Warfield Neighbourhood Plan Habitats Regulations Assessment

Warfield Parish Council

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Quality information

Prepared by	Reviewed by	Verified by	Approved by
[redacted] [redacted] Senior Ecologist	[redacted] Technical Director (CEnv MCIEEM)	[redacted] Technical Director (CEcol, FCIEEM)	[redacted] Technical Director (CEnv MCIEEM)

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Prepared by:

AECOM Infrastructure & Environment UK Limited
[redacted]
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1. Introduction

Background to the Project

1.1 AECOM was appointed to undertake a Habitats Regulations Assessment (HRA) of the submission version of the Warfield Neighbourhood Plan (WNP), which sets out the development goals for the Parish between the years 2013 – 2026. The new Draft Bracknell Forest Local Plan is still being developed. Importantly, the WNP has been drawn up to conform with the existing Bracknell Forest Development Plan, which sets out some of the key issues relating to European sites, most notably the Thames Basin Heaths SPA.

1.2 NDPs stem from the 2011 Localism Act and the Neighbourhood Planning (General) Regulations 2012 (as amended). Neighbourhood Plans (NPs) provide local communities with the opportunity to shape the development and growth in their local areas. Once the NP is approved it becomes a statutory component of the Bracknell Forest Development Plan and has significant bearings on the decision of planning applications. The WNP has been developed with the input of residents and community members, as well as the Bracknell Forest District Council (BFDC). Given that NPs are statutory documents that are incorporated into regional-level planning frameworks, they must be taken into account by BFDC.

1.3 Warfield Parish lies within Bracknell Forest District (BFD) and is therefore guided by the authority's overarching Development Plan documents. Planning in BFD is currently guided by the Local Development Framework (LDF). An integral component of the LDF is the Bracknell Forest Core Strategy Development Plan adopted in 2008, which provides for a housing provision of 11,139 dwellings and an unspecified amount of employment floorspace in the period up to 2026. The Core Strategy was followed by Bracknell Forest's Site Allocations Local Plan in 2013, which built upon policies of the Core Strategy. This included specific detail on the geographic siting and quanta of development, such as an allocation of 2,200 residential units at a site called 'Land at Warfield'.

1.4 Warfield Parish lies to the north of Bracknell Town. Its principal settlements are the villages of Warfield and Newell Green, which highlights the Parish's rural character. Smaller settlements and hamlets in the north of the Parish include Tickleback Row, Moss End, Nuptown, Brockhill and Hawthorn Hill. The Parish has good access to the M3, M4, M40 and M25, and lies relatively close to both Heathrow Airport and London. Its desirable location is reflected in the current need for new housing, with 2,200 new homes being built under the adopted Core Strategy. The WNP allocates an additional 235 dwellings at Hayley Green in the north-eastern part of the authority.

1.5 The Parish lies approx. 2.3km from the Windsor Forest & Great Park SAC and 3.3km from the closest component parcel of the Thames Basin Heaths SPA, the Broadmoor to Bagshot Woods and Heaths SSSI. Furthermore, it lies 7.2km from the closest component section of the Thursley, Ash, Pirbright & Chobham SAC, the Chobham Common SSSI. The South-West London Waterbodies SPA / Ramsar lies over 10km from the Parish and therefore beyond the screening distance for consideration.

1.6 The HRA of the WNP is required to determine if there are any realistic linking impact pathways present between policies outlined in the Plan and European sites, where Likely Significant Effects (LSEs) cannot be ruled out. If the presence of LSEs is determined, an Appropriate Assessment must be carried out to evaluate if adverse effects on the integrity of any European sites might occur, both due to the WNP alone or 'in-combination' with other plans and projects. If adverse effects on site integrity are established, appropriate mitigation measures must be put in place to allow development to come forward.

1.7 Aside from recreational pressure in the Thames Basin Heaths SPA / Ramsar, a well-known issue in south-eastern England, there is a particular concern about atmospheric pollution arising from vehicle emissions associated with new residential or employment development. The Thames Basin Heaths SPA, the Windsor Forest and Great Park SAC and the Thursley, Ash, Pirbright & Chobham SAC (partially overlapping with the Thames Basin Heaths SPA) are all sites that are sensitive to atmospheric nitrogen deposition. Therefore, due consideration must be given to development proposals that may result in an increased number of car journeys within 200m of these sites.

Legislation

1.8 The need for HRA is set out within the Conservation of Habitats & Species Regulations 2017 (as amended) and concerns the protection of European sites. European sites (also called Natura 2000 sites) can be defined as actual or proposed/candidate Special Areas of Conservation (SAC) or Special Protection Areas (SPA). It is also Government policy for sites designated under the Convention on Wetlands of International Importance (Ramsar sites) to be treated as having equivalent status to Natura 2000 sites.

1.9 The HRA process applies the precautionary principle to protected areas. Plans and projects can only be permitted having ascertained that there will be no adverse effect on the integrity of the site(s) in question. Plans and projects 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.

Conservation of Habitats and Species Regulations 2017 (as amended)

With specific reference to Neighbourhood Plans, Regulation 106(1) states that:

"*A qualifying body which submits a proposal for a neighbourhood development plan must provide such information as the competent authority* [the Local Planning Authority] *may reasonably require for the purpose of the assessment under regulation 105…* [which sets out the formal process for determination of 'likely significant effects' and the appropriate assessment']*."*

Figure 1: The legislative basis for HRA

1.10 It is therefore important to note that this report has two purposes:

- To assist the Qualifying Body (Warfield Parish Council) in preparing their plan by recommending (where necessary) any adjustments required to protect European sites, thus making it more likely their plan will be deemed compliant with the Conservation of Habitats and Species Regulations 2017 (as amended); and
- On behalf of the Qualifying Body, to assist the Local Planning Authority (Bracknell Forest District Council) to discharge their duty under Regulation 105 (in their role as 'plan-making authority' within the meaning of that regulation) and Regulation 106 (in their role as 'competent authority').

1.11 As 'competent authority', the legal responsibility for ensuring that a decision of 'Likely Significant Effects' is made, for ensuring an 'Appropriate Assessment' (where required) is undertaken, and for ensuring Natural England are consulted, falls on the local planning authority. However, they are entitled to request from the Qualifying Body the necessary information on which to base their judgment and that is a key purpose of this report.

1.12 The UK is no longer part of the European Union. However, the latest amendments to the Conservation of Habitats & Species Regulations (the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) make it clear that the need for HRA will continue.

1.13 While the UK is no longer part of the European Union, as a precaution, this HRA assumes that European Court of Justice (ECJ) rulings on the HRA process may continue to be considered useful jurisprudence by the UK courts. In 2018, the 'People Over Wind' European Court of Justice (ECJ) ruling[1] determined that 'mitigation' (i.e. measures that are specifically introduced to avoid or reduce the harmful effects of a plan or project on European sites) should not be taken into account when forming a view on Likely Significant Effects. Mitigation should instead only be considered at the Appropriate Assessment stage. Appropriate Assessment is not a technical term: it simply means 'an assessment that is appropriate' for the plan or project in question. As such, the law purposely does not prescribe what it should consist of or how it should be presented; these are decisions to be made on a case by case basis by the competent authority. An amendment was made to the Neighbourhood Planning Regulations in late 2018 which permitted Neighbourhood Plans to be made if they required Appropriate Assessment.

1.14 Over the years the phrase 'Habitats Regulations Assessment' has come into wide currency to describe the overall process set out in the Conservation of Habitats and Species Regulations from screening through to Imperative Reasons of Overriding Public Interest (IROPI). This has arisen in order to distinguish the process

[1] Case C-323/17

from the individual stage described in the law as an ‘Appropriate Assessment’. Throughout this report we use the term Habitats Regulations Assessment for the overall process.

Report Layout

1.15 This HRA comprises the following chapters:

- Chapter 2 outlines the methodology of HRA, including the three tasks of screening for Likely Significant Effects (LSEs), Appropriate Assessment and any mitigation measures required in response (note that not all of these are required in every instance);
- Chapter 3 provides detailed background on the impact pathways potentially linking to the WNP, including evidence from the scientific literature;
- Chapter 4 provides the Test of LSEs, relating policies and any arising impact pathways to the relevant European sites;
- Chapter 5 is the Appropriate Assessment, which investigates impact pathways and European sites for which LSEs have been identified in more detail;
- Chapter 6 details the main conclusions and recommendations derived from the main body of text;
- Appendix A shows the European sites within 10km of the WNP area;
- Appendix B outlines the background to European sites, including an introduction, their qualifying features, conservation objectives, and threats and pressures to their site integrity; and
- Appendix C presents the Test of LSEs table, which should be viewed in conjunction with Chapter 4
- Appendix D provides a comprehensive summary of NOx and NH_3 concentrations and nitrogen deposition rates for all modelled ecology transects
- Appendix E outlines the methodology utilised in the traffic and air quality modelling exercise

2. Methodology

Introduction

2.1 This section sets out the approach and methodology for undertaking the Habitats Regulations Assessment (HRA).

A Proportionate Assessment

2.2 Project-related HRA often requires bespoke survey work and novel data generation in order to accurately determine the significance of effects. In other words, to look beyond the risk of an effect to a justified prediction of the actual likely effect and to the development of avoidance or mitigation measures. However, the draft MHCLG guidance[2] (described in greater detail later in this chapter) makes it clear that when implementing HRA of land-use plans, the Appropriate Assessment (AA) should be undertaken at a level of detail that is appropriate and proportional to the level of detail provided within the plan itself:

2.3 *"The comprehensiveness of the [Appropriate] assessment work undertaken should be proportionate to the geographical scope of the option and the nature and extent of any effects identified. An AA need not be done in any more detail, or using more resources, than is useful for its purpose. It would be inappropriate and impracticable to assess the effects [of a strategic land use plan] in the degree of detail that would normally be required for the Environmental Impact Assessment (EIA) of a project."*

2.4 More recently, the Court of Appeal[3] ruled that providing the Council (competent authority) was duly satisfied that proposed mitigation could be "*achieved in practice"* then this would suffice to meet the requirements of the Habitat Regulations. This ruling has since been applied to a planning permission (rather than a Plan 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"*.

2.5 In other words, there is a tacit acceptance that AA can be tiered and that all impacts are not necessarily appropriate for consideration to the same degree of detail at all tiers as illustrated in Figure 2.

[2] MHCLG (2006) Planning for the Protection of European Sites, Consultation Paper
[3] No Adastral New Town Ltd (NANT) v Suffolk Coastal District Council Court of Appeal, 17th February 2015
[4] High Court case of R (Devon Wildlife Trust) v Teignbridge District Council, 28 July 2015

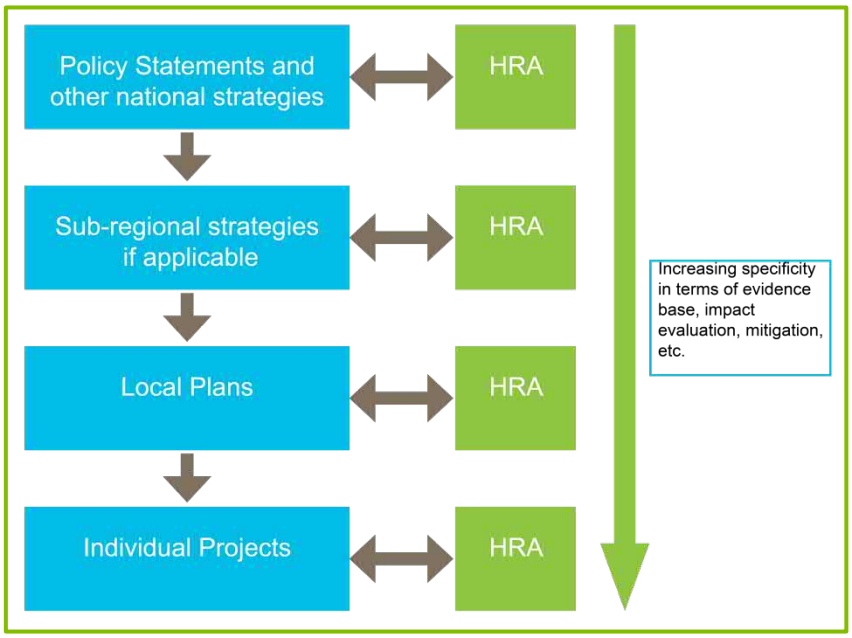


Figure 2: Tiering in HRA of Land Use Plans.

