived by car (83% of people), and only 13% arrived on foot. Those sites with large car parks had the highest number of visitors arriving by car. The median distance people had driven to reach an access point was 3.1km and 70% of car drivers had come from within a radius of 5km from the access point. For those people travelling by foot, 90% came from within 1.5km.

A variety of reasons were given for visiting the heaths, representing a broad range of recreational activities, such as cycling, fishing, picking mushrooms, flying model aircraft, wildlife watching or simply taking the children out. Dog walking was by far the most common reason (59% of groups) given for visiting the heaths. Only 28% of groups interviewed were without a dog and the total number of dogs accompanying the people interviewed was 1271, equating to 0.6 dogs for every person visiting the heath. A significantly higher proportion of those who visited the heaths daily were dog walkers, compared to less frequent visitors.

The distance travelled on the heath and the actual distance penetrated (the linear distance from the access point to the centre of a visitor's route) are summarised for each activity. Dog walkers walked an average of 2.5km, penetrating a mean of 760m onto the heath.

The questionnaire also addressed the use of alternative sites. Three-quarters of all heathland visitors said they visited alternative sites. People that travelled to sites by car were more likely (than those that walked to sites) to visit alternative locations. Dog walkers tended to travel shorter distances to reach alternative sites than other users.

A variety of different variables are explored as potential predictors of total visitor numbers at each access point. The number of houses surrounding each point was a significant predictor using a radius of 5km, but not further. The proportion of residents at different distance bands from each access point is calculated and is suggested as the most reliable method to model visitor levels. The proportion of residents recorded visiting the heath declined with increasing distance from the access point, this was irrespective of whether they travelled by foot or by car.

Across all sites, the average number of people leaving each access point, per hour, was 7 people. This figure is used to extrapolate an estimate of the total number of visits to the SPA per annum. This figure, of over 5 million visits per annum, is a crude estimate, and is calculated using the assumption that the 26 access points used in the study are representative of all access points within the SPA. Accepting the limitations, the figure of 5 million visits per year, if reasonable, is equivalent to many National Parks.

This report provides a valuable baseline assessment of access levels and patterns of access across the Thames Basin SPA. Additional work is required to look at some issues in more detail and provide data for building robust predictive models of access levels. Future potential applications of the work are discussed and include the possibility of mapping visitor densities within sites and relating these maps to bird data.

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Introduction

Lowland heathland is recognised as a priority habitat by conservationists, as it supports a range of rare and threatened species. Despite a considerable decline in the area of heathland over the past century, the UK still holds about 20% of the European resource. The most significant areas for heathland include the counties of Hampshire, Dorset and Surrey, where it is often found alongside areas with high human populations.

Human pressure, largely from recreation, can impact upon the conservation interest of heathland sites (for reviews see Underhill-Day 2005; Haskins 2000, De Molinaar 1998). Some of the problems include an increased incidence of fires (Kirby & Tantram 1999), disturbance to key bird species (Mallord 2005, Liley & Clarke 2003, Murison 2002) and predation from domestic pets such as cats (Underhill-Day 2005). Work on the heathland bird species of bird listed in Annex 1 of the EU Birds Directive (Mallord 2005, Liley & Clarke 2003, Liley & Clarke 2001) has shown a negative correlation between certain species and the amount of housing in the vicinity of the site.

The Thames Basin Heaths are designated as internationally important (the Thames Basin Heaths SPA) due to the presence of three Annex 1 bird species, the woodlark, nightjar and Dartford warbler. The SPA supports the second largest concentration of Dartford warblers in Great Britain, the third largest number of woodlarks, and the fourth largest population of breeding nightjars. The SPA consists of dry and wet heathland, mire, oak and birch woodland, gorse scrub and acid grassland, plus areas of rotational conifer plantation. It covers an area of some 8400ha, consisting of 13 Sites of Special Scientific Interest (SSSI) from Hampshire in the west, to Berkshire in the north through to Surrey. This location, to the south west of London on the M3 corridor, has led to high development pressures, which, from the mid 20th century continue to the present day. The loss of heathland in the area over the past 100 years has been estimated at 53% (Land Use Consultants 2005). The Land Use Consultant study (2005) calculates that at least 35,170 houses will need to be built around the Thames Basin Heaths based on the current housing allocation to 2016. This number of houses will require a land area of 12km², assuming a density of 30 houses per hectare.

At present there are an estimated 288,000 residential properties within 5km of the SPA boundary. Given the current and potential human pressure on the Thames Basin Heaths, there is a clear need for a better understanding of patterns of human recreational use of the heaths. With such an understanding, policy, planning and site management can all be targeted to reduce the pressure and avoid conflict between human needs for green space and wildlife conservation.

Most visitor studies of heathland sites have been undertaken in response to a proposed development or issues relating to a single site (see Underhill-Day (2005) for a review). As these studies are usually focussed on a single site, and have been conducted using different methods, it is difficult to draw conclusions across a range of sites, or develop a strategic understanding. Despite these problems a number of general conclusions can be drawn:

- A range of recreational uses typically occurs, including walking, jogging, cycling, dog walking and horse riding.
- At all sites examined, there is a majority of dog walkers over other users.
- The spatial pattern of use by visitors is largely determined by the location, type and size of access points and the network of paths and tracks on site.
- There are differences in the reasons for visiting, frequency of visit and length of stay between residents and tourists visiting heaths
- There are many similarities between the visiting patterns at heaths of similar character, even when these are in different areas.

The only study which has addressed a range of heathland sites, surveyed using a standard methodology, was carried out on the Dorset Heaths (Clarke *et al.* 2005). This study involved counts and questionnaires at twenty different access points, including a range of different car-park sizes on both rural and urban heaths. The Clarke *et al.* study was entirely focused on the Dorset Heaths, and it is not known how much the access patterns found might apply to other areas. Given the undoubted effect that public access has on the internationally recognised heathland habitat and its wildlife, further work on access patterns in the Thames Basin Heaths area was required. This study follows methods similar to those used by Clarke *et al.* to examine access patterns across the Thames Basin Heaths SPA, by investigating visitor behaviour through systematic sampling in a way which would:

1. allow conclusions to be drawn on the type of visitor and the patterns of visiting across the Thames Basin Heaths SPA
2. determine the catchment areas from which visitors travel to particular types of access point
3. measure the distances travelled to the heaths
4. quantify the routes taken by people on the heaths

Methods

Selection of sample survey heathland access points

Twenty six access points onto the Thames Basin Heaths SPA were selected. These points were chosen by English Nature staff familiar with the SPA as to include a variety of access points, ranging from a car-park with 200 spaces and accompanying visitor centre and café to tracks leading off housing estates with little or no parking provision. The access points selected are given in Table 1 and their locations shown in Figure 1.

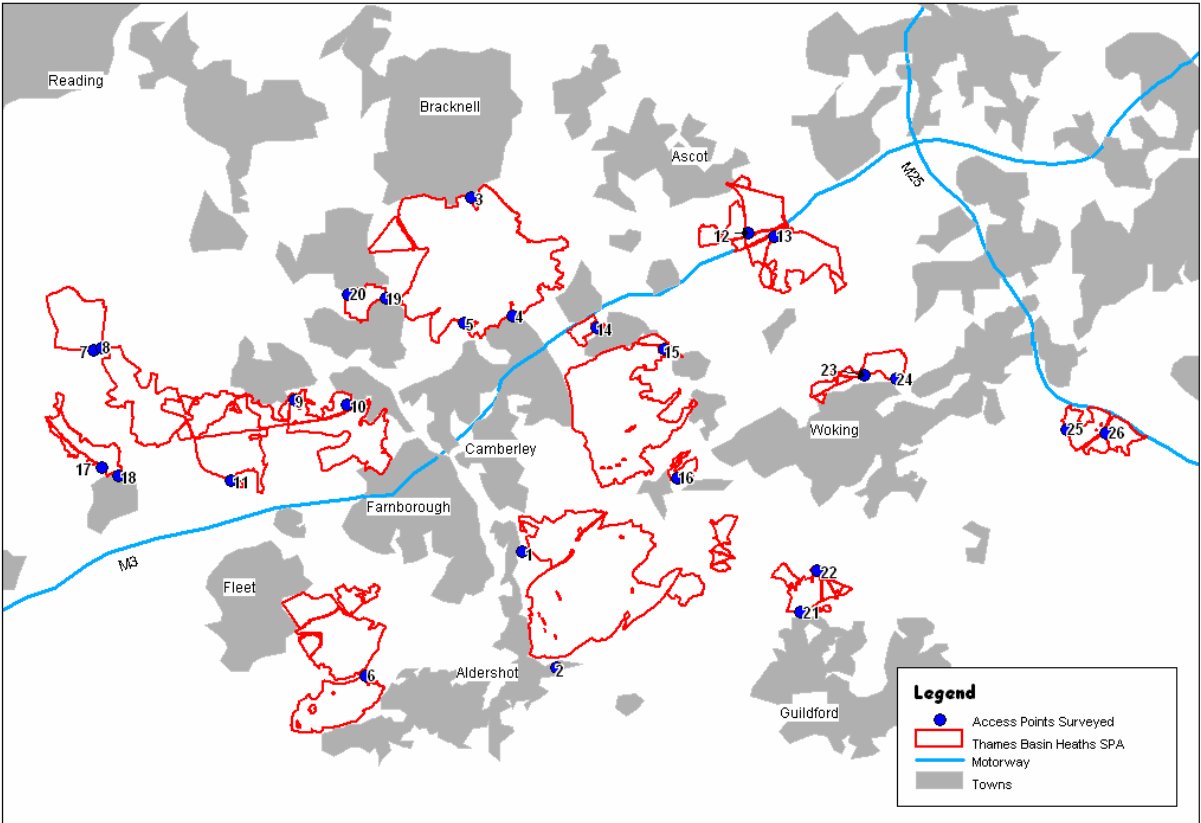


Figure 1: Location of access points surveyed. The numbers against each access point cross reference to Table 1.

Table 1: Access points used in the survey. Ticks in brackets indicate a facility not directly associated with the car-park but present in the immediate proximity.

Map Ref (Fig 1)	Site	SSSI	No. off-road parking spaces	Type of access point			Facilities			Other Attractions / Notes
				car park	lay-by or pull in	track entrance	Café / food	Sign-posted routes	toilets	
17	B3011 opposite Arrow Lane	Hazeley Heath	4	✓						Unsurfaced lay-by adjacent to road
11	Black Bushes Road	Castle Bottom to Yateley & Hawley Common	3	✓						Lay-by (unsurfaced and bumpy) adjacent to track into forestry plantation
6	Bourley Road	Bourley & Long Valley	36	✓						Some MOD access restrictions. Car parks either side of road, off-road parking for an additional 15 cars to south.
22	Burdenshott Road	Whitmoor Common	25	✓			(✓)	(✓)		Adjacent to pub, virtually extension of pub car park. Car park recently gravelled
9	Car Park off Cricket Hill Lane	Castle Bottom to Yateley & Hawley Common	8	✓						Very bumpy track, difficult turn quite hidden and discrete. Car park adjacent to pond.
10	Car Park off the A30	Castle Bottom to Yateley & Hawley Common	22	✓						Two separate car parks down a track, also access to housing. A pond adjacent to car-park
12	Chobham Road	Chobham Common	35	✓				✓		An additional 30 car parking spaces blocked off.
23	Chobham Road	Horsell Common	18	✓						Very secluded car park, with difficult turning and down a very bumpy track
26	Currie's Clump (Boldermere CP)	Ockham & Wisley Commons	65	✓			✓	✓	✓	Semaphore Tower may attract visitors. Very close to M25
25	E of Aberconway House (Wrens Nest CP)	Ockham & Wisley Commons	12	✓			(✓)	(✓)		Very close to RHS gardens at Wisley, where café etc.
14	Lightwater Country Park	Colony Bog & Bagshot Heaths	120	✓			✓	✓	✓	A variety of interlinked car parks and bays. Playground, heathland visitor centre (open 9 – 5), leisure centre etc.
1	Mytchett Place Road	Ash to Brookwood Heaths	10		✓		(✓)		(✓)	Simple lay by (unsurfaced) alongside road. Adjacent to Basingstoke canal visitor centre, camp site and "Potters"
8	N entrance to Warren Heath	Bramshill	1			✓				Trackway into Forestry, very close to designated car park. Track entrance surfaced, but kerb stones make parking difficult
2	Nightingale Road / A325	Ash to Brookwood Heaths	5	✓						Next to pub (with car park with a further 10 spaces). Well hidden access point, with very narrow gateway into car park.
20	Off Crowthorn Road	Sandhurst to Owlsmoor Bogs and Heaths	12	✓						Open and spacious car park just outside Crowthorn, parking bays, recently surfaced and safe exit onto road.
18	Play area, Springfield Avenue	Hazeley Heath	0							Small playground with swings etc and path alongside onto SPA. Within housing estate. No off-road parking, but parking available on residential streets nearby.
16	Queens Road, Cowshot Common	Colony Bog & Bagshot Heaths	3		✓					Difficult to find, tiny lay by, no real access facilities
7	S entrance to Bramshill Plantation	Bramshill	7	✓						FC car park with tracks leading off either side of road

Map Ref (Fig 1)	Site	SSSI	No. off-road parking spaces	Type of access point			Facilities			Other Attractions / Notes
				car park	lay-by or pull in	track entrance	Café / food	Sign-posted routes	toilets	
21	Salt Box Road	Whitmoor Common	18	✓						
15	Sandpit Hill	Colony Bog & Bagshot Heaths	8	✓						Small car park in front of houses
24	Shore's Road	Horsell Common	40	✓						
19	South Road	Sandhurst to Owlsmoor Bogs and Heaths	1			✓				Gateway to electricity sub station and a gateway (close to vehicles) onto SPA.
13	Staple Hill	Chobham Common	15	✓						Small car park with very good views
3	The Lookout	Broadmoor to Bagshot Woods & Heaths SSSI	200	✓			✓	✓	✓	"Go Ape", playground, designated mountain bike routes, heritage centre, café, shop and well-lit, large car park.
4	Top of Bracknell Road	Broadmoor to Bagshot Woods & Heaths SSSI	3		✓					Dead end of road within housing estate. Lay by / turning space adjacent to block of flats
5	Top of Kings Ride	Broadmoor to Bagshot Woods & Heaths SSSI	0			✓				Track starting from bend in road within housing estate. Parking available on residential streets surrounding access point.