2.6 For a plan the level of detail concerning the developments that will be delivered is usually insufficient to make a highly detailed assessment of significance of effects. For example, precise and full determination of the impacts and significant effects of a new settlement will require extensive details concerning the design of the new housing sites, including layout of greenspace and type of development to be delivered in particular locations, yet these data will not be decided until subsequent stages.

2.7 The most robust and defensible approach to the absence of fine grain detail at this level is to make use of the precautionary principle. In other words, the plan is never given the benefit of the doubt (within the limits of reasonableness); it must be assumed that a policy/measure is likely to have an impact leading to a significant adverse effect upon an internationally designated site unless it can be clearly established otherwise.

The Process of HRA

2.8 The HRA is being carried out in the continuing absence of formal central Government guidance. The former DCLG (now MHCLG) released a consultation paper on AA of Plans in 2006[5]. As yet, no further formal guidance has emerged from MHCLG. However, Natural England has produced its own informal internal guidance and central government has released general guidance on HRA and appropriate assessment[6].

2.9 Figure 3 outlines the stages of HRA according to the draft MHCLG guidance (which, as government guidance applicable to English authorities is considered to take precedence over other sources of 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 likely significant effects remain.

[5] MHCLG (2006) Planning for the Protection of European Sites, Consultation Paper
[6] https://www.gov.uk/guidance/appropriate-assessment

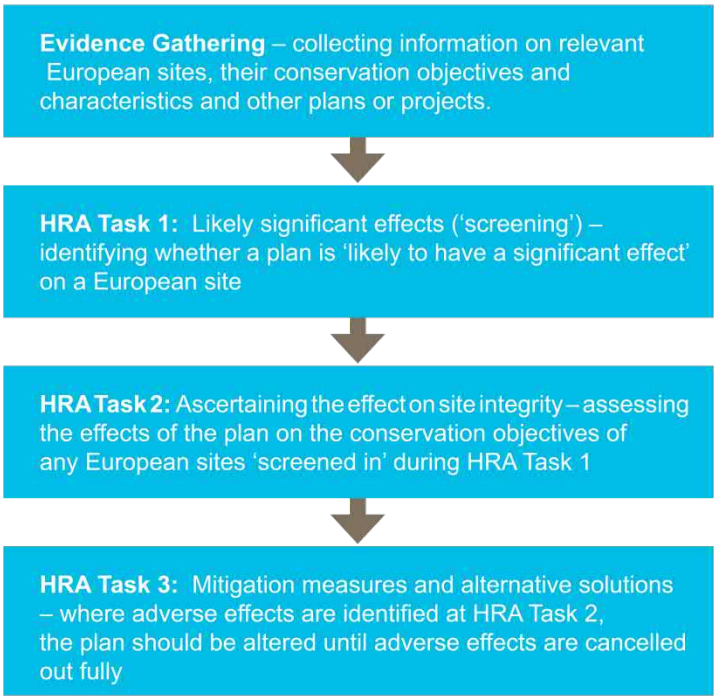


Figure 3: Four-Stage Approach to Habitats Regulations Assessment

Task One: Test of Likely Significant Effects (LSEs)

2.10 The first stage of any Habitats Regulations Assessment is a test of Likely Significant Effect - essentially a high-level assessment to decide whether the full subsequent stage known as Appropriate Assessment is required. The essential question is:

2.11 *"Is the Plan, either alone or in combination with other relevant projects and plans, likely to result in a significant effect upon European sites?"*

2.12 In evaluating significance, AECOM have relied on professional judgment and experience of working with the other local authorities on similar issues. The level of detail concerning developments that will be permitted under land use plans is rarely sufficient to make a detailed quantification of effects. Therefore, a precautionary approach has been taken (in the absence of more precise data) assuming as the default position that if a likely significant effect (LSE) cannot be confidently ruled out, then the assessment must be taken the next level of assessment Task Two: Appropriate Assessment. This is in line with the April 2018 court ruling relating to 'People Over Wind' where mitigation and avoidance measures are to be included at the next stage of assessment.

Task Two: Appropriate Assessment (AA)

2.13 European Site(s) which have been 'screened in' during the previous Task have a detailed assessment undertaken on the effect of the policies on the European site(s) site integrity. Avoidance and mitigation measures to avoid adverse significant effects are taken into account or recommended where necessary.

2.14 As established by case law, 'Appropriate Assessment' is not a technical term; it simply means whatever further assessment is necessary to confirm whether there would be adverse effects on the integrity of any European sites that have not been dismissed at screening. Since it is not a technical term it has no firmly established methodology except that it essentially involves repeating the analysis for the likely significant effects stage, but to a greater level of detail on a smaller number of policies and sites, this time with a view to determining if there would be adverse effects on integrity.

2.15 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 takes any policies or allocations that could not be dismissed following the high-level Screening analysis and analyses the potential for an effect in more detail, with a view to concluding whether there would actually be an adverse effect on integrity (in other words, disruption of the coherent structure and function of the European site(s)).

The Geographic Scope

2.16 There is no guidance that dictates the physical scope of an HRA of a development plan. Therefore, in considering the physical scope of the assessment AECOM was guided primarily by the identified impact pathways rather than by arbitrary "zones", i.e. a source-pathway-receptor approach. Current guidance suggests that the following European sites be included in the scope of assessment:

- All sites within the Neighbourhood Plan area boundary; and
- Other sites shown to be linked to development within the Neighbourhood Plan boundary (usually up to a straight-line distance of 10km from the boundary) through a known "pathway" (discussed below).

2.17 Briefly defined, impact pathways are routes by which a change in activity within the plan area can lead to an effect upon a European site. In terms of the second category of European site listed above, MHCLG guidance states that the AA 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). With specific regard to air quality assessment, Bracknell Forest District Council confirmed by email on 03/12/20 that both they and Natural England agreed with a 10km zone of influence being used.

2.18 Using Defra's MAGIC website[7], the following European sites within 10km of the Warfield Parish boundary were identified for further consideration:

- Windsor Forest & Great Park SAC;
- Thames Basin Heaths SPA; and
- Thursley, Ash, Pirbright & Chobham Common SAC.

2.19 Locations of European sites in relation to Warfield Parish are illustrated in Appendix A and full details of all relevant European sites is discussed in Appendix B, including their qualifying features, conservation objectives, and threats and pressures to site integrity.

2.20 It is to be noted that the inclusion of a European sites or pathway below does not indicate that an effect is expected but rather that these are pathways that will be investigated.

The 'In Combination' Scope

2.21 It is a requirement of the Regulations that the impacts and effects of a development plan are not only considered in isolation but in-combination with other plans and projects that may also be affecting the European designated site(s) in question.

2.22 When undertaking this part of the assessment it is essential to bear in mind the principal intention behind the legislation i.e. to ensure that those projects or plans which in themselves have minor impacts are not simply dismissed on that basis but are evaluated for any cumulative contribution they may make to an overall significant effect. In practice, in-combination assessment is therefore of greatest relevance when the plan would otherwise be screened out because its individual contribution is minimal. The overall approach is to exclude the risk of there being unassessed Likely Significant Effects (LSEs) in accordance with the precautionary principle. This was first established in the seminal Waddenzee[8] case.

2.23 For the purposes of this HRA, we have determined that one of the key higher-tier plans with a potential for in-combination effects is the adopted Bracknell Forest Core Strategy Development Plan (adopted in 2008). As outlined in the introduction, this Plan sets out the broad spatial development targets for Bracknell Forest in the period of 2006 – 2026. It provides for at least 11,139 residential dwellings and an unspecified quantum of employment floorspace (Table 1), in the wider area surrounding Warfield Parish. However, the housing allocated in the WNP is in addition to the growth provided in Policy SA 9 (Land at Warfield) of the accompanying Bracknell Forest Site Allocations Local Plan and therefore the NP requires its own HRA.

[7] The MAGIC website provides authoritative geographic information on the natural environment from across government and is typically the starting point of any HRA. It is available at: https://magic.defra.gov.uk/ [Accessed on 21/05/2020].

[8] Waddenzee case (Case C-127/02, [2004] ECR-I 7405)

2.24 Surrounding Bracknell Forest there are several other planning authorities that propose their own growth, including Windsor & Maidenhead, Surrey Heath, Hart and Wokingham. Together, these authorities provide for at least 36,083 new dwellings and an unspecified quantum of employment space in their forthcoming planning periods (Table 1). This represents significant urban development, the effect of which needs to be considered within the in-combination scope of this HRA.

2.25 Clearly, as can be inferred from the table, residential growth in Warfield Parish only accounts for 0.7% of the overall residential growth in this area of south-eastern England. This is only a fraction of the total urbanisation footprint and needs to be acknowledged when undertaking HRA Nevertheless, the potential for Warfield's contribution – however small – to an in-combination effect arising from increased development in the wider geographic area, must be considered.

2.26 The Bracknell Forest Core Strategy Development Plan HRA identified that the Plan is associated with several impact pathways, including recreational pressure, water quality, water quantity and loss of functionally linked land, and as such similar impact pathways that link the WNP to nearby European sites. Given the extent of development, both in terms of its volume and geographical distribution, the Local Plans identified in Table 1 (and their HRAs) are the most important documents to consider in assessing the in-combination effect of the WNP.

Table 1: Summary of the development (residential and employment) in Bracknell Forest District, the overarching authority of the WNP area (marked in bold), and other relevant adjacent authorities.

District	Residential Growth (number of dwellings)	Employment growth (ha)
Bracknell Forest (2006-2026)[9]	**11,139**	**Unspecified**
Windsor & Maidenhead (1991-2006)[10]	860	Unspecified
Surrey Heath (2011-2028)[11]	3,240	Unspecified, but 7,500 new jobs
Hart (2014-2032)[12]	7,614	At least 1ha
Wokingham (2006-2026)[13]	13,230	Unspecified
All Authorities	**36,083**	**Not Quantifiable Reliably**

2.27 It should be noted that, while their broad potential impacts will be considered, this document does not carry out a full HRA of these overarching Local Plans. Instead it draws upon existing HRAs that have been carried out on the relevant Plans prior to their adoption.

[9] Adopted Bracknell Forest Core Strategy Development Plan, February 2008. Available at: https://www.bracknell-forest.gov.uk/sites/default/files/documents/core-strategy-development-plan-document-february-2008.pdf [Accessed on the 21/05/2020].
[10] Adopted Royal Borough of Windsor and Maidenhead Local Plan. Available at: https://www3.rbwm.gov.uk/downloads/download/154/local_plan_documents_and_appendices [Accessed on the 21/05/2020].
[11] Adopted Surrey Heath Core Strategy & Development Management Policies 2011 – 2028. Available at: https://www.surreyheath.gov.uk/sites/default/files/documents/residents/planning/planning-policy/CSFinalAdoptedCSDMPSmallFileSize.pdf [Accessed on the 21/05/2020].
[12] Adopted Hart Local Plan – Strategy and Sites 2032. Available at https://www.hart.gov.uk/sites/default/files/4_The_Council/Policies_and_published_documents/Planning_policy/Local_Plan/Hart%20LPS%26S%20working%20draft%20v3%201%20May%202020.pdf [Accessed on the 21/05/2020].
[13] Adopted Wokingham Borough Core Strategy Development Plan. January 2010. Available at: https://www.wokingham.gov.uk/planning-policy/planning-policy-information/local-plan-and-planning-policies/ [Accessed on the 21/05/2020].

3. Impact Pathways

3.1 The following impact pathways are relevant to the Warfield Neighbourhood Plan:

- Recreational pressure
- Atmospheric pollution
- Loss of functionally linked habitat
- Construction activities (visual, noise and dust pollution)

Background to Recreational Pressure

Disturbance to breeding birds

3.2 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 being subject to recreational pressure. This applies to any habitat, but the key qualifying features in lowland heathland are particularly vulnerable to human disturbance. An English Nature (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 damage[14]. Various research reports have provided compelling links between changes in housing and access levels and impacts on European protected sites[15] [16].

3.3 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[17] [18] This is likely to be a direct consequence from the fact that birds are expending energy to avoid recreational users, time that is not spent feeding or incubating the eggs[19]. Overall, disturbance is likely to increase energetic output while reducing energetic input, which can adversely affect the 'condition' and ultimately survival of the birds.

3.4 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 hiking[20]. Scientific evidence also suggests that key disturbance parameters, such as areas of influence and flush distance, are significantly greater for dog walkers than hikers[21]. 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 assessments[22]. In addition, displacement of birds from one feeding site to another can increase the feeding pressure on available resources, which need to sustain greater numbers of birds[23]. Temporal factors are also important, with recreational disturbance generally being higher in summer than in winter (due to more people engaging in outdoor activities) and this is when qualifying bird species are breeding in the Thames Basin Heaths SPA.

3.5 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

[14] Underhill-Day, J. 2005. A literature review of urban effects on lowland heaths and their wildlife. English Nature Research Reports 623. 56pp.
[15] 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.
[16] 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.
[17] 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.
[18] 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.
[19] Riddington, R. *et al*. 1996. The impact of disturbance on the behaviour and energy budgets of Brent geese. *Bird Study* 43:269-279
[20] Banks P.B., Bryant J.Y. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3: 14pp.
[21] Miller S.G., Knight R.L., Miller C.K. 2001. Wildlife responses to pedestrians and dogs. 29: 124-132.
[22] Weitowitz D., Panter C., Hoskin R., Liley D. The spatio-temporal footprint of key recreation activities in European protected sites. Manuscript in preparation.
[23] Gill, J.A., Sutherland, W.J. & Norris, K. 1998. The consequences of human disturbance for estuarine birds. *RSPB Conservation Review* 12: 67-72

roaming 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.

Trampling damage, erosion and nutrient enrichment

3.6 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 & Seney)[24] 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 al[25] 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.

- Cole [26] 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 tramplers caused a greater reduction in vegetation height than lighter tramplers, but there was no difference in the effect on cover.

- Cole & Spildie[27] 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 invertebrates[28]. Species that burrow into flat surfaces such as the centres of paths, are likely to be particularly vulnerable, as the loose 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.

[24] 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
[25] 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
[26] 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.
[27] 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
[28] 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.

3.7 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 exposure[29]. 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 trampling[30]. 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 health[31]. 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.

3.8 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.[32]). 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 annually[33]. While there is little information on the chemical constituents of dog faeces, nitrogen is one of the main components[34]. 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.

3.9 The available baseline information suggests that the Thames Basin Heaths SPA and the Thursley, Ash, Pirbright & Chobham SAC (which partly overlaps with the SPA) 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. Warfield Parish is only approx. 3.3km from the SPA and 7.2km from the SAC, placing it within reasonable travel distances to these European sites.

3.10 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 SPA[35]. This initial survey provided an estimate of approx. 5 million annual visits 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, aiming as much as possible to repeat the methodology used in the 2005 survey[36]. Data from these studies will be used to assess the potential recreational impact of the WNP on the Thames Basin Heaths SPA, but also the Thursley, Ash, Pirbright & Chobham SAC (which partly overlaps with the SPA).

[29] 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.
[30] Waltert 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.
[31] 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 14/10/2019].
[32] Taylor K., Anderson P., Taylor R.P., Longden K. & Fisher P. 2005. Dogs, access and nature conservation. English Nature Research Report, Peterborough.
[33] 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.
[34] 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.

[35] Liley D., Jackson D.B. & Underhil-Day J.C. (2006). Visitor Access Patterns on the Thames Basin Heaths. English Nature Research Reports, N682, Peterborough.
[36] 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.

3.11 Overall, the following European sites within 10km of Warfield Parish are sensitive to recreational pressure (the sites in bold are taken forward to the successive chapters due to being connected to the WNP via a realistic impact pathway):

- **Thames Basin Heaths SPA** (the closest parcel of the SPA lies only approx. 3.3km to the south of Warfield Parish within Bracknell Forest District)
- **Thursley, Ash, Pirbright & Chobham SAC** (the closest parcel is located approx. 7.2km to the south-east of Warfield Parish in the authority of Surrey Heath)
- **Windsor Forest and Great Park SAC** (the closest part of the SAC is located approx. 2.3km to the east of Warfield Parish in Bracknell Forest District)

Background to Atmospheric Pollution

3.12 The main pollutants of concern for European sites are oxides of nitrogen (NOx), ammonia (NH_3) and sulphur dioxide (SO_2) and are summarised in Table 2. Ammonia can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges[37]. NOx can also be toxic at high concentrations (far above the annual average critical level) or in the presence of elevated sulphur dioxide (SO_2). High levels of NOx and NH_3 are also 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 is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats[38] [39].

3.13 In woodlands exceedance of the critical nitrogen load may lead to nutrient imbalances, decreases in mycorrhiza, losses of epiphytic lichens and bryophytes, changes in ground vegetation and changes in soil fauna. In mires and fens increased nitrogen deposition may lead to increases 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.

Table 2: Main sources and effects of air pollutants on habitats and species[40]

Pollutant	Source	Effects on habitats and species
Sulphur Dioxide (SO_2)	The main sources of SO_2 are electricity generation, and industrial and domestic fuel combustion. However, total SO_2 emissions in the UK have decreased substantially since the 1980's and SO_2 concentrations nationally are now generally very low and well below the critical level. Another origin of sulphur dioxide is the shipping industry and high atmospheric concentrations of SO_2 have been documented in close proximity to busy ports. In future years shipping is likely to become one of the most important contributors to SO_2 emissions in the UK.	Wet and dry deposition of SO_2 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, SO_2 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 SO_2, 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.	Gaseous precursors (e.g. SO_2) 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

[37] http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm.
[38] 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
[39] 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
[40] Information summarised from the Air Pollution Information System (http://www.apis.ac.uk/)

Pollutant	Source	Effects on habitats and species
		acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds / plants. 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 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. It is also produced by industrial chemical processes and in small but locally significant quantities by traffic. Ammonia reacts with acid pollutants such as the products of SO_2 and NO_X emissions to produce fine ammonium (NH_4+) - containing aerosol. Due to its significantly longer lifetime, NH_4+ 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 NH_4+ may occur via direct toxicity, when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is 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. As emissions mostly occur at ground level in the rural environment and NH_3 is rapidly deposited, some of the most acute problems of NH_3 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. In contrast to the steep decline in sulphur dioxide emissions, nitrogen oxides are falling more slowly due to control strategies being offset by increasing numbers of vehicles. However, current projections are nonetheless for NOx concentrations to continue to fall.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g. roadside verges). A critical level of NOx for all vegetation types has been set to 30 ug/m3. Deposition of nitrogen compounds (nitrates (NO_3), nitrogen dioxide (NO_2) and nitric acid (HNO_3)) contributes to the total nitrogen deposition and may lead to both soil and freshwater acidification. In addition, NO_x contributes 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. NH_3) 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 NOx, volatile organic compounds (VOCs) and sunlight. These precursors are mainly	Concentrations of O_3 above 40 ppb can be toxic to both humans and wildlife and can affect buildings.

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.	High O_3 concentrations are widely documented to cause damage to vegetation, including visible leaf 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.

3.14 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) shipping. Ammonia emissions originate particularly from agricultural practices, but some chemical processes and certain vehicles also make notable contributions. NOx 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 NOx footprint (92%) through the associated road traffic. Other sources, although relevant, are of minor importance in comparison. 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 impacts. Given the origin of nitrogen-derived atmospheric pollutants, it is considered that the WNP might be associated with an increase in such atmospheric pollutants.

3.15 Critical thresholds are now available for most atmospheric pollutants. According to the World Health Organisation, the critical NO_x concentration (critical threshold) for the protection of vegetation is 30 μgm^{-3}; the threshold for sulphur dioxide is 20 μgm^{-3}. In addition, ecological studies have determined 'critical loads'[41] of atmospheric nitrogen deposition (that is, NOx combined with ammonia NH_3).

3.16 The Department of Transport's Transport Analysis Guidance stipulates that, beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant[42] (Figure 4). 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 the Neighbourhood Plan.

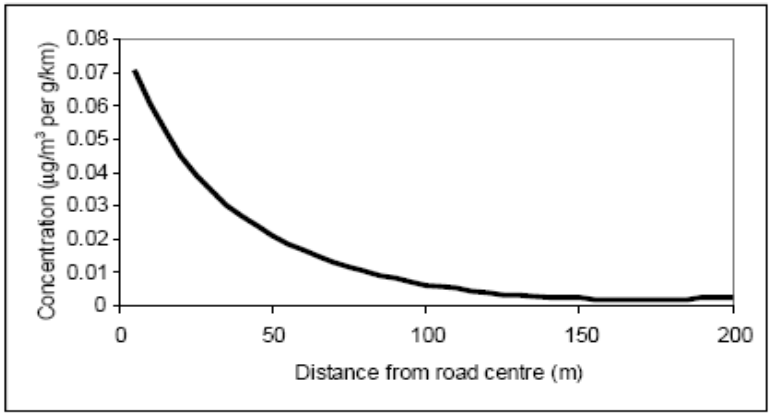


Figure 4: Traffic contribution to concentrations of pollutants at different distances from a road (Source: DfT[43])

3.17 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 Bracknell Forest as a whole 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 Bracknell Forest, 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

[41] The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur
[42] http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013 [Accessed on the 21/05/2020]
[43] http://www.dft.gov.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf [Accessed on the 21/05/2020]

are therefore at a competitive disadvantage to grasses and other plants, which grow much faster under increased nutrient concentrations.

3.18 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 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 plantation[44] 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.

3.19 The Thursley, Ash, Pirbright and Chobham SAC is designated for its depressions on peat substrates of the *Rhynchosporion* and its European dry heaths, which are both sensitive to atmospheric pollution. APIS highlights that the peat substrate depressions have a critical nitrogen load of 10-15 kg N/ha/yr, whereas European dry heaths have a slightly broader range of 10-20 kg N/ha/yr[45].

3.20 The large assemblage of veteran and / or ancient trees in the Windsor Forest & Great Park SAC is sensitive to atmospheric pollution, due to its disproportionate ecological value. The old acidophilous oak woods within the site boundary have a relatively low critical nitrogen load of 10-15 kg N/ha/yr. The Atlantic acidophilous beech forests dominated by *Ilex* and *Taxus* have a slightly broader range of 10-20 kg N/ha/yr. Violet click beetle would not be affected by nitrogen deposition, according to APIS.