Timing of surveys

The time of the day and point in the week are likely to influence both the rate and type of heathland usage by visitors. Great care was therefore taken to ensure that the usage of each heath access point was assessed in a statistically balanced manner. Each access point was surveyed for a total of eight two-hour periods, split into four periods during the weekend (Saturday-Sunday) and four periods during weekdays (Monday-Friday). Within both weekend and weekday visits, each access point was surveyed during each of the following periods within a day:

0700-0900,	1000-1200,	1300-1500	1700-1900.
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The questionnaire sample survey was carried out on 34 person-days within the period from 1st August to 31st August 2005.

Counts of People

During each two-hour period, a tally was kept of all people (i.e. not the number of groups but the total number of people, including children) entering and leaving the site.

Weather

As weather may influence the number of people visiting a site at a given time, the weather during each survey period was also recorded. Cloud cover was estimated, as a single value representing the average cloud cover during the period. Rainfall was recorded as either no rain within survey period; rain for less than 30 minutes; rain for between 30 and 60 minutes; rain for between 60 and 90 minutes or rain for more than 90 minutes. Where possible, wet weather was avoided.

Field questionnaire

During a two-hour survey period, as many visitors as possible, leaving the access point, were asked to fill in a brief questionnaire (Appendix 3). The questionnaire was designed to be simple and brief so as to maximise participation and cooperation. When interviewing a visitor, the total number of people with them in the group/party was recorded, but only one person was interviewed per group. As a consequence, the total number of interviews differs from the total number of people. Both totals are used within the analysis.

The questionnaire was designed to provide the following information:

- Size of group (adults & children)
- Number of dogs (if present)
- Frequency of visits to the site
- Distance travelled to reach the site (retrospectively calculated from postcode)
- Mode of transport to reach the site
- Time of day of visit
- Entry point onto heath (whether or not the same as the location where interview was taking place)
- Route taken during visit
- Purpose of visit
- Whether other sites were visited for the same purpose
- Distance typically travelled to reach alternative sites
- Mode of transport to reach alternative sites

Use of postcode data & GIS

A national postcode database containing the geographic location (as a point) and the number of residential dwellings (i.e. houses) within each postcode area was used within a GIS system to determine the number of houses within each of a range of distances from each access point (see Liley & Clarke 2003 for further details). These figures were then used to calculate the

number of potential visitors around each site. The actual number of people was estimated by multiplying the number of houses by 2.36 (the mean number of people per household in the UK, from the Office of National Statistics 2005).

In order to determine the distance that the people interviewed had travelled to reach the access point, they were asked which postcode they had travelled from. The distance travelled was then expressed as the linear distance from the postcode to the access point.

All people interviewed were asked to indicate the route they had taken on the heath, with the aid of aerial photographs, a copy of the OS map and with reference to landmarks (such as hills, ponds or viewpoints) that they had passed. The route was then drawn on a map (Ordnance Survey 1:10,000 scale), and subsequently transferred to GIS as a polyline, using the same OS base map. Where people entered and left the heath from different access points, the route was drawn simply as the route taken between the two points. Some routes would leave the site, for example detouring through housing estates to then return to the heath. In such cases, the entire route was drawn and not simply the route within the heath, ensuring that the actual distance walked or travelled was measured.

It was not always possible to accurately map the routes taken, due either to the maze of small paths that criss-cross some of the heaths, or because some people were uncertain. On heavily wooded sites the aerial photographs were of limited help as the tree canopy obscured paths.. Where the interviewee could not describe their route at all, no route was mapped, however, in most cases interviewers were able to map the route at least roughly.

All routes, once mapped, were summarised using two numbers: the distance covered (the total length of the route, mapped as a polyline) and the penetration distance (the linear distance from the mid-point of the route to the access point).

The area of the heath within which people could walk / visit was estimated, also using GIS. The boundary of this “visitable area” was, in most instances, the SPA boundary, but where open countryside, with access, occurred alongside, this was also included. This “visitable area” therefore encompassed the amount of land with public access and directly accessible from the given access point.

Analysis

All errors are standard errors unless otherwise indicated.

Box plots are commonly used within the analysis. The box boundary closest to zero indicates the 25th percentile, a line within the box marks the median, and the boundary of the box farthest from zero indicates the 75th percentile. Whiskers (error bars) above and below the box indicate the 90th and 10th percentiles, and outlying points are marked with dots. These percentiles simply divide the distribution of the data into percentages, allowing the distribution of the data to be visualised.

Results

Structure of results

The results section summarises the answers to each question, following the same order as the questionnaire. Much of the raw data, presented by site, is given in tables in the appendices. Both the total number of people and the total number of groups (i.e. number of interviews) have been used. As most analyses use the total number of people, this should be assumed unless the text states otherwise.

The total number of visitors recorded and variation between sites

A total number of 1144 interviews were conducted, involving 2062 people, 72% of all the people recorded leaving the access points. The totals per site are given in Appendix 1 (Table 17). Across all sites, the number of people interviewed significantly correlated ($p = < 0.001$) with the number of people leaving, indicating that the proportion of refusals and people missed was even across all sites. In total, 267 people (9% of those leaving) declined to be interviewed and 180 people (6% of those leaving) had already been interviewed on a previous visit. A total of 347 (12% of those leaving) were not interviewed. These were either people who passed at the same time as other people were being interviewed, or alternatively came past too quickly (for example by bicycle) for the interviewer to be able to stop them.

The Lookout was by far the busiest site, with 317 people (15% of all interviews) interviewed (Figure 2). The average number of people leaving, per access point, was 109.8 (+ 21.9) in 16 hours of survey time, equating to 7 people per hour.

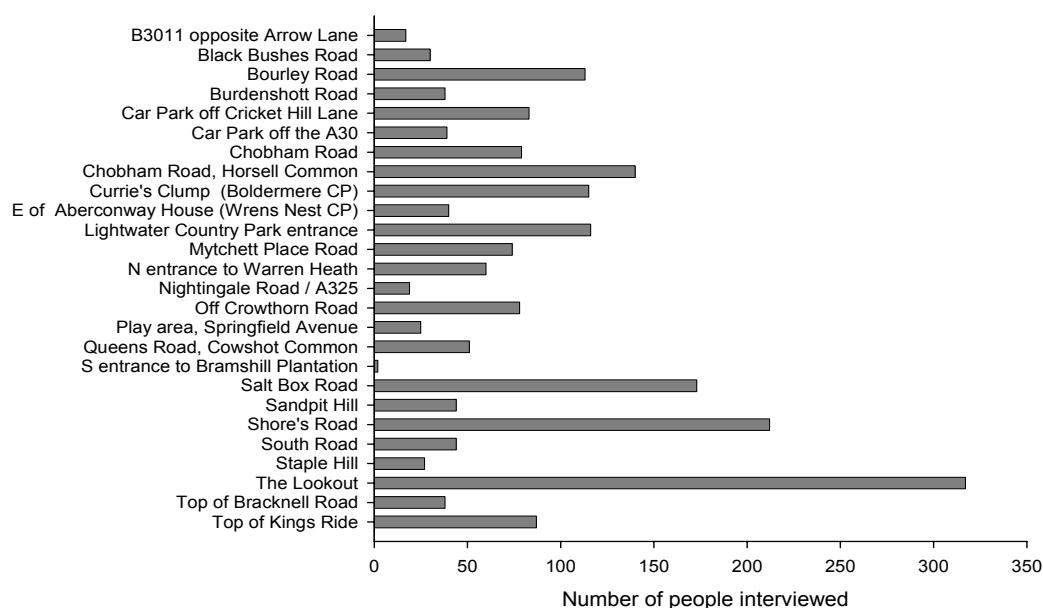


Figure 2: Total number of people interviewed per site

Group size

Group size ranged from 1 to 15 people. The most frequently encountered group size was 2 people (36% of all interviews) and, with 29% of all interviews conducted with lone people, 65% of all interviews involved groups of 2 or less (Appendix 1, Table 18).

Adults or children

Although the age or age class of people was not recorded, the number of children (under 16 years old) in each group was recorded. Overall, children comprised 16% of the 2062 people

recorded visiting the heaths; the percentage of children was highest at the Lookout (34% of people were children).

Number of dogs

The total number of dogs accompanying the people interviewed was 1271, equating to 0.6 dogs per person. Only 28% of groups interviewed were without a dog (Table 2). The number of groups interviewed that had dogs with them was 821, giving a mean of 1.5 dogs per group with a dog.

Table 2: Number of dogs recorded and group size (number of people in each group).

	<i>No of dogs per group</i>									Total
	0	1	2	3	4	5	6	7	8	
No of groups	323	504	242	42	19	8	2	3	1	1144
% of groups	28	44	21	4	2	1	0	0	0	
Total No people	792	749	389	75	31	13	5	4	4	2062
Total No dogs	0	504	484	126	76	40	12	21	8	1271

Frequency of visit

All people interviewed were asked how frequently they visited the site, and were given the choice of answering 'daily', 'weekly', 'monthly', 'varies through the year' or 'don't know'. Those who were visiting for their first time were included within the 'don't know' category. Most people interviewed clearly frequently visited the sites, with daily being the most common answer (52% of interviews, 41% of all people). At 22 of the 26 sites, daily was the answer given in the most interviews (see Appendix 1, Table 19 for the data for each site).

As might be expected, significantly more of those people visiting regularly were visiting the heath to walk their dogs (Table 3).

Table 3: Numbers of visitors coming daily, weekly or less frequently than weekly that visit to walk their dogs. Significantly more visitors coming daily are walking their dog ($\chi^2_2 = 184$, $p < 0.01$).

<i>Frequency of visit</i>	<i>Total number of people</i>	<i>Total number of people walking their dog</i>	<i>% of visitors walking dogs</i>
Those that visit daily	852	710	83
Those that visit weekly	525	361	69
Those that visit less frequently than weekly	685	199	29

Weekend vs weekday

Survey effort at each site was split equally between weekdays and weekends. Therefore, if visitor usage was the same at weekends and weekdays, one would expect half the observed people to be recorded on weekends. In fact, comparing the totals of visitors recording leaving the access points, 59% of people leaving were recorded on weekends. A Chi-square test of the null hypothesis of equal daily rates of usage at the weekend as on week-days was significant ($p < 0.01$) for all sites combined (omitting the south entrance to Bramshill Plantation where the sample size was too small). In fact only one site (Lightwater) had more people visiting, per day, during the week (33% of people leaving Lightwater were recorded at the weekend). The individual sites where significantly more people ($p < 0.01$) visited during the weekend were the Lookout, Stable Hill and Chobham Road (Chobham Common). These sites all have large car parks.

Time of day

People were asked whether they tended to visit more frequently at a certain time of day. Half of all people interviewed (49%) did not visit at a particular time (Table 4).

Table 4: Time of day interviewed in relation to the time of day when the interviewee tended to visit the heath. The percentages are calculated for each row.

Time period interviewed	Total (no groups)	Time of day most frequently visit (% of total)					
		before 9am	0900 - 1200	1200 - 1400	1400 - 1600	after 1600	don't know / no particular time
0700 – 0900	218	51	2	0	0	0	47
1000 – 1200	355	7	41	1	2	2	46
1300 – 1500	288	4	7	18	13	6	52
1700 – 1900	283	1	4	1	4	39	51
Total	1144	13	16	5	5	12	49

The actual totals of people leaving the site within each time period were used to determine when most people visit the heaths. On weekdays there was little difference in the number of people leaving the site in each of the two-hour time periods (Table 21, Figure 3). On weekdays the time period 1300 – 1500 was the time when the highest counts were recorded, but only 31% of people were recorded during this time period. On weekends, the early morning (0700 – 0900) had fewer visitors than the other time periods, and, as with weekdays, the highest counts of people were from the 1300 – 1500 time period (34% of weekend visitors leaving the site). The data for each site for weekdays and weekend days with visitors per time period are given in Appendix 1, Table 21.