3.21 Overall, the following European sites within 10km of Warfield Parish are sensitive to atmospheric pollution arising from development in the Parish (sites in bold are taken forward into the following chapters due to a realistic impact pathway linking with the WNP):

- **Thames Basin Heaths SPA** (the closest parcel of the SPA lies only approx. 3.3km to the south of Warfield Parish within Bracknell Forest District)
- **Thursley, Ash, Pirbright & Chobham SAC** (the closest parcel is located approx. 7.2km to the south-east of Warfield Parish in the authority of Surrey Heath)
- **Windsor Forest and Great Park SAC** (the closest part of the SAC is located approx. 2.3km to the east of Warfield Parish in Bracknell Forest District)

Background to Loss of Functionally Linked Habitat

3.22 While most European sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not always the case. A diverse array of qualifying species including birds, bats and amphibians are not confined to the boundary of designated sites.

3.23 For example, the highly mobile nature of both wildfowl and heathland birds implies that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of European sites. Despite not being designated, this area is still integral to the maintenance of the structure and function of the interest feature on the designated site and, therefore, land use plans that may affect such areas should be subject to further assessment.

3.24 The Thames Basin Heaths SPA is the only European site within 10km of the Warfield Parish boundary that supports mobile species, namely nightjar, Dartford warbler and woodlark. Their main habitat requirements are the following:

- Nightjar show a preference for bare patches or areas of very short or sparse vegetation with widely scattered trees where they are able to see predators approaching. These patches may be on open heath, in patchy scrub and in the interface between heath and woodland, as well as in clearings in woodland or plantations. Nightjars are known to forage up to 6 kilometres away from their nesting territory.

[44] 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.
[45] http://www.apis.ac.uk/srcl/select-a-feature?site=UK0012793&SiteType=SAC&submit=Next [Accessed on the 21/05/2020].

- Woodlark are strongly associated with bare ground, especially where this is adjacent to structurally diverse vegetation and short heather. They utilise scattered trees and large bushes as song-posts. Woodlark use a variety of habitats adjacent to heathland for foraging, including short grassland, stubble fields or margins of arable fields, golf courses and bare areas in quarry sites.

- Dartford warbler favour large areas of open terrain, largely free of obstructions, in and around nesting, roosting and feeding areas in lowland heathland with gorse and heather. They benefit from availability of an unobstructed line of sight within nesting, feeding or roosting to enable birds to detect approaching predators, or to ensure visibility of displaying behaviour. However, they will utilise enclosed features such as clearings in conifer plantations.[46]

3.25 Most of these qualifying species forage in a range of different habitats, including common and widespread ones, and the focus of assessment is therefore on nesting habitat for which they have much more specific requirements.

3.26 Generally, the long-term substantial loss, degradation and fragmentation of lowland heathland habitats has been the major factor associated with the decline of nightjar and woodlark[47]. Whilst a large portion of woodland and heathland in the area is located within the Thames Basin Heaths SPA, there are various parcels of such habitats outside the designated site boundary, all of which could provide functionally linked supporting habitat to SPA species.

3.27 The most suitable habitats for nesting nightjar and woodlark are heathland, acid grassland and rotationally-managed plantation woodland (meaning any woodland that is cropped and replanted on a regular cycle, creating clearings in which the birds can nest). Woodland that is maintained as continuous-cover forestry is generally unsuitable for nesting nightjar and woodlark, unless they incorporate a sufficient number of large, sparsely vegetated, clearings. Development that would affect areas of rotationally-managed plantation woodland, heathland or acid grassland (irrespective of whether they are part of the European sites) could potentially affect nightjar and woodlark.

3.28 Research undertaken in Breckland Forest[48] has shown that nightjar are most likely to use conventionally managed plantation during the first 20 years of 60 year forestry cycles, including the initial 2 year 'felled unplanted' period. Population densities are highest during the restock phase (plantation age of 0-5 years), although significant densities can also be supported during the pre-thicket (6-10 years) and thicket (11 – 20 years) stages. Woodlark most likely use conventionally managed plantation during the first seven years (including the initial 2 year felled unplanted period), particularly the restock phase (plantation age of 0-5 years). However, a review of the Hayley Green site allocation (the only site allocated in the WNP) on Google Maps indicates that it does not comprise heathland, acid grassland and plantation woodland, the preferred nesting habitats of nightjar and woodlark. Therefore, it is concluded that the WNP does not have the potential to result in the loss of functionally linked habitat. This impact pathway is excluded from further assessment.

3.29 The following European site within 10km of Warfield Parish is sensitive to the loss of functionally linked habitat, because it is designated for mobile species:

- Thames Basin Heaths SPA (the closest parcel of the SPA lies only approx. 3.3km to the south of Warfield Parish within Bracknell Forest District) – however, the site is not taken forward to the LSEs screening stage

Background to Construction Related Activities (Visual and Noise Disturbance, Dust Deposition)

3.30 The implementation of the WNP might result in increased emission of dust during the construction, associated with processes such as top soil stripping, digging and the movement of Heavy Duty Vehicles carrying building materials or rubble. Dust emission from construction sites has the potential for an adverse temporary localised effect on plant growth, by coating vegetation, blocking stomata and slowing down photosynthesis. While the death of plants attributed to dust emission might adversely affect the integrity of

[47] Research examples that support/explore this include: Rose, et al. 2000. Changes in heathland in Dorset, England between 1987 and 1996. Biological Conservation. 121: 93-105. & Langston et al. 2007. Nightjar Carprimulgus europaeus and Woodlark Lullula arborea – recovering species in Britain? Ibis. 149: 250-260.
[48] Dolman PM & Morrison C, 2012. Temporal change in territory density and habitat quality for Breckland Forest SSSI woodlark and nightjar populations, Unpublished report for Forestry Commission and Natural England.

a European site directly (if these plants are qualifying features), the integrity of a site might also be threatened indirectly through a changed community composition.

3.31 According to recent guidance from the Institute of Air Quality Management[49] *"an assessment will normally be required where there is…an 'ecological receptor' within: 50m of the boundary of the site; or 50m of the route(s) used by construction vehicles on the public highway…".* This is based on the view that heavy dust soiling is a threat to vegetation, but only up to a distance of 50m from dust generating activities, even in the absence of mitigation measures (e.g. wetting).

3.32 Policies that will result in construction-related activities also carry the risk of negative effects on both surface water and groundwater quality through spillage or leaching of fuels or other contaminating substances (e.g. cement or grout) used in construction. Ultimately, diffuse pollution deriving from construction activities therefore has the potential to reduce water quality, thereby potentially resulting in adverse effects on the integrity of European sites. However, the closest European site to the WNP area sensitive to dust deposition is the Windsor Forest & Great Park SAC approx. 2.3km to the east of the Parish boundary. Even if a precautionary screening distance of 200m for dust emission is used, this site lies beyond the distance for which negative impacts relating to dust would be expected.

3.33 It is well established that European sites designated for their breeding or overwintering bird species are, in principle, sensitive to noise or visual disturbance arising from construction works. In the case of the WNP, the sole European site that requires consideration is the Thames Basin Heaths SPA, which is designated for its ground-nesting bird species nightjar, woodlark and Dartford warbler. Little empirical evidence on construction-related disturbance of these species is available. However, the Waterbird Disturbance Mitigation Toolkit, produced by the Institute of Estuarine & Coastal Studies at the University of Hull, provides useful threshold distances for both visual and noise disturbance arising from construction works. It is generally considered that noise disturbance arising from the noisiest of works (i.e. impact piling) is irrelevant beyond 170m. The closest component parcel of the Thames Basin Heaths SPA lies 3.3km to the south of Warfield Parish. This is well beyond the threshold screening distances that apply to visual and noise disturbance. Therefore, it is concluded that this impact pathway will not be relevant for the WNP.

3.34 Similarly, it is considered that water pollution arising from construction works is unlikely to be a threat for any of the European sites identified in relation to the WNP. Primarily, this is because none of the European sites (e.g. the Thames Basin Heaths SPA, the Thursley, Ash, Pirbright & Chobham Common SAC and the Windsor Forest & Great Park SAC) specifically rely on good water quality; i.e. they are not sites with significant aquatic elements. Furthermore, it is illegal to pollute watercourses (whether or not they are designated as European sites) under the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and Environmental Permitting (England and Wales) Regulations 2016. Therefore, any site where a risk to water quality exists, must incorporate protection measures into their construction and operational procedures. Each initiative bought forward will have to provide a Construction Environmental Management Plan (CEMP). The plan will be implemented during construction and will include best practice measures to ensure dust emissions and surface runoff do not result in adverse effects on European sites. Because these measures are not specifically introduced to protect European sites, they fall outside of the 2018 'People Over Wind' European Court of Justice (ECJ) ruling[50] and can thus be included prior to Appropriate Assessment. In addition, the relatively long distance between Warfield Parish and the relevant European sites means that it is unlikely for any construction-related pollutants to actually reach these sites.

3.35 Overall, due to the long distances between the WNP area and European sites, and the mitigating role of the Environmental Damage Regulations (2015), the impact pathway 'construction related activities' is not considered further in this HRA.

[49] IAQM. (2016) *Guidance on the assessment of dust from demolition and construction*. The Institute of Air Quality Management. Version 1.1.
[50] Case C-323/17

4. Test of Likely Significant Effects (LSEs)

Introduction

4.1 The initial scoping of impact pathways and relevant European sites identified that the following require consideration:

Recreational Pressure

- Thames Basin Heaths SPA
- Thursley, Ash, Pirbright & Chobham SAC
- Windsor Forest & Great Park SAC

Atmospheric Pollution

- Thames Basin Heaths SPA
- Thursley, Ash, Pirbright & Chobham SAC
- Windsor Forest & Great Park SAC

4.2 The policies contained within the WNP where therefore screened for their potential of Likely Significant Effects (LSEs) on European sites. The full results of the LSEs Test are presented in Appendix C.

Recreational Pressure

Thames Basin Heaths SPA

4.3 The WNP allocates 235 dwellings that, upon completion, will result in increases of the local population and the demand for recreational spaces. Being a relatively close and particularly attractive destination, the Thames Basin Heaths SPA (a composite European site) is likely to receive some of this additional recreational pressure. Since the SPA harbours ground-nesting breeding bird populations of nightjar, woodlark and Dartford warbler, it is highly susceptible to recreational disturbance, particularly from dog walkers. Natural England's Site Improvement Plan highlights that the SPA is already subject to high levels of recreational use, which is likely to affect the distribution and breeding success of its Annex I bird species.

4.4 The nearest component part of the SPA to Warfield Parish is the Broadmoor to Bagshot Woods & Heaths SSSI, approx. 3.3km to the south of the Parish. Given that proximity to home determines the likelihood of people visiting a European site, it is likely that much of the recreational demand will focus on the SPA. While the destination lies beyond the average walking distance of site users, it still lies within reach of visitors travelling by car. Given the distance of this SPA parcel to Warfield Parish and the strong appeal of the SPA, Likely Significant Effects cannot be excluded, and the site is screened in for Appropriate Assessment.

4.5 The following policy providing for residential growth in Warfield has been screened in for Appropriate Assessment, because it increases the local population and is likely to intensify recreational pressure in the Thames Basin Heaths SPA:

- Policy WNP2 – Hayley Green Allocation: Provides for 235 new dwellings in Hayley Green; a quantum that is additional to the residential growth allocated in Warfield within the Bracknell Forest Core Strategy Development Plan

Thursley, Ash, Pirbright & Chobham SAC

4.6 The Thursley, Ash, Pirbright & Chobham SAC is designated for its Northern Atlantic wet heaths with *Erica tetralix* and its European dry heaths. Importantly, these habitats also support the ground-nesting birds of the Thames Basin Heaths SPA, which largely overlaps with the SAC. An increase in the number of recreational

visits to the SAC, particularly off-track activities, are likely to lead to trampling damage to heathland plants as well as path widening. Furthermore, an increase in the number of dog walkers in the SAC will lead to nutrient enrichment of the soil and, ultimately, may be followed by a change in plant community composition. Heathland plants are adapted to depauperate nutrient conditions and dog fouling puts them at a disadvantage with more competitive grass species. Notably, this could also affect the Thames Basin Heaths SPA's ground-nesting birds that critically depend on these plant species.

4.7 However, the closest component parcel of the Thursley, Ash, Pirbright and Chobham SAC to Warfield Parish is the Chobham Common SSSI, approx. 7.2km to the south-east. The core catchment zone of the SAC (and overlapping SPA) has been identified as 5km, with larger developments in the 5-7km also requiring consideration. Therefore, the distance between the Hayley Green development site and the SAC is too great for there to be LSEs of the WNP. The Thursley, Ash, Pirbright & Chobham SAC is screened out from Appropriate Assessment.

Windsor Forest & Great Park SAC

4.8 The Windsor Forest & Great Park SAC is designated for its oak woods with *Quercus robur* and its beech forests with *Ilex* and *Taxus* in the shrublayer. The closest part of the SAC, and the component that is most likely to be accessed by both on-foot or car visitors, lies approx. 2.3km to the east of the Warfield Parish. The site contains a large number of ancient and / or veteran trees, which are sensitive to trampling damage. Soil compaction surrounding the tree can affect its root system, nutrient uptake rates and associations with mycorrhiza. However, Natural England's Site Improvement Plan[51] and Supplementary Advice on Conservation Objectives do not mention recreational pressure as a specific concern for the site notwithstanding the heavy recreational use. Furthermore, the focal points of recreational activity are on the existing paths and open parkland rather than concentrated beneath the canopies of the veteran trees. Therefore, it is unlikely that recreational pressure arising from the WNP, alone or in-combination, will have any material effects on the conservation objectives of the site. Overall, Likely Significant Effects can be excluded, and the site is screened out from Appropriate Assessment.

Atmospheric Pollution (Through Nitrogen Deposition)

Thames Basin Heaths SPA

4.9 Nightjar, woodlark and Dartford warbler, the qualifying species of the Thames Basin Heaths SPA, are not directly sensitive to atmospheric pollution. However, atmospheric nitrogen deposition has the potential to affect these species through indirect effects on these species' broad habitats, notably areas of heathland or acid grassland, if it is sufficient to materially change habitat structure, depending on management requirements. APIS highlights that European dry heaths, which all these species depend on, have a critical nitrogen load of 10-20 kg N/ha/yr[52]. Exceedance of this critical load could lead to a transition from heather to coarse grass dominance and therefore change how the qualifying birds are able to use the micro-habitats in heathland. The current background atmospheric nitrogen deposition rate for the heathland components of the SPA is a maximum of 16 kg N/ha/yr, which already exceeds the critical load.

4.10 Furthermore, during the breeding season woodlark and nightjar also use coniferous woodland, which has a low critical nitrogen load of 10-15 kg N/ha/yr. Exceedance of this load may lead to changes in soil processes, nutrient imbalances, and altered composition of mycorrhiza and ground vegetation. APIS provides a critical load range for coniferous woodland of 5-15 kg N/ha/yr. However, the range for coniferous woodland is derived from research into natural native pine and spruce forests of Scotland and Scandinavia[53]. The 10-15 kg N/ha/yr range is therefore considered to be the most appropriate critical load for conifer plantation. APIS identifies that this species is sensitive to nitrogen impacts on its coniferous woodland habitat. The existing background deposition rate to such woodland is at a maximum of 26.5 kg N/ha/yr, far exceeding the identified critical load[54].

[51] http://publications.naturalengland.org.uk/publication/6221375450644480 [Accessed on the 21/05/2020]
[52] Available on APIS: http://www.apis.ac.uk/srcl/select-a-feature?site=UK9012141&SiteType=SPA&submit=Next [Accessed on the 21/05/2020]
[53] This can be seen from the entry for coniferous woodland on the following page on APIS where it directs the reader to use 10 kg N/ha/yr unless lichens/ free-living algae are important features of the site http://www.apis.ac.uk/indicative-critical-load-values
[54] Ibid.

4.11 Multiple parcels of the SPA lie adjacent (within 200m) to major roads, but only a few of these are likely to constitute journey-to-work routes for Warfield residents. These journeys would mainly be to towns south of Warfield, including Sandhurst, Camberley, Farnborough, Chobham and Woking. A focal point of such traffic may be the M3, where parcels of the Thames Basin Heaths SPA (e.g. Chobham Common SSSI, Colony Bog and Bagshot Heath SSSI) lie within a few metres of the motorway. However, there are several habitat management measures in place at these locations that are likely to limit the local magnitude of atmospheric nitrogen deposition. At Lightwater Country Park (part of the Colony Bog and Bagshot Heath SSSI) the M3 is in a cutting, separated from the SAC by a high, 30m wide densely tree-covered embankment. This embankment is likely to receive the highest amount of nutrient deposition. At the Chobham Common SSSI, the area of SAC within 30-100m of the motorway, subject to the greatest increase of nitrogen deposition, is mown as a firebreak. This management would have a much greater effect on botanical composition and habitat structure than nitrogen deposition.

4.12 An alternative route that may impact lowland heathland may involve the A3095 to the settlements of Sandhurst, Owlsmoor and Camberley past the Sandhurst to Owlsmoor Bogs and Heaths SSSI. It is to be noted that identifying journey-to-work routes in this part of southern England is particularly challenging, due to the complexity of the road infrastructure and the vast number of feasible destinations. Given that this potential commuter route for Warfield residents runs within the 200m atmospheric pollution impact distance for sensitive habitats, the Thames Basin Heaths SPA is screened in for Appropriate Assessment.

4.13 The following policy providing for residential growth in Warfield has been screened in for Appropriate Assessment, because it increases the local population and may increase the number of commuter journeys along the Thames Basin Heaths SPA:

- Policy WNP2 – Hayley Green Allocation: Provides for 235 new dwellings in Hayley Green; a quantum that is additional to the residential growth allocated in Warfield within the Bracknell Forest Core Strategy Development Plan

Thursley, Ash, Pirbright & Chobham SAC

4.14 The Thursley, Ash, Pirbright & Chobham SAC is designated for its depressions on peat substrates, Northern Atlantic wet heaths and European dry heaths. From an atmospheric pollution perspective, the lowland fens and mire habitats (depressions on peat substrates) are most sensitive (critical nitrogen load of 10-15 kg N/ha/yr). However, both the wet and dry heath habitats are also sensitive to atmospheric nitrogen deposition (both have critical nitrogen loads of 10-20 kg N/ha/yr)[55]. A large portion of the SAC overlaps with the Thames Basin Heaths SPA, most notably the parcels that were discussed in relation to the M3 in the previous section (i.e. Lightwater Country Park and Chobham Common).

4.15 A large portion of the SAC (and its sensitive habitats) lies within 200m of major roads, such as the aforementioned M3. In the authority of Surrey Heath, the M3 runs directly past the heathland habitat of Lightwater Country Park, and both lowland fen and heathland habitats in Chobham Common. However, as mentioned in relation to the Thames Basin Heaths SPA, the M3 at Lightwater Country Park is in cutting and at the sections of Chobham Common adjacent to the motorway are regularly mown as a firebreak. Given these specific characteristics and conditions of the Thursley, Ash, Pirbright and Chobham SAC along the M3, this site is screened out from Appropriate Assessment.

Windsor Forest & Great Park SAC

4.16 Several habitats in the Windsor Forest and Great Park SAC are sensitive to impacts from atmospheric nitrogen deposition, most notably the oak woods with *Quercus robur* (empirical critical nitrogen load of 10-15 kg N/ha/yr) and the Atlantic beech forests with *Ilex* and *Taxus* in the shrublayer (critical nitrogen load of 10-20 kg N/ha/yr)[56]. For example, exceedance effects in the oak woods would include a loss of mycorrhiza, epiphytic lichens and bryophytes. Notably the current deposition rates in the SAC far exceed the critical loads in both the oak woods and the beech forest, equating to a maximum of 27.8 kg N/ha/yr.

4.17 The SAC and sensitive woodland habitat therein lie directly adjacent to the B383 and the A332 in the adjoining authority of Windsor and Maidenhead, to the east of Warfield Parish. A review of the distribution

[55] Available on APIS: http://www.apis.ac.uk/srcl/select-a-feature?site=UK0012793&SiteType=SAC&submit=Next [Accessed on the 21/05/2020]
[56] Available on APIS: http://www.apis.ac.uk/srcl/select-a-feature?site=UK0012586&SiteType=SAC&submit=Next [Accessed on the 21/05/2020]

of woodland within the SAC on MAGIC indicates that these habitats are evenly distributed along the entire cutting of these roads through the site.

4.18 The Census 2011 data of journey-to-work routes show that the District of Windsor and Maidenhead is the top destination for commuters from Bracknell Forest. Of a total of 25,383 people commuting outward of Bracknell Forest, 4,115 (16.2%) work in the District of Windsor & Maidenhead[57]. This is also the second most important origin of commuters that travel into Bracknell Forest. It is noted that most people are likely to work in Maidenhead (the much larger settlement compared to Windsor, with considerably more employment opportunities). The journey between Warfield Parish and Maidenhead would not involve driving past the SAC.

4.19 Notwithstanding, Windsor is still the second most likely destination for commuters into the District of Windsor and Maidenhead. The two fastest routes – and indeed the only ones suggested by Google Maps – between Hayley Green and Windsor are along the A332 and the B3022. Any commuters between Hayley Green are thus likely to choose one of these journey-to-work routes. Both these routes cut through the SAC and run within a few metres of sensitive woodland habitat. This is important because for an Air Quality Impact Assessment it is an increase in average daily commuter traffic that is most important. Overall, Likely Significant Effects of the WNP cannot be excluded and the site is screened in for Appropriate Assessment.

4.20 The following policy providing for residential growth in Warfield has been screened in for Appropriate Assessment, because it increases the local population and may increase the number of commuter journeys along the Windsor Forest & Great Park SAC:

- Policy WNP2 – Hayley Green Allocation: Provides for 235 new dwellings in Hayley Green; a quantum that is additional to the residential growth allocated in Warfield within the Bracknell Forest Core Strategy Development Plan

[57] Nomis Official Labour Market Statistics – Census 2011 data. Available at: https://www.nomisweb.co.uk/census/2011/WU03UK/chart/1132462116 [Accessed on the 21/05/2020]

5. Appropriate Assessment

Recreational Pressure

Thames Basin Heaths SPA

5.1 Natural England's Site Improvement Plan for the SPA highlights recreational disturbance as a threat to the qualifying birds for the site. This is particularly the case because the SPA's species nest on (or close to) the ground and are therefore highly susceptible to recreation, particularly the impacts of dog walkers. The main parcels of the SPA that are most likely to be accessed by new residents lie to the south of Warfield Parish in the southern extent of Bracknell Forest.

5.2 Much of the available evidence base relating to the in-combination recreational pressure in the Thames Basin Heaths SPA, stems from two visitor surveys undertaken in 2005 and 2012 / 2013. 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 / 2013[58], replicating the original methodology where possible. The results of this visitor survey (as relevant to Bracknell Forest and, by extension, to Warfield Parish) are discussed in the following to assess whether the WNP might lead to an increase in recreational pressure in the SPA.