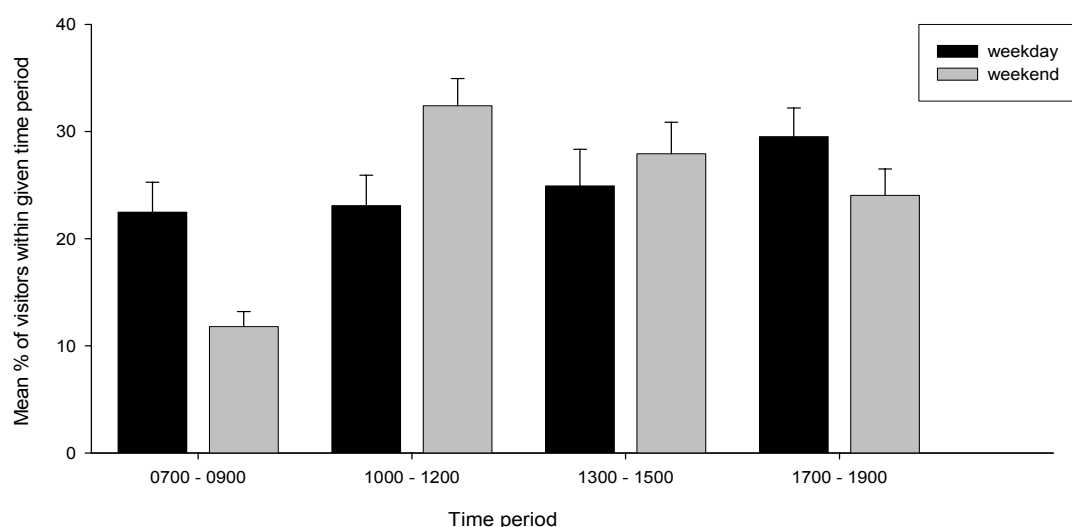


Figure 3: Mean percentage of visitors within a given time period for weekends and weekdays. The percentage figures give the proportion of the total count for a weekday or a weekend day recorded leaving the site within the given time period.

Reason for visiting the heath

All of the people interviewed were asked the purpose of their visit on that day, and were given a choice of eight possible answers. These eight included an “other” category, and when this was used the other purpose was recorded. As people were able to give up to two reasons (for example some people may exercise their dog and jog during the same visit), the total number of reasons given was greater than the number of people interviewed. The number of people who gave two reasons for visiting the heath was 347, meaning that 2409 reasons were given for visiting the heath (see Appendix 1, Table 20 for totals).

Dog walking was the most common reason given as the purpose of the visit that day, with 59% of people walking dogs (Figure 4). The total number of dog walkers arriving by car significantly correlated with the total count of people leaving the site (Pearson correlation coefficient = 0.628, p = 0.001).

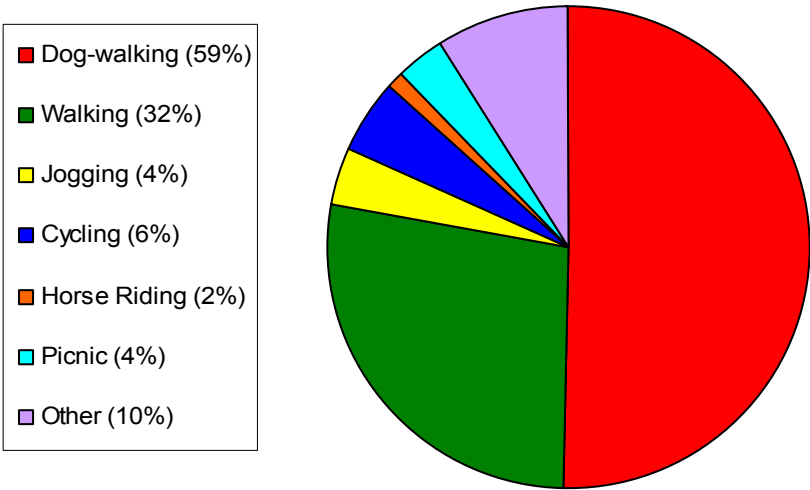


Figure 4: The purposes for visiting the sites. Proportions are calculated from the total number of answers given (some people were visiting for more than one reason).

Taking only those access points with car-parks, there was no significant relationship between the number of dog walkers interviewed at each site (taking only those dog walkers that arrived by car) and the number of houses within either 5km or 10km (Figure 5). This would suggest that factors other than distance to the heath may be influencing the number of dog walkers visiting a given site by car. Sites such as Nightingale Road and the car park at Cricket Hill Lane had particularly low numbers of dog walkers arriving by car. The Nightingale Road car park is very small, and parking is difficult, and the car park of Cricket Hill Lane is reached down an unmarked, very bumpy and difficult to negotiate track. Such factors may be influencing the lack of any relationship.

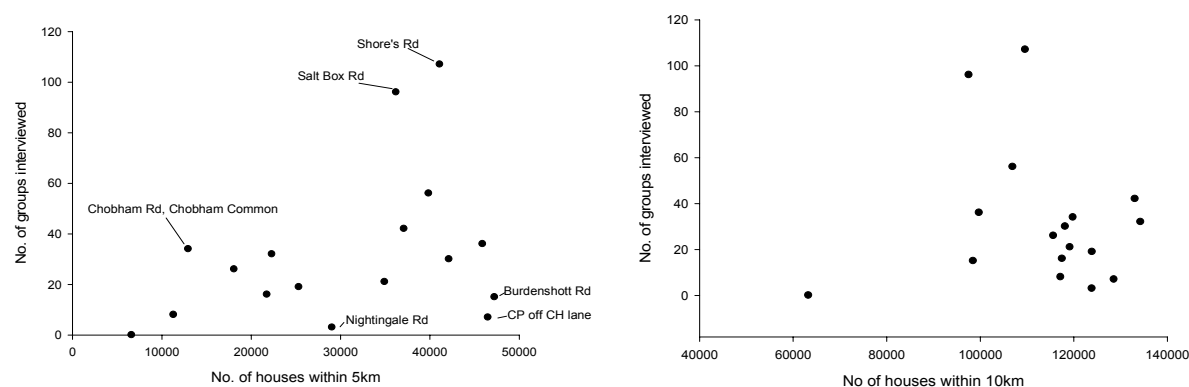


Figure 5: No of groups of dog walkers, arriving by car and number of people living within 5km and 10km radius of each access point. Only sites with car parks are included.

The “other” category included a wide range of reasons for the visit, these included:

Taking the children out	70 people
Flying model aircraft	19 people
Fishing	14 people
Short cut to work	14 people
Exercise / keeping fit	9 people
Mushroom picking	9 people
Orienteering	5 people
Nature watching	4 people

In addition, the interviewers noted on one occasion a group of people involved in battle re-enactment and also two instances of people walking on the heath with their cat. None of these people were subsequently interviewed (they either left by a different access point or left outside the interview periods).

The Lookout clearly attracts a wide range of visitors and it was here that a particularly high number of people gave “other” as the reason for visiting. The presence of an adventure playground, discovery centre and specific child-orientated events clearly attracted people with children. The “Go-Ape” theme park also attracted a number of people, and while those solely visiting “Go Ape” were ignored, “Go Ape” was still given as a reason for a number of visitors. For example, not all of a group would visit “Go Ape”, and those not involved would walk or picnic while waiting. The high numbers of people recorded at the Lookout were therefore clearly related to the range of attractions present at the site.

Mode of transport to heath access point

For all 26 access points together, the majority of people arrived by car or van (83% of people). The proportion of people who arrived on foot was 13% (Figure 6). However, relative use of cars compared to arriving on foot varied enormously between access points. No one came by car, and practically all people walked, to the access point next to the play area on Springfield Avenue. Over 95% of people came by car to access points on Chobham Road (Chobham Common), Currie’s Clump, S entrance to Bramshill Plantation, Shore’s Road, Staple Hill and The Lookout. The data for each site is given in Appendix 1, Table 22.

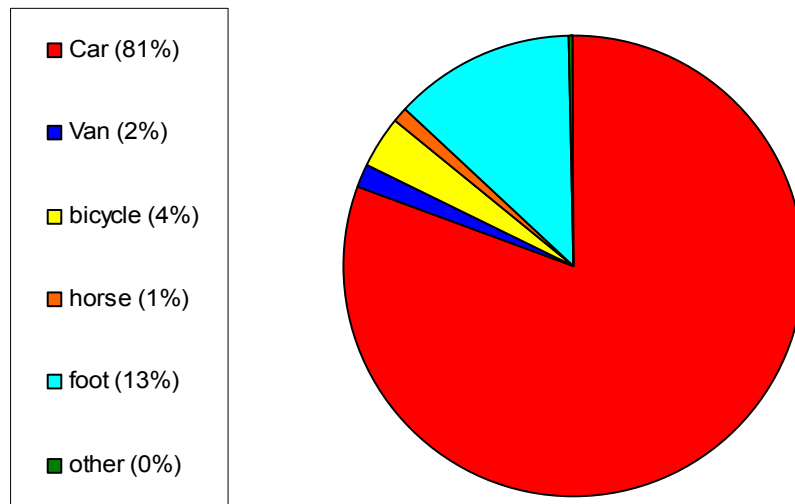


Figure 6: Mode of transport. Percentages are based on the total number of people rather than the number of groups interviewed.

The role of parking

Car parking provision varied between the access points surveyed. Sample sizes for each type of parking provision varied, with only four sites with no parking or very limited parking (for example on a grass verge). As might be expected, the sites with large car-parks had the highest hourly rate of visitors arriving by motor vehicle (Table 5). Some of the sites with large car parks also had additional facilities, such as cafes, toilets, and adventure playgrounds etc, which could serve as additional attractions and hence account for the wide variation in the number of visitors to sites with large car parks.

Table 5: Number of people per hour, according to car-parking facilities and mode of transport. Total people is the number of people in groups that were interviewed. Small car-parks are those that hold less than 20 cars.

	<i>large car park</i> (n=8)		<i>small car-park</i> (n=9)		<i>lay-by or pull in</i> (n=5)		<i>V. limited parking</i> (n=4)	
Mode of transport	Total people	No. per hour per site	Total people	No. per hour per site	Total people	No. per hour per site	Total people	No. per hour per site
foot	54	0.4	68	0.5	78	1.0	65	1.0
vehicle	947	7.4	564	3.9	124	1.6	59	0.9
other	29	0.2	32	0.2	8	0.1	34	0.5
	1030		664		210		158	

Across all sites, the number of people counted leaving each site significantly correlated with the number of car-parking spaces (both including the Lookout: Pearson's correlation coefficient = 0.77, $p = <0.001$, and excluding the Lookout: Pearson's correlation coefficient = 0.42, $p = 0.04$).

Distances travelled to each heath access point

Each interviewed visitor was asked for the postcode from which they had travelled that day. A GIS (MapInfo Professional 7.5, 2003) was then used to calculate the straight-line distance from the postcode and the access point. This approach provided a good approximation of the distribution and range of distances people travel to each access point. Distances greater than 10 km were classed as '>10km'. A map of postcodes

In total 723 (63%) of the people interviewed gave full valid postcodes from which the distance to the access point could be calculated. Of the remaining people 381 (33%) gave only the first half of their postcode, referred to as the postcode stem. Where the range of recorded distances for all visitors to a particular access point from places with the same post code stem was relatively small, the missing distances from the same stem postcode to the same heath were set to the median of the observed distances. However, this infilling of numerous missing values made little difference to the distribution of distances travelled to any of the access points. Therefore all subsequent analyses and statistics are based solely on the full postcodes only.

Some of the people travelling by car had travelled considerable distances, with the maximum distance for one group interviewed of 568 km ! However, the majority of people travelling by car came from within a radius of 15km (Figure 7 and Table 6). Those travelling by foot travelled the shortest distances.

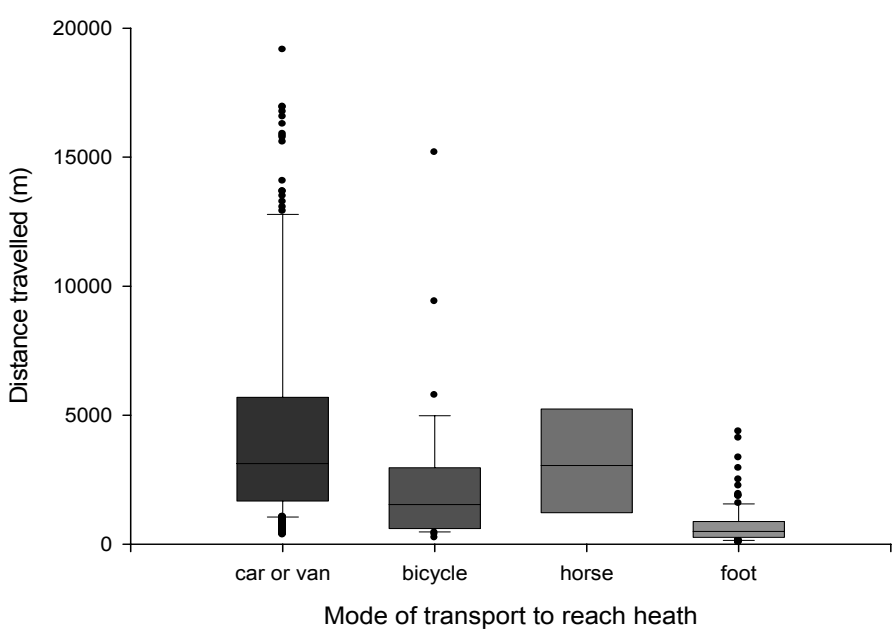


Figure 7: Distances people travelled to sites, grouped according to mode of transport used to reach the site

**Table 6: Summary of distances people travelled to sites (data shown graphically in Figure 7).
Data from all sites combined**

	Distance (km) of postcode to access point			
	car or van	bicycle	horse	foot
Median	3.1	1.5	3.1	0.5
Standard deviation	35.9	2.9	2.0	0.8
count (n)	568	34	8	112
Max	555.4	15.2	5.7	4.4
Min	0.4	0.2	0.6	0.1

The cumulative frequency of the distance travelled to reach the site, for each mode of transport, gives an indication of the catchment for each site. It can be seen that 40% of people travelling by foot come from within the 400m distance band; that the 1500m distance band includes 20% of car drivers and 90% of those arriving by foot, and that no walkers and only 30% of car drivers came from beyond 5km (Table 7, Figure 8)

Table 7: The percentage of people travelling within a given distance to reach the access points

Distance (m)	car / van	foot	bicycle
100	0	4	0
200	0	18	0
300	0	30	4
400	1	40	7
500	2	51	11
1000	9	79	35
1500	20	90	50
5000	70	100	93

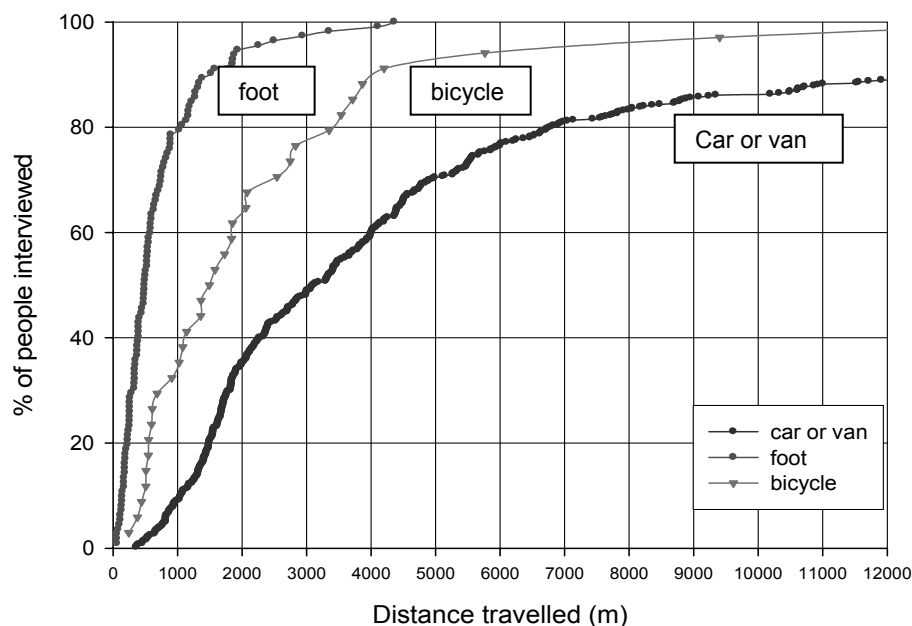


Figure 8: Cumulative frequency distribution of the distances travelled to heath access points

Distances and route travelled on each heath access point

Each person interviewed (as they were leaving the heath) was asked to indicate on a map of the site which route and where they had just walked. These routes are mapped for all sites in Appendix 2. These maps show that circular routes were commonly followed. The length of route was compared for each of the main activities (Figure 9, Table 8).

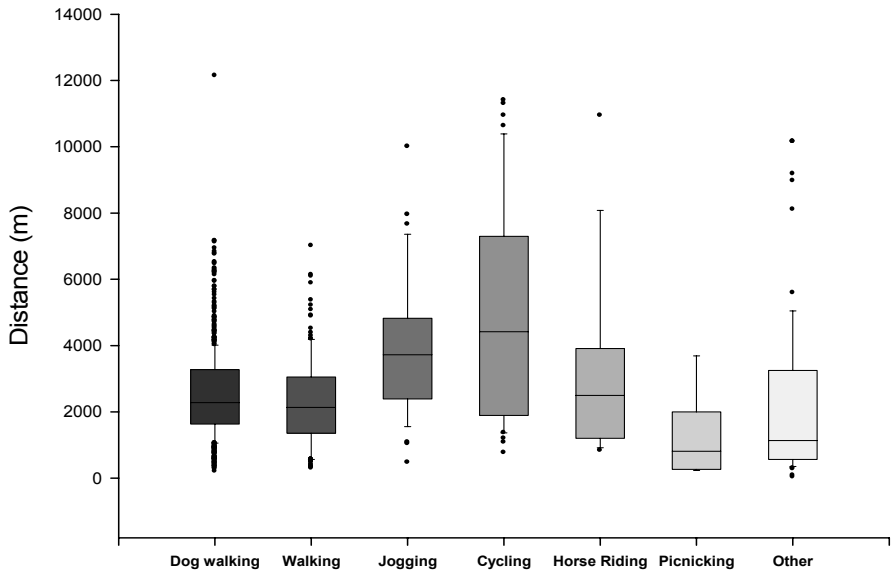


Figure 9 Length of route for each user group.

Table 8: Length (km) of route for each user group (data matches Figure 9 above).

	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Count(n)</i>
Dog Walking	2.5	2.3	1.3	0.2	12.1	772
Walking	2.3	2.1	1.4	0.3	7.0	143
Jogging	3.9	3.7	2.1	0.5	10.0	39
Cycling	4.9	4.4	3.3	0.8	11.4	44
Horse Riding	3.2	2.5	2.6	0.8	10.92	16
Picnicking	1.2	0.8	1.2	0.2	3.7	9
Other	2.3	1.1	2.5	0.03	10.2	76

The penetration distance measurement provides a useful measure of how far onto the heath visitors will go from the access point. Despite the average dog-walk route being 2.5km, 78% of dog walkers do not penetrate further than 1km onto the heath (Figure 10, Table 9, Figure 11).

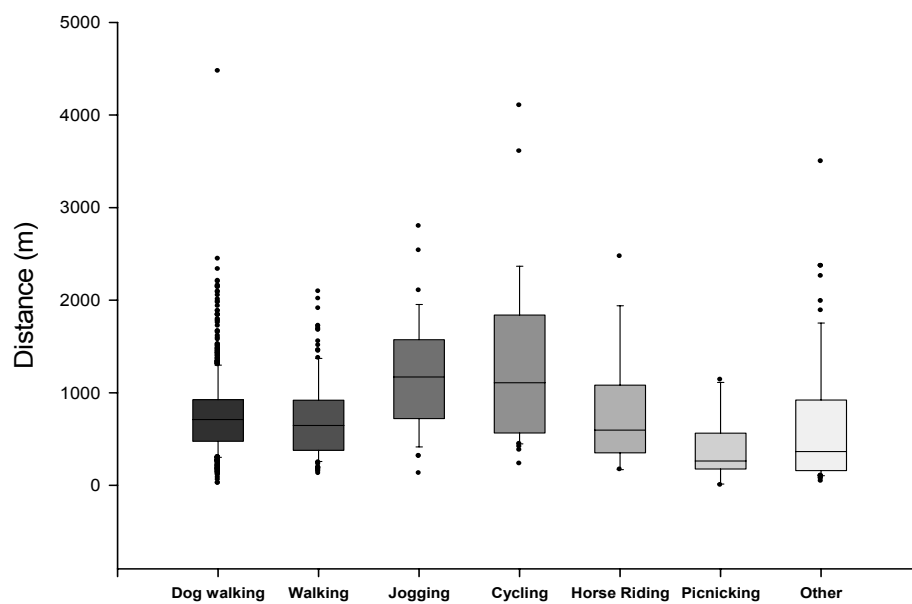


Figure 10: Penetration distance for each user group. The penetration distance is the linear distance from the mid point of the route to the access point.

Table 9: Penetration distances (m) for each user group (data matches that in Figure 10)

	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Count (n)</i>
Dog walking	760	712	419	20	4471	772
Walking	722	646	431	126	2091	143
Jogging	1174	1170	617	128	2796	39
Cycling	1336	1109	858	232	4101	44
Horse Riding	807	596	621	168	2470	16
Picnicking	388	263	358	0	1137	10
Other	676	364	685	43	3495	76

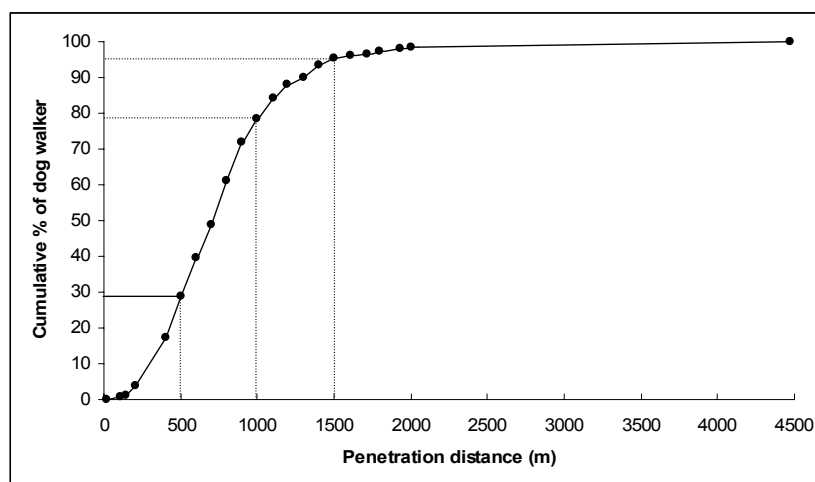


Figure 11: Cumulative frequency of the penetration distance onto heath, dog walkers only

For all users, neither the mean distance travelled on the heath, nor the mean penetration distance significantly correlated with the ‘visitable’ area (non-parametric rank Spearman correlations of 0.21 and 0.11 respectively, $p > 0.05$ for both) (Table 23).

Alternative sites

People were asked whether they visited alternative sites for the same primary purpose as their visit when interviewed. Three-quarters (1553 people) of all people interviewed did visit alternative sites, but there was some variation depending on the purpose of the visit (

Table 10).

Table 10: Responses (in percent) from people when asked whether they visit alternative sites for the same purpose as their visit when interviewed.

<i>Purpose</i>	<i>Yes</i>	<i>No</i>
Dog walking	78	22
Walking	80	21
Jogging	54	41
Cycling	67	33
Horse Riding	62	34
Picnic	85	15
Other	62	38
Total (all groups)	75	24

A binary logistic regression was used to determine whether those people arriving by car were more likely to use alternative sites than visitors who arrive on foot.

Significant differences were found for dog walkers (80% of those arriving by car visit alternative sites and 57% of those arriving on foot visit alternative sites, $z = 5.00$, $p = <0.01$) and walkers, (80% of those arriving by car visit alternative sites and 63% of those arriving on foot visit alternative sites, $z = 1.99$, $p = <0.05$). For joggers, sample sizes were small and no significant difference ($z = -0.52$, $p > 0.05$) was found between those arriving by car (43% visit alternative sites) and those arriving on foot (52% visit alternative sites).

Distance travelled to alternative sites

Those people interviewed who did visit alternative sites were asked how far they travelled to reach these alternatives, being given a choice of less than a mile, 1 – 5 miles and greater than 5 miles. A small proportion (12%) said that they visited a number of sites that fell within more than one category. Relatively few people (16%) travelled less than a mile and the majority (44%) travelled between 1 and 5 miles to reach alternative sites. There was some evidence that dog walkers tended to travel shorter distances to alternative locations as dog walkers were the group with the smallest proportion of people (20%) travelling more than 5 miles.

Table 11: Distance travelled to alternative sites. The table takes only those interviews where the person / group did visit alternate sites and the table gives the number of groups and then the percentage of those who travel within a given distance category.

Purpose	No groups	% of groups			
		< 1 mile 1.6km	1 - 5 miles 1.6 – 8km	> 5 miles >8km	more than 2 categories
Dog walking	610	17	51	20	11
Walking	112	13	20	47	21
Jogging	19	21	26	42	11
Cycling	32	9	22	50	19
Horse Riding	10	0	50	40	10
Picnic	9	22	11	56	11
Other	44	9	32	52	7
Total (all visitors)	836	16	44	28	12

Those who visited alternative sites were also asked how they travelled to these other locations. These data are summarised in (Table 12), which gives the % of groups, split according to purpose and mode of transport. Most dog walkers who travel to alternative sites on foot (82%) go less than a mile, but where they travel by car, most (59%) will travel between 1 and 5 miles. Most walkers (67%) also travel less than a mile on foot to reach alternative sites, whereas 57% of walkers who travel by car to the sites where they walk will travel more than 5 miles.

People were asked both the mode of transport they had used to visit the site on the day interviewed and also the mode of transport used to visit alternative sites. There was a clear difference between those who travelled to the site by vehicle and those who walked. Of those who came by car and also visited other sites, 82% would also visit other sites by car. By contrast, for those who arrived by foot, approximately half (52%) would visit alternative sites by car. This suggests that there are a number of people who tend always to travel to sites by car, and also a set alternate between car and foot.

Table 12: Percentage of visitors who travel a given distance to reach alternative sites, split by purpose of visit and by type of access.

<i>Mode of transport</i>	<i>Total</i>	% of groups who travel given distance to alternative sites			
		less than 1mile	1 - 5 miles	>5 miles	more than 1 distance category
Dog walkers					
car	479	8	59	25	8
foot	68	82	16	1	0
other	4	0	25	25	50
both foot and car	56	18	32	4	46
Walkers					
car	88	7	23	57	14
foot	12	67	8	0	25
other	1	0	0	100	0
both foot and car	10	0	10	20	70
Joggers					
car	9	0	22	78	0
foot	7	57	43	0	0
other	1	0	0	0	100
both foot and car	2	0	0	50	50
Cyclists					
car	18	0	11	78	11
by bike	1	0	100	0	0
other	13	23	31	15	31
Horse Riders					
car	2	0	0	100	0
other	7	0	71	29	0
both foot and car	1	0	0	0	100
Picnickers					
car	5	0	0	100	0
other	1	100	0	0	0
both foot and car	3	33	33	0	33
“Others”					
car	40	5	33	58	5
foot	3	67	0	0	33
both foot and car	1	0	100	0	0

Table 13: Mode of transport used to reach the site on the day interviewed cross referenced with mode of transport used to visit alternative site. Table gives the number of groups in each category and the percentage (% in brackets). The percentage is calculated from the row totals.