Overview of In-Combination Visitor Survey Results as Relevant to Warfield Parish

5.3 The most relevant access points to the SPA for Warfield residents are likely to encompass northern parcels of the SPA, including the Broadmoor and Bagshot Woods & Heaths SSSI and Chobham Common SSSI. The following locations have been covered by at least one of Footprint Ecology's visitor survey:

- The Lookout, Broadmoor to Bagshot Woods & Heaths SSSI (survey location 3), which is easily accessible via the A322 and the B3430 to the south of Bracknell in Bracknell Forest District; it comprises the largest designated car park with approx. 350 parking spaces
- Car park off roundabout where the B3348 meets the A3095 (survey location 30), at the northern end of the Broadmoor to Bagshot Woods & Heaths SSSI
- South Road, southern part of the Broadmoor to Bagshot Woods & Heaths SSSI (survey location 19); connected to the north of Bracknell Forest District via the A3095 and A322
- Off Crowthorne Road, part of the Sandhurst to Owlsmoor Bogs and Heaths SSSI (survey location 20); connected to Warfield Parish via Crowthorne Road and the A3095-A322 road link

5.4 It is considered that these are the main access points that would be visited by residents from Warfield Parish due to their relative proximity to Bracknell Forest District and because they are easily accessible via the main road links in the southern part of the authority.

5.5 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 Warfield Parish, because they can be conveniently reached via the A322 that connects this part of Bracknell Forest with parishes further north in the authority.

5.6 In the southern part of the Broadmoor and Bagshot Woods & Heaths SSSI (survey point 19), a total of 207 adults and 121 dogs were entering over a 32-hour period. Nearby, in the Sandhurst to Owlsmoor Bogs and

[58] 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.

Heaths SSSI, a total of 178 adults and 152 dogs entered over a similar timeframe. While these component parcels of the SPA appear to be somewhat less busy than the parts further north, the visitor data still indicate a relatively high popularity, especially among dog walkers. Given the more convoluted travel route to, and slightly longer distance from Warfield Parish, these southern survey points are likely to be less frequently visited by Warfield residents compared to survey points 3 and 30.

5.7 More generally, the data from the visitor surveys in May / June and August 2012 indicate that the majority of interviewees to the SPA visit 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 are likely to 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 by dog walkers, which is the user group that is likely to have the highest disturbance impact to SPA birds.

5.8 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 an 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 districts interviewees lived in. Unsurprisingly, most visitors originate from districts that contain significant parts of the SPA, including Surrey Heath (540 interviewees, 23%), Woking (355 interviewees, 15%) and Hart Districts (341 interviewees, 15%). Bracknell Forest's contribution (the authority which comprises Warfield Parish) to the overall recreational footprint was somewhat lower (270 interviewees, 12%), but it still ranked within the top five origins of visitors. According to the map showing the distribution of visitor postcodes, most visitors from Bracknell Forest come from the wider area of Bracknell town, with only few isolated home postcodes from the area around Warfield Parish. While this evidence indicates that the wider area around the parish is not a main contributor to recreational pressure in the SPA, due consideration to this impact pathway must be given, particularly in-combination with the residential growth in other parishes and authorities surrounding the SPA.

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

5.9 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.

5.10 Most importantly, visitor catchment data from the visitor surveys have informed several TBH SPA Avoidance Strategies (e.g. [59], effectively Supplementary Planning Documents agreed upon by 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. These zones are 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

Relevant Mitigation in the Warfield Neighbourhood Plan

5.11 The outer edge of the Hayley Green site allocation is approx. 4.7km from the closest component part of the Thames Basin Heaths SPA, placing it within the core recreational catchment and the 5km mitigation buffer zone of the SPA. The part of the Hayley Green allocation that lies furthest from the SPA is at approx. 5.2km distance, which places it in the wider 5-7km mitigation zone in which residential developments over 50

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

dwellings must be mitigated. In principle this implies that if this part of the development was under 50 dwellings, there would be no need for mitigation. However, as outlined in **Policy WNP2** (**Hayley Green Allocation**) of the WNP, '*the whole allocation should be delivered as one single outline planning application… Any planning applications for piecemeal development that would undermine this objective will not be supported*'. Given that the whole application is to be brought forward as one planning application, the entire residential growth allocated in the WNP (i.e. 235 dwellings) requires SANG and SAMM mitigation.

5.12 Overall, the WNP proposes 235 new residential dwellings within the mitigation zone, equating to 564 new residents[60]. Using Natural England's SANG standards and the average occupancy rates in the UK, Table 3 shows the total amount of SANG (4.5ha) that would be needed to mitigate the residential growth detailed in the WNP within 7km of 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: Calculation of the SANG size and capacity requirements to mitigate the residential growth allocated in the WNP 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: 235	8ha per 1000 new residents	Required Size: 4.5ha
Number of Residents*: 564 According to average occupancy of 2.4 residents / dwelling	0.008ha per every 1 new resident	Number of new residents * 0.008ha

5.13 AECOM notes that Policy WNP2 provides for 4ha of public open green space in the Hayley Green site allocation. This is positive as such greenspace will provide a significant community benefit and will encourage at least some new residents to engage in recreational activities locally. In turn this will extend some protection to the Thames Basin Heaths SPA by capturing some people that would otherwise visit the SPA. However, this public greenspace does not negate the requirement for SANG (see the following paragraph), as this must fulfil stringent criteria in order to be recognised as such. This includes features such as a 2.3 - 2.5km circular route, adequate parking (for SANGs over 4ha in size) and a well-maintained path network. Unless these conditions are met by the greenspace referred to in Policy WNP2, SANG provision will have to be a separate exercise. Importantly, if a proposed SANG is already publicly accessible, current usage will have to be discounted from the overall capacity determined for the site. It should also be noted that in AECOM's experience a SANG (unless it is to be connected to another existing SANG) needs to be at least 10ha in size to comfortably accommodate a 2.5km circular walk. Therefore, the developer may need to make a financial payment to Bracknell Forest District Council to contribute to one of their strategic SANG.

5.14 Importantly, **Policy WNP6** (**Suitable Alternative Natural Greenspace**) already identifies that residential development proposals in Warfield '*shall include measures to mitigate the impact of residential development upon the Thames Basin Heaths Special Protection Area (SPA) in agreement with the BFC and Natural England*'. This is an important policy as it recognises the need for mitigation while also ensuring that is achieved in agreement with Bracknell Forest Council (BFC), thereby ensuring the WNP is in line with the overarching Bracknell Forest Development Plan. Furthermore, the policy also identifies that '*a financial contribution towards Strategic Access Management and Monitoring… to satisfy Habitats Regulations*' is required. Therefore, the WNP satisfies all legal requirements relating to the protection of European sites.

5.15 The Core Strategy Development Plan for Bracknell Forest, the Local Planning Authority in which Warfield falls, extends protection to the Thames Basin Heaths SPA in **Policy CS14** (**Thames Basin Heaths Special Protection Area**) where it states that '*The Council will not permit development which, either alone or in combination with other development, has an adverse effect upon the integrity of the SPA*'. The SPA is also referred to in the 2013 Site Allocations Local Plan, including for residential allocations in Warfield. By

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

recognising the need for an agreement with BFC, the WNP provides appropriate protection to the Thames Basin Heaths SPA.

5.16 Notwithstanding the provision of appropriately sized and located SANG, a small proportion of new Warfield residents may still visit the Thames Basin Heaths SPA, because:

- The Hayley Green site allocation lies in Bracknell Forest District within a relatively short driving distance from component parcels of the Thames Basin Heaths SPA, such as the Broadmoor to Bagshot Woods and Heaths SSSI
- The SPA has a unique draw (e.g. habitats, wildlife interest, feeling of openness) that is difficult to replicate in SANGs

5.17 The WNP already 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[61]. 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

5.18 The JSPB agreed that the SAMM delivery would be funded by developer contributions. Bracknell Forest Council has published a Special Protection Area Supplementary Planning Document (SPD)[62], detailing the updated avoidance and mitigation strategy for the SPA, including any SANG and SAMM obligations for new residential developments. The SPD specifies a SAMM contribution based on the number of dwellings in new developments. For example, a 1-bedroom dwelling currently has to pay a tariff of £399, increasing up to £1,052 for 5+ bedroom dwellings. Natural England is continually reviewing the appropriate per-dwelling tariff for SAMM contributions in line with emerging evidence.

5.19 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. It is considered that given the adequate recognition of SANG and SAMM in the WNP, the Plan contains an adequate policy framework and by definition cannot result in adverse effects on the SPA.

Recommendations

5.20 To provide adequate SANG for the mitigation of its share in population growth, it is recommended that the developer of the Hayley Green site contact Bracknell Forest Council to explore the feasibility of contributing payments to one of the strategic SANGs already in place across the authority. It is likely to prove difficult to deliver a sufficiently large greenspace of at least 10ha on-site **and** fulfilling the required SANG criteria. Furthermore, the Hayley Green development could not become occupied until a SANG is functional, indicating that investment into an existing SANG is likely to be the most time-effective approach.

5.21 Overall, it is concluded that, given the adequate policy framework included in the WNP, there will be no adverse effects of the plan on the site integrity of the Thames Basin Heaths SPA regarding the impact pathway recreational pressure.

Atmospheric Pollution

5.22 The following policy providing for residential growth in Warfield Parish has been screened in for Appropriate Assessment, because it increases the local population and may increase the number of commuter journeys within 200m of the Thames Basin Heaths SPA, overlapping Thursley, Ash, Pirbright & Chobham SAC and / or the Windsor Forest & Great Park SAC:

[61] Outline Business Plan for the Thames Basin Heaths Strategic Access Management and Monitoring Project, Joint Strategic Access Board 18th June 2009.
[62] Bracknell Forest Council. (April 2018). Thames Basin Heaths Special Protection Area Supplementary Planning Document. Available at: https://www.bracknell-forest.gov.uk/sites/default/files/documents/thames-basin-heaths-spa-supplementary-planning-document.pdf [Accessed on the 08/02/2021]

- Policy WNP2 – Hayley Green Allocation: Provides for 235 new dwellings in Hayley Green; a quantum that is additional to the residential growth allocated in Warfield within the Bracknell Forest Core Strategy Development Plan

5.23 These three European sites are discussed in the following sections, which provide further background on the nature of the atmospheric pollution impact pathway and the further evidence that is required to adequately determine whether adverse effects on the integrity of the sites may be present.

5.24 Warfield Parish is covered by the emerging Bracknell Forest Development Plan (BFDP), which provides the overarching planning guidance for its Parish constituents. Typically, the Air Quality Impact Assessment (AQIA) would involve the strategic traffic and air quality modelling undertaken at the Local Plan level, which would take account of the in-combination growth including Warfield Parish. However, the AQIA for the BFDP has not yet been completed and the WNP must therefore provide its own AQIA evidence base.

5.25 Although the estimated traffic flows attributable to the WNP were small, discussions with Bracknell Forest Council identified that Likely Significant Effects on the Thames Basin Heaths SPA could not be dismissed without air quality modelling given that various M, A and B roads lie within 200m of the site. The Bracknell Forest strategic transport model was used to extract the 2019 baseline, 2037 Do Minimum and 2037 Do Something traffic flows of the Hayley Green site allocation on all M, A and B roads within 200m of the SPA. This was done for all road links that lie within a 10km zone of Warfield Parish. The 10km radius reflects the average commuting distance of UK residents and is considered by Natural England as an appropriate traffic-related zone of influence for new residential development, as confirmed by Bracknell Forest Council. The Do Minimum scenario is the total 24hr AADT expected on each road link by 2037 due to both existing traffic and traffic growth across Bracknell Forest and beyond, excluding that attributable to the Hayley Green allocation. The Do Something scenario then adds on the growth in traffic attributable to the Hayley Green allocation. The Do Something scenario is therefore the 'in combination' scenario while the contribution of Hayley Green can be identified by the difference between Do Something and Do Minimum.

5.26 All road links within 200m of a European site where a change in AADT was forecast due to the Neighbourhood Plan were then run through an air quality model to determine whether these increases in AADT would lead to material increases in NOx concentrations and nitrogen deposition rates, both alone and in-combination (see the following section). This was done by placing an air quality transect on each modelled road link. Roads where there would be no change in AADT due to the Neighbourhood Plan were not modelled, as on those roads the Neighbourhood Plan will have no effect.