<i>Method used to visit the site when interviewed</i>	<i>Method used to visit other sites</i>				<i>Total</i>
	car, van or other motor vehicle	On foot	Other method	Both vehicle and on foot	
car, van or other motor vehicle	581 (82)	56 (8)	4 (1)	62 (9)	703
foot	49 (52)	34 (36)	2 (2)	10 (11)	95
total	630	90	6	72	798

Predicting total visitor numbers

The total number of people varied between sites. There are a number of possible factors which are likely to influence the total numbers of visitors, these include:

- 1) The size of the human population living near the access point (the size of this catchment will vary depending on mode of transport)
- 2) The ease of reach, barriers such as rivers, or motorways may mean that the actual distance to travel to a given access point is considerably larger than the linear distance from the house to the access point
- 3) The number of parking spaces
- 4) The number of other visitors – this may influence whether parking is available and also it is possible that other people could both attract or deter other users.
- 5) Access restrictions - for example no cycling or a requirement to keep dogs on leads (the presence of livestock will usually necessitate the latter).
- 6) Provision of certain access features, such as nature trails or mountain bike circuits
- 7) The quality of the site – whether it be views, shade to walk under or attractiveness of the location
- 8) Facilities, the presence of toilets, cafes etc
- 9) The size of the site and the actual area open to visitors
- 10) The presence and number of alternative sites nearby
- 11) Cost – whether there are parking or other charges

Many of the above are difficult attributes to quantify. However, certain variables can be easily quantified and were used to test whether the total number of visitors leaving an access point (the tally counts) could be predicted. The following variables were used:

- Total no of houses within 5km (taken from the postcode data)
- Total no of houses within 10km (taken from the postcode data)
- The number of off-road parking spaces at each access point
- The ‘visitable’ area at each site, calculated largely from the SPA boundary, modified to include additional undesignated areas of countryside where access was permitted. Main roads, railway lines and built up areas were used to delimit the area ‘visitable’.

Each of these will be explored in turn

Housing density around sites

The actual number of people living in around each access point varied between points: the maximum was Lightwater Country Park, which has 112,000 properties lying within a 10km radius of the access point and the smallest number of properties within this radius was found with the Burdenshott Road access point (51,000 properties). The mean number of properties within a short distance (eg less than 1km) of the access points was relatively small, reflecting the small area within the given radii (Figure 12).

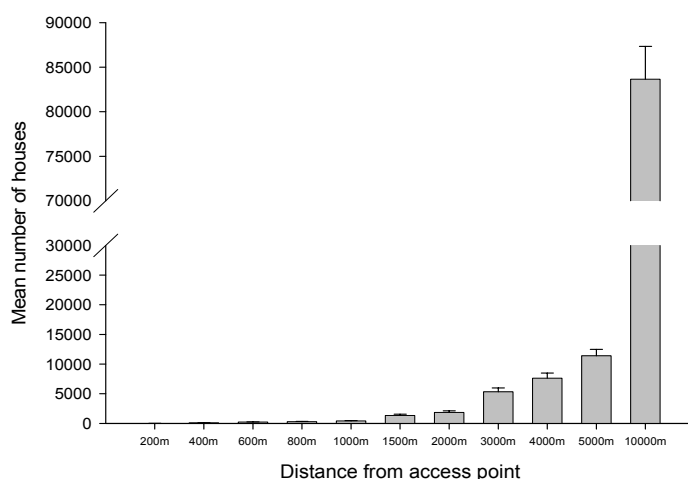


Figure 12: Mean number of houses per access point at different distance bands. Note the break in the y axis.

The number of houses with 5km and within 10km of access points significantly correlated with each other (Pearson correlation co-efficient = 0.543, $p=0.004$). The Lookout was a clear outlier, attracting more people than might be expected given the number of people in the surrounding area (Figure 13). There was a significant relationship between the number of houses and total visitors leaving the site, using the housing figures for all distance bands between 1km and 5km. At distances above 5km, there was no significant relationship between the number of houses surrounding the access point and the numbers of visitors (Figure 13,).

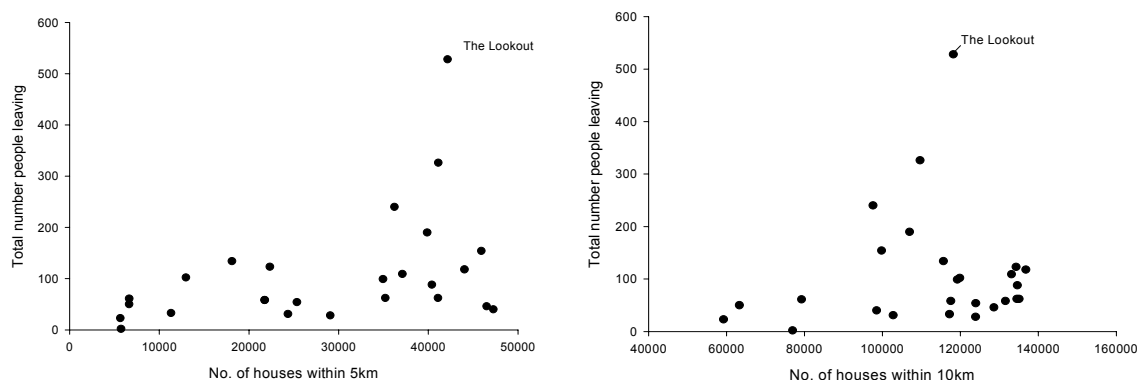


Table 14: Significance and R^2 values (indicating the percentage of variance explained) for regression analyses testing the relationship between the number of houses within a given distance band and the total number of people counted leaving the site. The analyses were repeated both including and excluding the Lookout.

Distance band	Including the Lookout		Excluding the Lookout	
	p	R^2	p	R^2
200m	0.24	1.8	0.25	1.6
400m	0.94	0	0.87	0
600m	0.35	0	0.67	0
800m	0.23	2.1	0.65	0
1000m	0.04	12.8	0.25	1.7
1500m	0.004	26.6	0.02	17.5
2000m	0.003	29.3	0.008	23.3
3000m	0.003	27.6	0.005	26.7
4000m	0.03	15.1	0.007	24.3
5000m	0.03	13.8	0.036	14.1
7500m	0.12	5.8	0.17	3.8
10,000m	0.57	0	0.58	0

‘Visitable area’

There was no clear relationship between the number of people counted leaving the site and the ‘visitable area’ (Figure 14). The ‘visitable area’ was very large for some sites, especially the three sites on Broadmoor to Bagshot Woods and Heaths SSSI (where the area is 1800 ha). It is perhaps possible that many of the sites are too large for site size to influence the number of visitors. It is likely to be user groups such as cyclists and joggers, who cover longer distances on their visits, who will be influenced by the size of the site.

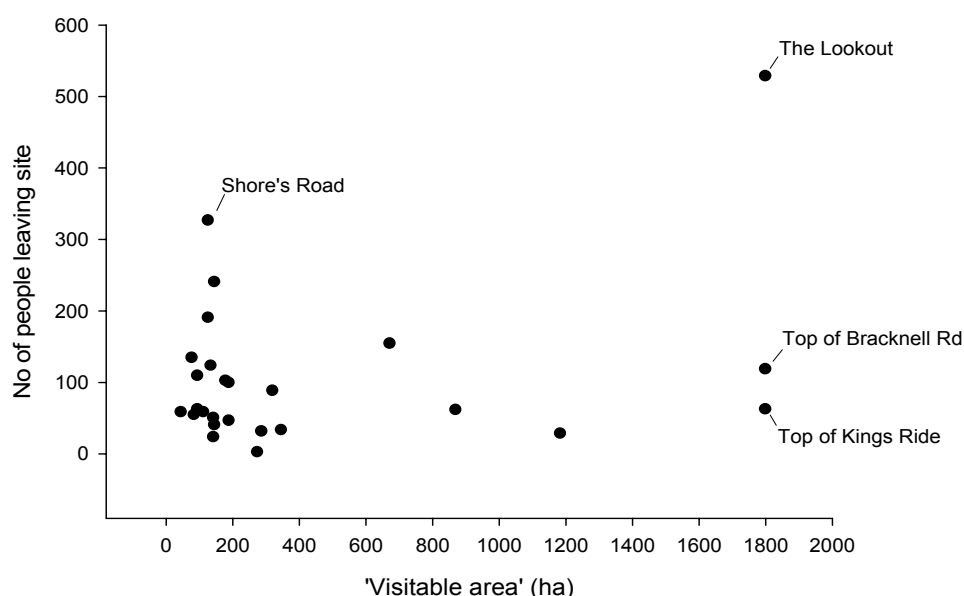


Figure 14: Numbers of people leaving each site in relation to the ‘visitable ares’ at each site.

In order to attempt to predict the total number of people leaving the site, a multiple regression was carried out, using the number of people leaving the site as the response variable and the number of houses within 5km and the number of parking spaces at each site as the regressors. The Lookout was excluded from the analysis. There was a rather poor fit, with only 25% of the variance in the number of people explained. The overall relationship was significant ($F_2 = 5.09$, $p = 0.015$) and both regressors were significant ($p < 0.05$). The multiple regression was repeated with the inclusion of the visitable area, but the overall fit was not improved.

The above multiple regression was repeated, but only using those 16 sites with a car park (again excluding the Lookout). With this, smaller sample size, none of the variables individually, or in combination, was significant in predicting the number of people.

The proportion of residents visiting each site

As might be expected, the proportion of residents, living around each site and that visit that heath decreases with increasing distance away from each site. This decreasing proportion of residents can be described using fitted curves, which can then be used to predict the numbers of people visiting a given site.

Figures shows such curves, for all visitors across all sites and then for visitors arriving by foot and by car separately. The data presents the percentage of people who were interviewed.

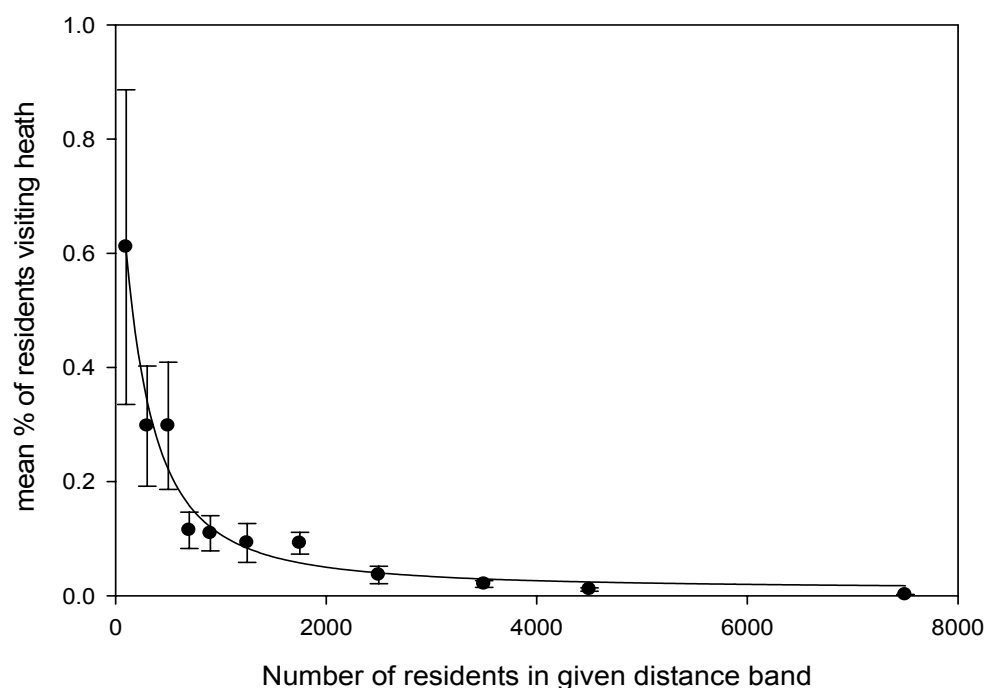


Figure 15: All visitors: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: $y = ae^{(b/x+c)}$. Where $a = 0.010$ (± 0.011); $b = 5130.163$ (± 3672.72) and $c = 1145.581$ (± 555.843). $R^2 = 97\%$.

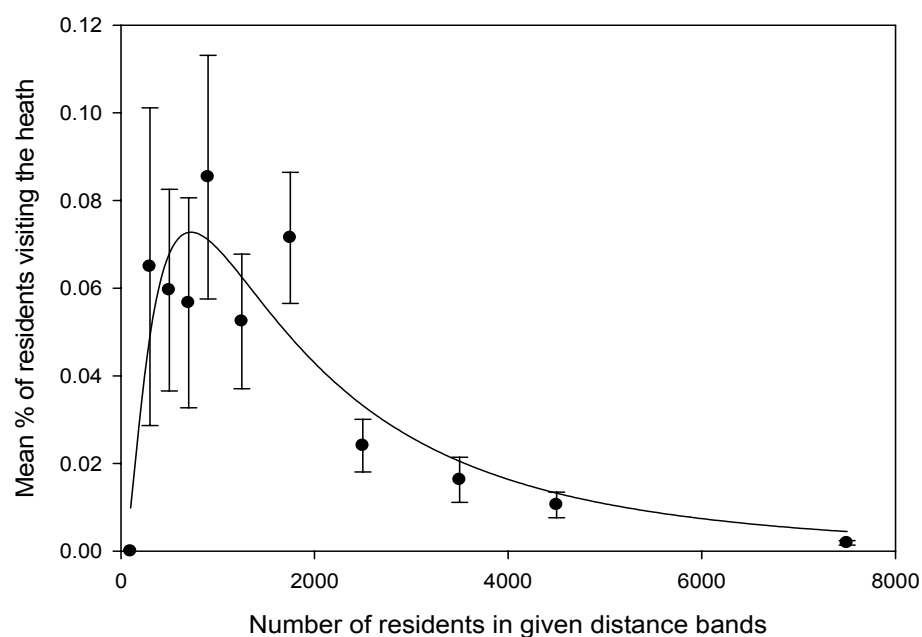


Figure 16: Car drivers only: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: .

$$y = ae^{\left[-0.5 \left(\frac{\ln \left(\frac{x}{x_0} \right)}{b} \right)^2 \right]}$$

Where $a = 0.073 (\pm 0.008)$; $b = 0.99 (\pm 0.16)$ and $x_0 = 723.65 (\pm 114.16)$. $R^2 = 85\%$.

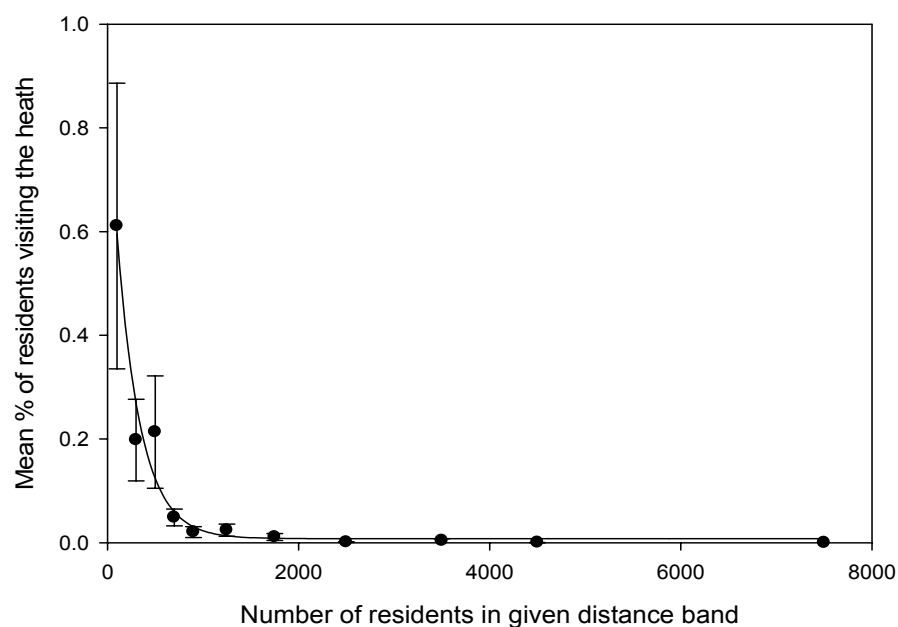


Figure 17: People travelling by foot: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: $y = y_0 + ae^{(-bx)}$. Where $y_0 = 0.08 (\pm 0.02)$; $a = 0.88 (\pm 0.09)$; $b = 0.004 (\pm 0.0001)$. $R^2 = 95\%$.

Extrapolating visitor numbers to give annual totals

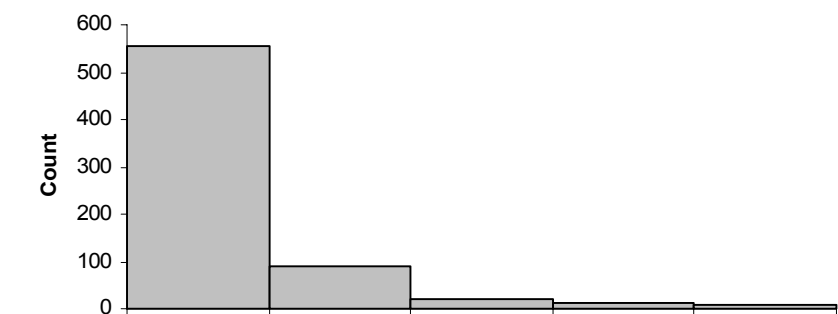
Most studies of visitor numbers express visitor levels in terms of an annual figure, representing the number of visits to the site. Such a figure is calculated here to facilitate a comparison between visitor pressure on the SPA as a whole and other sites within the UK. There are a number of different ways in which such the total could be estimated, and only one, simple approach, is given here. A total of over 5 million visits per annum to the SPA is estimated as follows:

Total number of visitors recorded leaving during this survey	2856
Number of sites	26
Mean number of visitors leaving per site	110
No. of hours of surveying per site	16
Mean no. of people leaving per site per hour	7
Total hours in day (0600 – 2000)	14
Total people leaving site per day per access point	98
Mean number of people leaving per access point per yr.	35,770
Total number of access points within the SPA	150
Estimate of the total number of visits per year to the SPA	5,365,500

The above calculation uses an estimate of 150 access points within the SPA. This total is estimated using a survey of access points, conducted for English Nature (Exergesis 2004). All access points within the SPA were identified, apart from Bourley, which was not surveyed. The survey found a total of 685 access points, 130 of which had space for at least one car. The figure of 150 is therefore considered a reasonable estimate (allowing for Bourley) of the total number of access points equivalent to the ones in this survey.

Without a comprehensive survey of all access points it is not possible to check that the 26 access points used in the survey is representative of the SPA as a whole. The audit of access points (Exergesis 2004) does give the number of car-park spaces at each access point, the frequency distribution of which is compared with the current survey in (Figure 18). It can be seen that the 26 points covered in this survey do not represent the real distribution, as a lower proportion of access points with foot access only were covered in this survey. Hence the estimate of the total number of visitors to the SPA, while being as accurate as possible with the current data available, is likely to be an over estimate of the total number of visits.

All access points with SPA (apart from Bourley)



Access points included in this survey

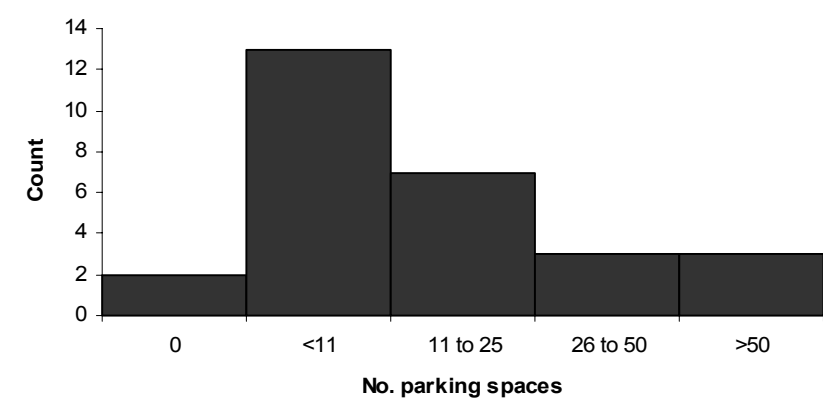


Figure 18: A comparison of the range of access points (categorised according to car park capacity) within the SPA as a whole (top graph) and within this report.

Discussion

This study looks across a range of access points within the SPA and clearly identifies broad patterns in the types of access, frequency of visits, visitor behaviour and reasons for visiting. This understanding will help develop a strategic approach to access management, for example facilitating the creation of alternative sites which will be attractive to visitors, and hence reducing visitor pressure within the SPA. An understanding of the catchments of individual access points will also help to identify when changes in the number of houses surrounding the heath, perhaps through new development, will influence actual visitor numbers to the SPA.

A number of clear patterns have emerged:

- The number of visitors to sites is related to the number of houses surrounding each site and the type of access point (amount of parking etc.)
- The majority of visitors travel by car and drive relatively short distances (less than 5km)
- The main reason for visiting sites is for dog walking.
- Dog walkers visit sites very frequently and will typically walk around 2.5km along circular routes which take them approximately 760m from the access point
- Besides dog walking there are a wide range of other reasons why people visit heaths
- A high proportion of visitors will visit alternative sites – those that travel by car especially so

As Figure 19 clearly illustrates, the routes taken by the visitors interviewed have covered a considerable proportion of the SPA. The routes taken create a web like network spreading out from each access point. Were all access points to be mapped, and a similar mapping exercise conducted for each, it is clear that few areas would remain undisturbed. Even on some of the larger heaths, it can clearly be seen from Figure 19 that the routes from different access points overlap, suggesting that the centre of some heaths will be visited by people who have entered from different access points. Depending on the shape and size of site, and also the distribution of access points, it is possible that visitor numbers could be highest away from car-parks.

Figure 20 shows the postcodes from which people travelled from. Only the area around the SPA is shown. The map shows the “catchment” of the SPA, and it is clear that people from a number of different settlements visit the SPA. Each access point is surrounded by a cluster of coloured dots representing people who have travelled from that postcode to the access point. It is interesting to see that people do not necessarily visit the nearest part of the SPA to their postcode, and also that the catchments for different access points clearly overlap. The map therefore supports the approach of looking at the proportion of residents that visit at different distance bands. People who live close to a given access point would be expected to visit that access point more frequently as it is the closest. Sites that are further away might still be visited. The approach of using the proportion of residents quantifies this choice, and the increased number of alternative sites which are likely to be available at greater distances. This approach is recommended as a future avenue for predicting visitor pressure at unsurveyed sites.

It is apparent that the SPA receives a high number of visitors from the local area who visit sites regularly. We extrapolate these data to give an estimate of total visits per annum to the SPA. This figure, of over 5 million, is higher than figures for some national parks (Table 15). However, the estimate should be treated with caution. There are a number of different ways by which this could be calculated, only one is used here. A full audit of all access points to the SPA has not been conducted and a simple comparison with our current knowledge of access points does suggest that the points included in this survey tend to be

those with more parking. The 5 million figure may therefore be an over estimate, but does serve to illustrate the order of magnitude that may be involved.

Table 15: Visitor numbers to English National Parks (from Defra 2002).

National Park	Total Visits (millions of people p.a.)
Broads	5.4
Dartmoor	3.8
Exmoor	1.4
Lake District	22
Northumberland	1.5
North York Moors	8
Peak District	19
Yorkshire Dales	9

Understanding the context

The interviews were conducted in August. This month is the peak holiday period, and visitor access patterns may, as a consequence, be different when compared to the rest of the year. The results here demonstrate that most visitors are local residents, and the SPA is unlikely to attract many tourists. As some residents may well be away on holiday at this time of year, net visitor numbers could be lower than at other times of the year. The numbers of children and number of families visiting sites would also be expected to be different outside of the school holiday period.

Dog walkers are clearly the main user group. The data show that dog walkers visit more frequently than other users, many of them walking daily on the same site. As dogs need exercising on a daily basis, the dog walkers interviewed are therefore likely to represent relatively constant sample of visitors, and usage would be likely to be similar throughout the year. During the winter, the proportion of dog walkers to other users may well be higher as the numbers of people cycling, taking the children out, picnicking etc. would be likely to be less.

Another feature of August is that there are more day-light hours. Assuming that those people who visit daily visit throughout the year (and visit during day-light hours), then the number of these people visiting per hour will be likely to be higher during the winter. Expressing visitor numbers as a daily rate rather than an hourly rate is therefore likely to provide the best means of comparing visitor pressure at different times of the year.

Towards an access management toolkit for lowland heathlands ?

This study was conducted in a similar fashion to the Dorset study (Clarke *et al.* 2005), with identical time periods used and many of the same questions asked in the interviews. Given the similarities between the two studies, it is interesting to compare the results. While much of the data are broadly similar, it does appear that there are differences between the two areas (Table 16), and it would be interesting to determine whether these are significant.

Table 16: Comparison between visitor access pattern data from the Dorset Heaths (Clarke *et al.* 2005) and this study.

	<i>Dorset</i>	Thames Basin
Proportion of people visiting on their own	41%	29%
Proportion of visitors arriving by car	59%	83%
Proportion of visitors arriving on foot	36%	13%
Proportion of car drivers coming from within 2km	31%	36%
Proportion of car drivers coming from within 3km	43%	47%
Proportion of people walking coming from within 1km	89%	79%
Average distance walked by dog walkers	2181m	2508m
Average penetration distance (dog walkers) only	698m	760m
Proportion of people interviewed walking their dog	80%	59%
Proportion of people interviewed joggers	2%	4%

Combining the two datasets would, in fact, provide the potential to develop a generic model of lowland heathland visitor use in southern England. In particular, by combining all the sites (the total number of sites would be 46), it would be possible to identify particular features of access points (such as parking provision, way-marked routes etc) which were present on sites that attracted particularly high numbers of people. It would also be of interest to combine the data of catchment and proportion of residents visiting the heaths. With these data combined it would be possible to develop a predictive model of visitor numbers and their subsequent distribution (once on the heath) for any access point. Such a model, once developed, could be applied to all access points within a given area, using GIS, allowing a hotspot model of people density across each site to be mapped. Such maps could then be used to develop access management plans; as a tool for exploring the distribution of key bird species and as a means of predicting the effect of manipulating access (for example through closing access points) in strategic locations.