5.27 In interpreting the model results it is important to note that:

- Paragraph 5.26 of the only Natural England guidance on the issue (written for European sites so the process is slightly different particularly regarding the need for 'in combination' assessment which isn't a legal requirement for SSSIs, but the principles are applicable)[63] states that '*An exceedance* [of the critical level or load] *alone is insufficient to determine the acceptability (or otherwise) of a project'.* So, the fact that the critical level for NOx or critical load for nitrogen are already exceeded is not a legitimate basis to conclude that any further NOx or nitrogen (no matter how small) will result in an adverse effect;

- Paragraph 4.25 of the same NE guidance states '…*1% of critical load/level are considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible…There can therefore be a high degree of confidence in its application to screen for risks of an effect'.*

Thames Basin Heaths SPA

General Setting of the SPA

5.28 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 is advised. The Thames Basin Heaths SPA is a composite site with a complex network of busy roads traversing the various compartments. As highlighted in an earlier section of the HRA, the SPA comprises two habitats that are important for the qualifying bird species, including heathland and rotationally managed plantation woodland.

[63] 'Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. Version: June 2018'. http://publications.naturalengland.org.uk/publication/4720542048845824

The closest component parcel of the SPA is the Broadmoor to Bagshot Woods and Heaths SSSI, approx. 3.3km to the south of Warfield Parish. This part of the SPA contains both types of sensitive habitat relevant to the SPA birds. For example, plantation woodland lies adjacent to the A322 along the north-eastern boundary of the SSSI. According to the Department for Transport's road traffic statistics, the A322 is a very busy road with a total of 48,132 Annual Average Daily Traffic (AADT) at count point 78287[64]. Further plantation woodland lies directly adjacent to the A3095 Forrester's Way, on the western side of the Broadmoor to Bagshot Woods and Heaths SSSI. While this road is less busy than the A322, it still has a relatively large traffic volume. Dwarf shrub heath also lies directly adjacent to the A3095 in several places. For example, at count point 78080 to the north of Sandhurst and Owlsmoor, an AADT of 16,967 cars, 2,341 light goods vehicles and 463 heavy goods vehicles was counted in 2018[65]. Given the high sensitivity of heathland to atmospheric nitrogen deposition, this is considered to be a particularly important stretch of road.

5.29 It is noted that the Thames Basin Heaths SPA lies outside Warfield Parish however, due to the highly urban context and the relatively short distance to the Parish, this part of the SPA requires further consideration. It is noted that most residents from Warfield Parish are likely to travel to Bracknell, the biggest town in Bracknell Forest District. Notwithstanding this, some people might commute further south past the sensitive habitats of the SPA. For example, residents from Warfield might use either of the two identified roads to commute to settlements in the south of Bracknell Forest District, such as Sandhurst. Furthermore, the A322 and the A3095 might also be used to travel to towns in nearby authorities, including Rushmoor, Surrey Heath and Hart. Therefore, data for journey-to-work routes between authorities is considered in the next section.

Commuter Traffic

5.30 A second integral step of the Appropriate Assessment of atmospheric pollution is an analysis of commuter traffic, as this establishes the likelihood of new residents regularly passing (and thereby affecting) a European site. It is the regular commuting journeys (i.e. potentially passing sensitive sites twice a day) that will contribute the largest proportion to the air quality impact. It is noted that the pattern of commuter traffic analysed here, only reflects the current pattern of motorised travel within the region 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 considered to be a useful starting point for assessing the potential atmospheric pollution impacts of new residential development. Such data is not available for individual parishes and is therefore assessed at the overarching level of districts; in this case Bracknell Forest District.

5.31 According to Journey to Work data from the 2011 census[66], the number of people commuting into (23,925 daily journeys) and out from (25,383 daily journeys) Bracknell Forest District are approximately even. The authorities identified in the previous section (which may involve passing the Thames Basin Heaths SPA), are among the 10 most frequent origins and destinations for Bracknell Forest residents. Given the rural nature of Warfield Parish and the fact that the WNP only provides for residential development (not employment opportunities), it is considered that the commuter outflow from Bracknell Forest District is most relevant and most likely to include Warfield residents. Overall, a total of 8.6% (2,183 journeys), 4.1% (1,047 journeys) and 3.8% (962 journeys) of commuters outwards from Bracknell Forest District travel into the authorities of Surrey Heath, Hart and Rushmoor respectively.

5.32 It is to be noted that these data do not include journeys to work that both start and end in Bracknell Forest District and the commuter trips that are carried out on foot, by bike or by public transport. Therefore, the actual proportion of regular commuter journeys that might pass the Thames Basin Heaths SPA is likely to be lower than the relative proportions of car travel that have been assessed in this section.

Traffic Modelling

5.33 The following road links were identified as receiving the highest increases in AADT due to the WNP/Hayley Green allocation[67]:

[64] The AADT count and location of this traffic count point can be accessed at https://roadtraffic.dft.gov.uk/manualcountpoints/78287 [Accessed on the 26/06/2020].
[65] The AADT count and location of this traffic count point can be accessed at https://roadtraffic.dft.gov.uk/manualcountpoints/78080 [Accessed on the 26/06/2020].
[66] Available at https://www.nomisweb.co.uk/census/2011/wu03uk [accessed 26/06/2020]
[67] Transect numbers for easier cross-referencing to the air quality modelling are also provided. Note that only transects with significant increases in NOx and NH_3 concentrations and nitrogen deposition rates are discussed in the main body of text.

- B3430 to the north of the Broadmoor to Bagshot Woods and Heaths SSSI – 25 AADT (Transect 32 of the air quality modelling)
- A3095 Forresters Way to the west of the Broadmoor to Bagshot Woods and Heaths SSSI – 25 AADT (Transect 44)
- A322 to the east of the Broadmoor to Bagshot Woods and Heaths SSSI – 54 AADT (Transect 41)
- B383 at Chobham Common SSSI – 27 AADT (Transect 58b; this transect has been modelled as a worst case to take account of the cumulative effect of the B383 and the M3 together)
- M3 to the east of Junction 3 leading past Lightwater Country Park – 37 AADT (Transect 53 of the air quality modelling)

5.34 These five links therefore provide the worst-case assessment for the Neighbourhood Plan with regard to the SPA. The air quality modelling data for all modelled links are contained in Appendix D.

Air Quality Impact Assessment

5.35 The traffic and Air Quality Impact Assessment (AQIA) has followed Bracknell Forest Council's guidance on air quality assessments in the authority[68] and Natural England's advice note on guiding Competent Authorities in assessing impacts of road traffic emissions[69].

5.36 One transect on each of six road links within the considered road network was modelled (see Figure 5). The relevant roads all lie within 200m of the nitrogen-sensitive habitats in Thames Basin Heaths SPA, including plantation and heathland. Three core atmospheric pollutants were modelled as part of the AQIA: nitrogen oxides (NOx), ammonia (NH_3) and total nitrogen deposition rate. While it is noted that both NOx and NH_3 can be directly toxic to vegetation (and this is discussed below), their main air quality threat is as a source of nitrogen.

Toxicity Effects of NOx and NH_3

5.37 It is noted that the Thames Basin Heaths SPA is designated for breeding birds that are more dependent on overall habitat structure than the precise botanical composition. As such the vulnerability of the SPA to the subtle changes in species composition or plant health that may arise from NOx or ammonia directly is low. Moreover, there is only one modelled transect where NOx and ammonia concentrations are forecast to exceed the critical level (30 μgm^{-3} for NOx and 3 μgm^{-3} for ammonia) by 2037. This is link 58b (B383/M3 south of Chobham Common) where the critical level for both pollutants will be exceeded up to 30m from the motorway. However, the vegetation within this zone at Chobham Common is regularly mown as permanent short grassland to serve as a firebreak. This management activity is likely to continue for as long as the M3 remains a motorway i.e. in perpetuity. This will have a much greater effect on vegetation structure and composition than pollutant concentrations in atmosphere.

5.38 Therefore, the individual toxicity effects of NOx and NH_3 are not further assessed in relation to the SPA. However, their potential impact as significant sources of nitrogen is discussed in the following section.

Total Nitrogen Deposition Rates (incl. NOx and NH_3)

5.39 Total nitrogen deposition is the most inclusive and important metric, because it represents the amount of fertilisation resulting from traffic associated with development. This Appropriate Assessment takes the approach of assessing the contribution to total annual mean nitrogen deposition (kg N/ha/yr) of the WNP alone, before evaluating its role in the in-combination nitrogen deposition.

5.40 WNP's highest influence on nitrogen deposition rates was modelled at Transect 58b and these data are summarised in Table 4. The highest nitrogen deposition rate arising from the WNP alone (measured as the difference between the DS and DM scenarios), is less than 0.01 kg N/ha/yr[70] beyond 10m from the M3/B383 in Chobham Common. In other words, the greatest contribution of the WNP, at the transect showing the highest impact in air quality parameters, is too small to be precisely modelled except at the roadside. Natural England air quality specialists and other statutory nature conservation bodies typically recommend the use of the 1% CL as a threshold below which nitrogen deposition impacts become imperceptible. The

[68] Air pollution effects on Habitats Sites – Guidance Note for Air Quality Assessments in Bracknell Forest 2020-21. Provided by Bracknell Forest Council.
[69] Natural England. (June 2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. 43pp.
[70] Air quality data are generally not reported to more than 2 decimal places to avoid false precision.

contribution of the WNP falls clearly below this threshold CL, such that adverse effects on site integrity of the plan alone can certainly be excluded.

5.41 When the in-combination nitrogen deposition is considered, the 1% CL is far exceeded. At 3.5m from the M3, the in-combination nitrogen dose in 2037 is predicted to be 7.19 kg N/ha/yr, amounting to 71.9% of the CL. By 200m from the roadside, the in-combination dose is still forecast to be 0.69 kg N/ha/yr (6.87% of the CL), remaining significantly above the NE screening threshold value. Clearly, a significant adverse fertiliser effect on habitats in this part of the SPA cannot be excluded based purely on modelling.

5.42 However, ecological factors relevant to Chobham Common will render the in-combination deposition in the vicinity of the M3 immaterial to the ability of the SPA to achieve its conservation objectives. All three qualifying species (especially nightjar and woodlark) are disturbance sensitive. Survey data from 2Js Ecology (data from 2007-2012) on Chobham Common indicate that, even where suitable habitat was available, no territories of these species were found adjacent to the motorway. The closest Dartford warbler territory was 70m from the M3 and no nightjar and woodlark territories were found within 200m of the motorway. This interpretation was also supported by data collated by EPR Ltd for Ockham and Wisley Commons near the M25/A3 junction in the period between 2010-2014[71]. The closest SPA bird territories were found approx. 300m from the roadside. Given the existing evidence on disturbance sensitivity of the designated SPA species, it is considered unlikely that nightjar, woodlark or Dartford warbler would establish successful nesting territories within 200m of the M3 at Chobham Common, the area for which the in-combination nitrogen deposition was modelled to be highest.

5.43 The observed bird distributions are likely to be at least partly shaped by the distribution of suitable habitats in proximity to the M3. As mentioned above, a belt 50-75m wide at Chobham Common adjacent to the M3 is closely mown as a firebreak. This likely removes the ability of this zone to support nesting SPA birds (although it will still be of foraging value and of value as a buffer zone) and also reduces the likelihood that this section of the SPA will be restored to heathland habitat in the future. Overall, the section of the SPA adjoining the M3 is unlikely to directly support SPA species, due to a combination of noise disturbance and much of this area being unsuitable for ground-nesting birds. This is **not** to imply that this part of the SPA does not serve an important function, not least by buffering and protecting more distant parts of the SPA that are used by designated species. However, it is important context when assessing the likelihood of roadside atmospheric pollution preventing the SPA from meeting its Conservation Objectives.