Further steps towards understanding access issues to the SPA

This survey presents an overview of access patterns, and the data have considerable potential for furthering our understanding. The following are beyond the scope of this report, but represent logical next steps for building on the work here:

- 1) Repeat counts at one or two of the access points at a different time of year in order to determine how visitor levels in August compare with other months.
- 2) Combine the Dorset and Thames Basin Heaths data sets to build a model which will predict total visitor numbers to sites based on the number of houses surrounding each site. This model will also allow the number of visitors likely to visit a site that will result from new development.
- 3) Use the process of developing the above model to pull out which sites attract more people than expected and which sites attract fewer. By looking at these residual values it will be possible to further highlight particular features of sites which attract people.
- 4) Map and categorise all access points within the Thames Basin Heaths SPA
- 5) Calculate (using the model identified in 1) the total visitor numbers to each access point within the SPA. Use this figure to show the total visitor numbers per annum to the SPA.
- 6) Use the cumulative curves representing the penetration distances of different user groups to map visitor density within sites.
- 7) Overlay bird data to compare settlement pattern of Annex 1 species with the number of visitors to each site.

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Acknowledgements

The fieldwork, conducting the interviews and counting the people, was conducted by Lauren Beasley, Paul Derbyshire, Steve Hughes, Richard Johnstone, Kirsten Light, Durwyn Liley, Dante Munns, Lousie Munns and Nick Walford. Jenny Goy and Lauren Beasley entered the excel data.

We are grateful to all the site managers and land owners who allowed access and provided advice and support to those conducting the interviews.

For some of the ideas and discussions about access patterns on heathlands we are grateful to, Andrew Nicholson, Nick Squirrel and Doug Kite.

The funding for this work was provided by English Nature, Thames & Chilterns Team. Keith Payne was responsible for managing the contract. We are grateful to Vanessa Burley and Sam King for further information and access to electronic files. Colin Pritchard (Countryside Agency) was also on the steering group for the contract.

We are also grateful to Brian Crumley and Hannah Ross (both English Nature, Peterborough) for providing access to the electronic map files and organising the copyright transferral of UKP and Ordnance Survey files.

Abbreviations

GIS	Geographical Information System
SPA	Special Protection Area

Appendix 1

Additional tables, giving breakdowns of totals per site.

Table 17: Totals of people entering, leaving and interviewed by site

Site	No. of people					
	entering	leaving	Declined to answer	already interviewed	interviewed	% people leaving interviewed
B3011 opposite Arrow Lane	33	23	2	2	17	74
Black Bushes Road	32	31	1	0	30	97
Bourley Road	143	154	14	11	113	73
Burdenshott Road	61	43	0	5	39	91
Car Park off Cricket Hill Lane	85	99	5	5	83	84
Car Park off the A30	62	46	0	5	39	85
Chobham Road	124	102	3	4	79	77
Chobham Road, Horsell Common	255	190	3	3	140	74
Currie's Clump (Boldermere CP)	137	134	5	3	115	86
E of Aberconway House (Wrens Nest CP)	70	58	3	4	40	67
Lightwater Country Park entrance	242	134	12	6	116	87
Mytchett Place Road	112	99	21	4	74	75
N entrance to Warren Heath	61	73	7	6	60	82
Nightingale Road / A325	39	28	1	1	19	68
Off Crowthorn Road	121	109	5	18	78	72
Play area, Springfield Avenue	47	50	1	10	25	50
Queens Road, Cowshot Common	68	58	1	3	51	88
S entrance to Bramshill Plantation	4	2	0	0	2	100
Salt Box Road	299	240	10	28	173	72
Sandpit Hill	100	54	1	5	44	81
Shore's Road	400	326	13	15	212	65
South Road	60	62	7	5	44	71
Staple Hill	38	33	0	1	27	82
The Lookout	538	528	141	11	317	60
Top of Bracknell Road	84	62	8	14	38	61
Top of Kings Ride	116	118	3	11	87	74
Total	3331	2856	267	180	2062	72

Table 18: Number of groups encountered of a given size (group size includes adults and childrens).

Site	Group size					Total people
	1	2	3-5	6-9	<10	
Top of Kings Ride	30	17	6			87
B3011 opposite Arrow Lane	9	4				17
Black Bushes Road	11	8	1			30
Bourley Road	30	26	4	3		113
Burdenshott Road	12	6	4			39
Car Park off Cricket Hill Lane	27	17	7			83
Car Park off the A30	15	6	4			39
Chobham Road, chobham common	21	19	4	1		79
Chobham Road, Horsell	48	30	5	2		140
Currie's Clump (Boldermere CP)	13	26	12	1		115
E of Aberconway House (Wrens Nest CP)	9	12	2			40
Lightwater Country Park entrance	26	14	9	3		116
Mytchett Place Road	30	14	5			74
N entrance to Warren Heath	21	15	3			60
Nightingale Road / A325	5	4	2			19
Off Crowthorn Road	33	17	3			78
Play area, Springfield Avenue	7	4	3			25
Queens Road, Cowshot Common	15	10	3	1		51
S entrance to Bramshill Plantation	2					2
Salt Box Road	64	36	10	1		173
Sandpit Hill	22	9	1			44
Shore's Road	72	38	13	3		212
South Road	29	3	3			44
Staple Hill	12	5	1			27
The Lookout	19	31	30	13	2	317
Top of Bracknell Road	19	5	2			38
Total no. of people	601	752	484	196	29	2062
% of all visitors in given group size	29	36	23	9	1	

Table 19: Frequency of visit for each site. The table gives the total number of groups interviewed at each site, and then the percentage of that total according to the answers given. Numbers in bold refer to the most frequently given answer (highest percentage) at each site.

Site	Total interviewed at each site (no of people)	% of groups interviewed				
		Daily	Once a week	Once a month	Varies through the year	Don't know
B3011 opposite Arrow Lane	13	54	38	0	0	8
Black Bushes Road	20	55	30	5	5	5
Bourley Road	63	51	29	14	3	3
Burdenshott Road	22	50	18	5	23	5
Car Park off Cricket Hill Lane	51	57	16	10	10	8
Car Park off the A30	25	56	16	4	16	8
Chobham Road, chobham common	45	31	33	11	7	18
Chobham Road, Horsell	85	53	33	7	6	1
Currie's Clump (Boldermere CP)	52	10	25	13	29	23
E of Aberconway House (Wrens Nest CP)	23	39	22	9	9	22
Lightwater Country Park entrance	52	60	33	2	4	2
Mytchett Place Road	49	59	33	2	6	0
N entrance to Warren Heath	39	54	33	8	3	3
Nightingale Road / A325	11	91	9	0	0	0
Off Crowthorn Road	53	68	21	4	4	4
Play area, Springfield Avenue	14	79	14	0	7	0
Queens Road, Cowshot Common	29	83	7	3	0	7
S entrance to Bramshill Plantation	2	0	50	0	0	50
Salt Box Road	111	64	23	6	4	4
Sandpit Hill	32	66	25	3	3	3
Shore's Road	126	49	34	7	8	2
South Road	35	63	17	11	9	0
Staple Hill	18	17	22	22	22	17
The Lookout	95	25	17	22	20	16
Top of Bracknell Road	26	85	12	0	4	0
Top of Kings Ride	53	64	23	6	4	4
Total	1144	52	25	8	8	6

Table 20: Total number of people interviewed at each heath access point, classified by their principle reason for visiting the heath. The percentages are expressed as a proportion of the number of people interviewed (2062), not the number of reasons given for visiting the heath (2409).

	Total number of people at each site						
	Dog-walking	Walking	Jogging	Cycling	Horse Riding	Picnic	Other
Top of Kings Ride	43	25	12	5	0	0	16
B3011 opposite Arrow Lane	13	3	1	0	0	0	0
Black Bushes Road	27	16	2	1	0	0	0
Bourley Road	70	54	14	13	1	0	0
Burdenshott Road	27	11	0	2	0	0	0
Car Park off Cricket Hill Lane	38	27	1	2	8	0	14
Car Park off the A30	20	9	1	6	5	0	1
Chobham Road, chobham common	59	37	4	0	0	0	4
Chobham Road, Horsell	91	41	3	8	6	0	16
Currie's Clump (Boldermere CP)	52	68	1	3	0	11	5
E of Aberconway House (Wrens Nest CP)	30	23	0	0	0	2	0
Lightwater Country Park entrance	56	41	2	0	0	39	0
Mytchett Place Road	58	21	5	2	0	0	0
N entrance to Warren Heath	47	7	3	3	6	0	3
Nightingale Road / A325	9	11	4	0	0	0	0
Off Crowthorn Road	65	15	1	1	0	0	2
Play area, Springfield Avenue	10	7	2	3	0	0	6
Queens Road, Cowshot Common	32	13	2	0	3	0	4
S entrance to Bramshill Plantation	1	0	0	0	0	0	1
Salt Box Road	154	30	1	0	3	0	5
Sandpit Hill	37	18	0	1	0	0	2
Shore's Road	168	78	2	2	0	12	2
South Road	17	5	5	11	0	0	9
Staple Hill	8	16	0	0	0	0	4
The Lookout	55	73	19	51	0	15	119
Top of Bracknell Road	23	17	5	5	0	0	0
TOTAL	1210	666	90	119	32	79	213
%	59	32	4	6	2	4	10

Table 21: Proportion of people visiting each site according to time period, for weekdays and weekend. The time period with the highest percentage for each day is highlighted in bold.

Site	Weekday					Weekend				
	No people leaving	% of people within time period				No people leaving	% of people within time period			
		0700 - 0900	1000 - 1200	1300 - 1500	1700 - 1900		0700 - 0900	1000 - 1200	1300 - 1500	1700 - 1900
B3011 opposite Arrow Lane	6	0	33	33	33	17	24	35	24	18
Black Bushes Road	9	11	11	67	11	22	9	36	55	0
Bourley Road	55	13	27	24	36	99	12	25	30	32
Burdenshott Road	14	43	7	14	36	26	4	54	27	15
Car Park off Cricket Hill Lane	42	12	17	33	38	57	14	49	16	21
Car Park off the A30	14	29	14	29	29	32	25	31	9	34
Chobham Road	16	44	19	0	38	86	5	35	24	36
Chobham Road, Horsell Common	77	12	49	21	18	113	12	27	42	19
Currie's Clump (Boldermere CP)	46	9	37	39	15	88	6	30	34	31
E of Aberconway House (Wrens Nest CP)	11	27	27	18	27	47	13	21	47	19
Lightwater Country Park entrance	83	6	6	64	24	40	13	38	45	5
Mytchett Place Road	39	15	18	18	49	49	12	24	27	37
N entrance to Warren Heath	25	24	32	20	24	36	19	44	19	17
Nightingale Road / A325	8	25	63	0	13	20	0	55	10	35
Off Crowthorn Road	43	16	28	23	33	66	5	47	20	29
Play area, Springfield Avenue	21	29	14	10	48	29	7	34	28	31
Queens Road, Cowshot Common	22	36	27	9	27	36	11	8	53	28
S entrance to Bramshill Plantation	2	50	0	50	0	0	0	0	0	0
Salt Box Road	118	30	25	25	20	122	18	28	19	35
Sandpit Hill	18	6	6	28	61	36	25	44	17	14
Shore's Road	119	19	34	29	17	207	11	21	30	38
South Road	33	52	6	3	39	29	10	31	10	48
Staple Hill	6	33	17	17	33	27	7	41	33	19
The Lookout	251	6	29	47	18	277	6	32	57	5
Top of Bracknell Road	35	17	37	11	34	27	22	33	15	30
Top of Kings Ride	50	22	16	16	46	68	18	18	35	29
Total	1163	17	26	31	26	1656	11	31	34	25

Table 22: Mode of transport given by people interviewed when asked how they travelled to the heath. The 3 “others” were all horse riders who had travelled to the sites using a horse box.

Site	<i>No of people visiting</i>						% of visitors arriving	
	Car	Van	bicycle	horse	foot	other	by car or van	on foot
B3011 opposite Arrow Lane	11	1			5		71	29
Black Bushes Road	27	2			1		97	3
Bourley Road	90	10	12		1		88	1
Burdenshott Road	35	1			3		92	8
Car Park off Cricket Hill Lane	60		3	6	14		72	17
Car Park off the A30	10		6	5	18		26	46
Chobham Road, chobham common	77				2		97	3
Chobham Road, Horsell	122		5	4	9		87	6
Currie's Clump (Boldermere CP)	106	6	1		2		97	2
E of Aberconway House (Wrens Nest CP)	36				4		90	10
Lightwater Country Park entrance	91	1			24		79	21
Mytchett Place Road	62				12		84	16
N entrance to Warren Heath	49		3	3	2	3	86	4
Nightingale Road / A325	4				15		21	79
Off Crowthorn Road	69	1	1		7		90	9
Play area, Springfield Avenue			3		22		0	88
Queens Road, Cowshot Common	19			3	29		37	57
S entrance to Bramshill Plantation	1	1					100	0
Salt Box Road	162	5		3	3		97	2
Sandpit Hill	29		1		14		66	32
Shore's Road	206	5			1		100	0
South Road	4		22		18		9	41
Staple Hill	27						100	0
The Lookout	309		5		3		97	1
Top of Bracknell Road	2		5		31		5	82
Top of Kings Ride	52	1	9		25		61	29
Total	1660	34	76	24	265	3		
%	81	2	4	1	13	0	83	13

Table 23: Mean and range of distances (m) travelled on the heaths and the penetration distance (m) from each access point (sorted by visitable area).

	<i>visitable area (ha)</i>	<i>No. of groups</i>	<i>Distance walked</i>			Penetration distance		
			mean	max	min	mean	max	min
Play area, Springfield Avenue	46	35	2001	7655	280	661	2796	108
Chobham Road, Horsell	78	28	2469	7008	706	781	1465	256
Salt Box Road	85	12	2449	6516	527	723	1337	141
Nightingale Road / A325	95	34	1650	4776	554	552	1571	208
Shore's Road	95	11	2443	4508	589	667	1372	245
Currie's Clump (Boldermere CP)	113	49	1736	4631	205	568	1211	81
Sandpit Hill	127	49	2188	4475	474	629	1136	125
Chobham Road, chobham common	127	34	2910	4083	1155	1039	1332	398
E of Aberconway House (Wrens Nest CP)	135	2	2689	6466	421	804	1841	177
Off Crowthorn Road	143	23	1729	3815	305	541	999	20
Top of Kings Ride	143	90	3981	10004	1431	1229	3495	334
S entrance to Bramshill Plantation	146	63	1760	2233	1288	453	828	78
Bourley Road	146	26	4083	10942	995	1249	2133	462
Car Park off the A30	180	20	1567	4812	348	438	1542	23
Car Park off Cricket Hill Lane	190	13	1278	3258	32	391	1242	0
Burdenshott Road	190	110	2757	5674	321	869	1522	157
Queens Road, Cowshot Common	275	23	1626	3236	569	590	1107	142
B3011 opposite Arrow Lane	288	50	1699	3206	910	514	1032	263
Lightwater Country Park entrance	321	84	2014	4456	233	557	1514	188
South Road	347	22	1589	3664	348	485	1334	57
Black Bushes Road	672	18	3658	5949	2212	1072	1455	667
Mytchett Place Road	870	50	2484	4811	1502	706	1470	409
N entrance to Warren Heath	1185	47	4562	7154	2007	1443	2470	482
Staple Hill	1800	52	2025	5075	366	616	1692	179
Top of Bracknell Road	1800	32	3069	11301	354	1004	3603	126
The Lookout	1800	122	3772	12143	293	1028	4472	0

Appendix 2

A review of methods used, timings of interviews and weather

Rainfall

Interviews and counts were conducted at each site for 8 two hour sessions (208 sessions). Attempts were made to avoid any sessions with rain, and 79% of all sessions were conducted in dry weather. There was certainly no decrease in the numbers of visitors when there was rain for a short duration, but there was evidence that longer periods of rain may have deterred visitors (Table 24).

Table 24: Mean number of people recorded leaving each site per session and amount of rainfall during session

Amount of rain	Mean number of people leaving per 2 hour session	Standard error	Number of sessions
No rain	14	1.3	165
Less than 30 minutes	17	7.3	21
Between 30 minutes & 1 hour	7	2.0	7
Between 1 hour & 1 hour 30 minutes	5	1.2	10
Rainfall for more than 1 hour & 30 minutes	1	0.5	5

The sample sizes for days with rain were too small to develop any kind of adjustment factor by which to modify site totals. For reference, sites and time periods where rain was fell for more than 30 minutes of the two hour time period are given in Table 25.

Table 25: Survey periods with more than 30 minutes of rain

	Time period	Day	No. of people leaving
Rainfall for between 30 minutes & 1 hour			
Black Bushes Road	1300 - 1500	Weekday	6
Chobham Road	1700 - 1900	Weekday	6
Lightwater Country Park entrance	1300 - 1500	Weekend	18
Mytchett Place Road	1300 - 1500	Weekday	7
Queens Road, Cowshot Common	1300 - 1500	Weekday	2
Sandpit Hill	1700 - 1900	Weekend	5
Staple Hill	1700 - 1900	Weekday	2
Rainfall for between 1 hour & 1 hour 30 minutes			
Lightwater Country Park entrance	1700 - 1900	Weekend	2
Mytchett Place Road	0700 - 0900	Weekday	6
Mytchett Place Road	1000 - 1200	Weekday	7
N entrance to Warren Heath	1300 - 1500	Weekend	7
N entrance to Warren Heath	1700 - 1900	Weekend	6
Queens Road, Cowshot Common	1000 - 1200	Weekday	6
Queens Road, Cowshot Common	1700 - 1900	Weekday	6
S entrance to Bramshill Plantation	1300 - 1500	Weekend	0
S entrance to Bramshill Plantation	1700 - 1900	Weekend	0
The Lookout	1700 - 1900	Weekend	13
Rainfall for more than 1 hour & 30 minutes			
Black Bushes Road	1000 - 1200	Weekday	1
Chobham Road	1000 - 1200	Weekday	3
Chobham Road	1300 - 1500	Weekday	0
Staple Hill	1000 - 1200	Weekday	1
Staple Hill	1300 - 1500	Weekday	1

Timing

Visitor numbers were sampled at each site using 8 two hour periods. During each period, the number of people entering and leaving the site was recorded. By comparing the number of people entering and leaving during each session it is possible to check whether the periods not sampled were not different to those tested. For all time periods, across all sites, there were slightly higher numbers of visitors entering than leaving during the survey sessions (median number entering = 9, median leaving = 8). The difference between the two is not significant (Mann-Whitney $W = 45159$, $p > 0.05$).

In total, more people were recorded entering than leaving for 3 of the four time periods, with the 1700 – 1900 time period, as would be expected with the approaching darkness, being the one period where more people were recording leaving. For none of these time periods, however, was the difference significant.

Table 26: Totals of people entering and leaving each site by time period. Significance column gives the Mann Whitney W score and p value.

<i>Time period</i>	<i>Total no. people entering</i>	<i>Total no. people leaving</i>	significance
0700 - 0900	514	379	(2984, p>0.05)
1000 - 1200	1011	811	(2866, p>0.05)
1300 - 1500	1164	915	(2926, p>0.05)
1700 - 1900	642	714	(2646, p>0.05)

Appendix 3

Questionnaire

INSTRUCTIONS TO INTERVIEWERS:

Use this sheet to read out the questions (IN BLACK INK, BOLD & BLOCK CAPITALS) and enter the answers on the summary sheet. Questions should be read out exactly as written. The red text shows the answers that people may give, and these answers should be read out after the question.

HELLO, COULD YOU SPARE ME A COUPLE OF MINUTES TO ANSWER SOME BRIEF QUESTIONS REGARDING YOUR VISIT TO THIS HEATH TODAY. THIS IS PART OF A STUDY OF VISITOR ACCESS PATTERNS COMMISSIONED BY ENGLISH NATURE.

- 1) HOW MANY ADULTS IN TOTAL, INCLUDING YOURSELF, ARE THERE WITH YOU HERE TODAY FOR THIS VISIT ?** if more than one: **HOW MANY ADULTS AND HOW MANY CHILDREN (UNDER 16) ?**

-
- 2) CAN I JUST CHECK, HOW MANY DOGS DO YOU HAVE WITH YOU TODAY?**
-

- 3) HOW FREQUENTLY DO YOU TEND TO VISIT THIS SITE ?**
 DAILY,
 ONCE A WEEK,
 ONCE A MONTH,
 SPORADICALLY (VARIES THROUGH THE YEAR)
 DON'T KNOW / FIRST VISIT
-

- 4) DO YOU TEND TO VISIT THIS SITE AT A CERTAIN TIME OF DAY ?**
 BEFORE 9AM
 BETWEEN 9AM AND 12
 BETWEEN 12 AND 2
 BETWEEN 2 AND 4
 AFTER 4PM
 DON'T KNOW / FIRST VISIT
-

- 5) FROM WHICH POSTCODE DID YOU TRAVEL TO REACH THIS SITE ?**
-

- 6) HOW DID YOU GET HERE ?** single answer only. Add if necessary: **WHAT FORM OF TRANSPORT DID YOU USE ?**
 CAR
 VAN
 BUS / COACH
 MOTORCYCLE
 BICYCLE
 HORSE
 ON FOOT
 OTHER (WRITE IN)
-

- 7) DID YOU ENTER THE HEATH FROM HERE OR FROM SOMEWHERE ELSE ?**
 ENTERED FROM THIS ACCESS POINT
 ENTERED FROM A DIFFERENT ACCESS POINT

DON'T KNOW

8) WHERE HAVE YOU WALKED DURING YOUR VISIT TO THIS AREA TODAY?

show visitor aerial photograph and annotate copy. if necessary ask for landmarks.

9) WHAT WAS THE MAIN PURPOSE OF YOUR VISIT TODAY ? multiple answers ok.

DOG WALKING

WALKING

JOGGING / RUNNING

MOTOR-CYCLING

BICYCLING

HORSE-RIDING

PICNIC

OTHER (WRITE IN)

10) DO YOU VISIT ANY OTHER PLACES, EITHER HEATHLAND OR NON-HEATHLAND, FOR THIS SAME PURPOSE ?

YES: GO TO QUESTION 10

NO: END OF QUESTIONNAIRE

DON'T KNOW: END OF QUESTIONNAIRE

11) HOW FAR DO YOU TYPICALLY TRAVEL FROM YOUR HOME TO REACH THESE ALTERNATE SITES ?

<1 MILE

1 – 5 MILES

>5 MILES

12) AND HOW DO YOU TRAVEL FROM YOUR HOME TO REACH THESE OTHER SITES?

BY CAR OR OTHER MOTOR VEHICLE

ON FOOT

OTHER

THANK YOU VERY MUCH FOR YOUR TIME

Figure 19: Routes taken by visitors on each site

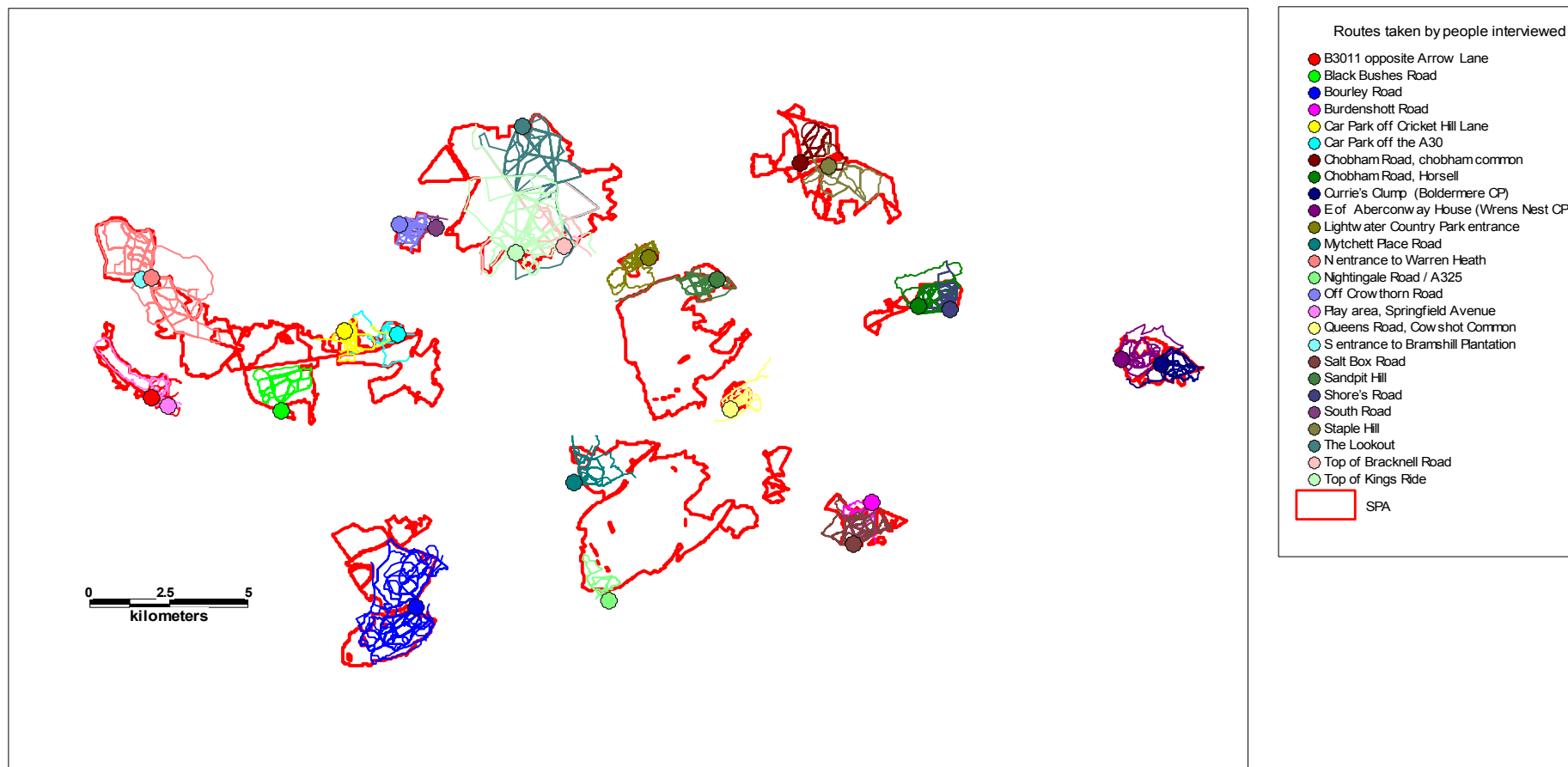


Figure 20: Locations of different postcodes given by people interviewed. Only the immediate area to the SPA is shown.