5.44 **Furthermore**, the imperceptible contribution of the WNP to these deposition rates (too small to reliably model) means that adverse effects on site integrity of the WNP can be excluded even in-combination. Based on in-combination assessments in other areas of the UK, an individual plan or project with such a very small contribution can be dismissed on the following basis:

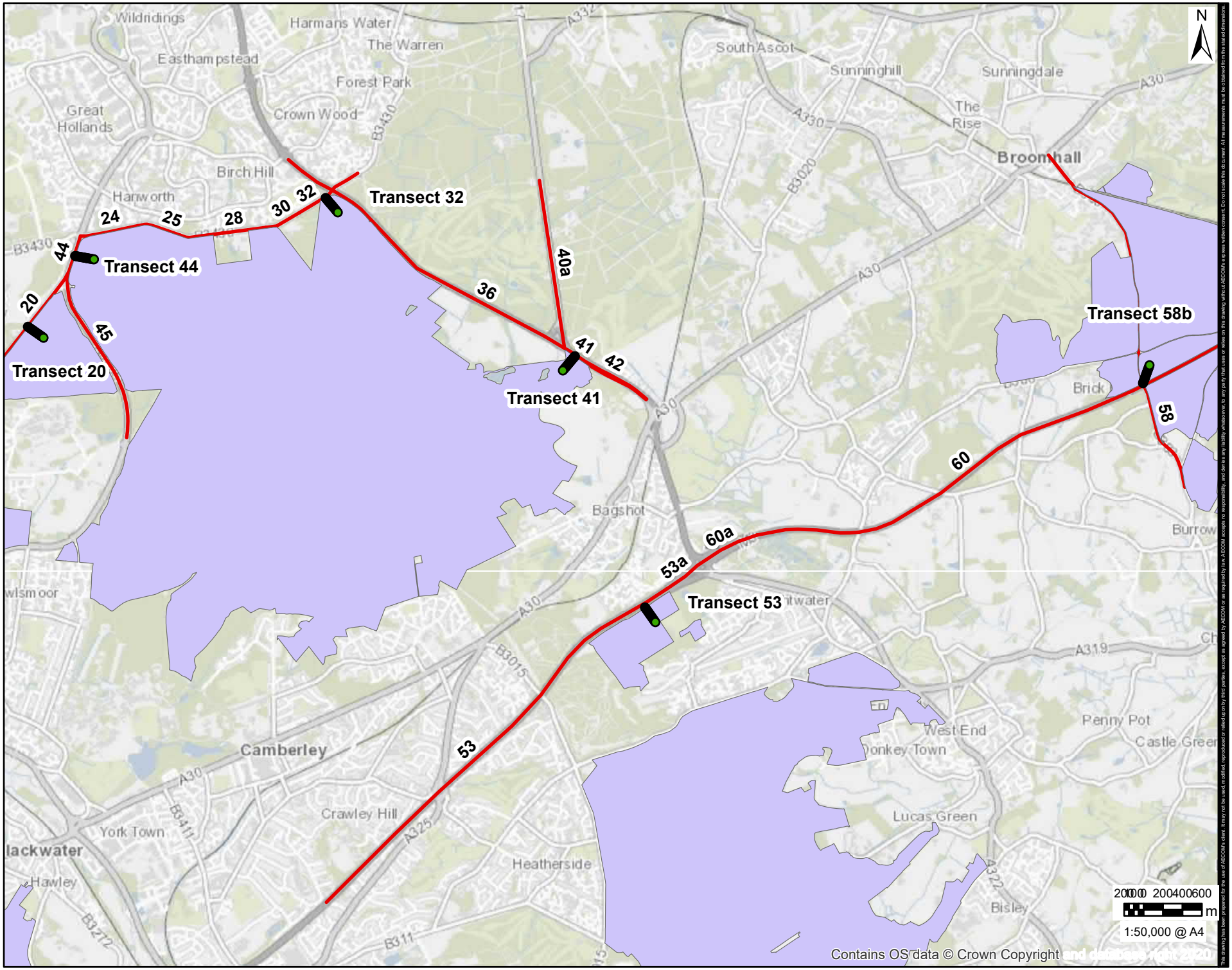
- In Advocate-General Sharpston's Opinion in European Court of Justice Case C-258/11 she specified in Paragraph 48 that '*the requirement for an effect to be 'significant' exists in order to lay down a de minimis threshold. Plans and projects that have* ***no appreciable effect on the site*** *can therefore be excluded. If all plans and projects capable of having any effect whatsoever on the site were to be caught by Article 6(3), activities on or near the site would risk being impossible by reason of legislative overkill.*'; and

- In Wealden v SSCLG [2017] EWHC 351 (Admin) (2017), which specifically concerned the need for 'in combination' assessment in air quality modelling for European sites, Mr. Justice Jay accepted that if the contribution of an individual plan or project to traffic growth or resulting air quality effects was '*very small indeed*' (quoting a notional 20 AADT), it could be legitimately and legally excluded from 'in combination' assessment. This is in agreement with the opinion of Advocate-General Sharpston.

5.45 It would seem inarguable that a contribution that is greater than zero but too small to reliably model would certainly meet the definition of 'no appreciable effect' or 'very small indeed'.

[71] EPR. 2015. Wisley Airfield. Information for Habitats Regulations Assessment. Report to support a planning application by Wisley Property Investments Ltd.

Figure 5: Map showing the modelled road network within 200m of the Thames Basin Heaths SPA and the six modelled transects (Transects 20, 32, 41, 44, 53 and 58b).



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AECOM

PROJECT
Warfield HRA

CLIENT
Warfield Neighbourhood Plan Group

CONSULTANT
AECOM
Sunley House
4 Bedford Park
Croydon CR0 2AP
United Kingdom
www.aecom.com

LEGEND
- Eco Transects
- Thames Basin SPA
- Modelled Road Network

NOTES
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Figure 2

Table 4: Nitrogen deposition rates at one transect modelled for the Thames Basin Heaths SPA. The data shows Transect 58b, which has the largest % contribution to nitrogen deposition of the WNP alone and in-combination with other plans and projects.

Link	Distance from Roadside (m)	Baseline (2019)	Modelled Scenarios – Nitrogen Deposition Rates (kg/ha/yr)			Scenario Differences – Nitrogen Deposition Rates (kg/ha/yr)		Scenario Differences – % Contributions to Nitrogen Critical Load (10 kg/ha/yr)	
			Future Baseline[72] (FB, 2030)	Do Minimum[73] (DM, 2030)	Do Something[74] (DS, 2030)	DS – DM (WNP impact)	DS – FB (in-combination impact	DS – DM	DS – FB
Transect 58b (where B383 and the M3 both lie within 200m of Chobham Common)	3.5	52.25	53.30	60.47	60.49	0.02	7.19	0.16	71.9
	10	41.07	41.34	46.33	46.34	0.01	5.00	0.1	50
	20	33.27	33.19	36.73	36.74	<0.01	3.54	0.06	35.41
	30	29.06	28.87	31.65	31.65	<0.01	2.78	0.05	27.8
	40	26.38	26.15	28.45	28.45	<0.01	2.30	0.04	23.04
	50	24.49	24.25	26.23	26.23	<0.01	1.98	0.03	19.75
	60	23.09	22.86	24.59	24.59	<0.01	1.73	0.03	17.33
	70	22.00	21.78	23.32	23.32	<0.01	1.55	0.02	15.46
	80	21.13	20.92	22.32	22.32	<0.01	1.40	0.02	13.99
	90	20.42	20.22	21.49	21.50	<0.01	1.28	0.02	12.8
	100	19.83	19.64	20.82	20.82	<0.01	1.18	0.02	11.8
	110	19.33	19.14	20.24	20.24	<0.01	1.10	0.02	10.96
	120[75]	18.90	18.72	19.74	19.74	<0.01	1.02	0.01	10.24

5.46 For all other transects contained in Appendix D for this SPA, including the four other links mentioned earlier, either the dose due to the Neighbourhood Plan is too small to reliably model at the closest point to the SPA, or the 'in combination'' dose is less than 1% of the critical load, or both.

Recommendations

5.47 Given its negligible individual contribution to the observed in-combination nitrogen deposition rate to the Thames Basin Heaths SPA, it is concluded that the plan will not result in adverse effects on the integrity of the SPA regarding atmospheric pollution, even 'in combination' with other plans and projects.

5.48 It is noted that the WNP is being adopted ahead of the overarching Bracknell Forest Local Plan (BFLP). The emerging BFLP will be supported by its own traffic and air quality modelling work. This modelling exercise will include growth allocated in the WNP (i.e. the Hayley Green site allocation) and will ultimately supersede

[72] Future Baseline scenario: Current traffic volume, accounting for improvements in vehicle emission technology by 2030. This is what the baseline is expected to be by 2037 with no further traffic growth beyond the 2019 baseline but allowing for improvements in emissions technology. Comparing the 2037 Do Something ('in combination') scenario with the 2037 Future Baseline therefore shows the in-combination effect of traffic growth unobscured by improvements in emissions technology

[73] Do Minimum scenario: Forecast traffic volume by 2030 excluding the Warfield Neighbourhood Plan.

[74] Do Something scenario: Forecast traffic growth by 2030 including the WNP.

[75] Note that data are only shown for up to a distance of 120m from the roadside, because hereafter the contribution of the WNP to the SPA's nitrogen Critical Load drops to below 0.01%, which is imperceptible. Also note that the contribution of the WNP alone is below 0.01 kg N/ha/yr at all distances from the roadside, which is too low to model with precision.

the air quality results presented in this HRA. Based on the levels / loads obtained for NOx, NO_3 and total nitrogen deposition, Bracknell Forest Council (BFC) may develop an overarching strategic policy for mitigating air quality impacts. Any mitigation measures identified in such a policy would be mandatory for developments coming forward under the Neighbourhood planning process. AECOM therefore recommends that, notwithstanding the conclusion of this assessment, additional policy text should be added to the WNP, confirming that any overarching air quality mitigation policy developed for the emerging BFLP will be adhered to. It is noted that **Policy WNP2 (Hayley Green Allocation)** of the WNP already refers to a requirement for the site to manage its effects on the road network. **The following statement could be added to that policy: '*Measures to avoid and mitigate the impact of residential development upon Habitats Sites, in line with Policy WNP6 and the Thames Basin Heaths SPA SPD or any successor adopted mitigation strategy, in agreement with the Council and Natural England as part of the planning application.*' AECOM considers that the recommended policy statement provides additional protection to the Thames Basin Heaths SPA, by aligning the WNP with a potential future atmospheric pollution mitigation policy.**

Thursley, Ash, Pirbright & Chobham SAC

5.49 The Thursley, Ash, Pirbright & Chobham SAC partly overlaps with the Thames Basin Heaths SPA, including at key locations that were considered in the SPA's Air Quality Impact Assessment such as Chobham Common and the Lightwater Country Park (both adjacent to the M3). Given the overlap between the SAC and the SPA, the general setting and pattern of commuter traffic is not discussed again here (please see previous section for further information). Importantly, the SAC is designated for dry and wet lowland heathland, to which different assessment criteria compared to the overlapping SPA are applicable.

Traffic Modelling

5.50 As for the Thames Basin Heaths SPA, the Bracknell Forest strategic transport model was used to forecast changes in traffic flows on the M3 within 10km of Hayley Green **and** 200m from the SAC. the following road links on the M3 were found to receive an increase as a result of the WNP[76]:

- M3 to the east of Junction 3 leading past Lightwater Country Park – 37 AADT (Transect 53 of the air quality modelling)
- B383 at Chobham Common SSSI – 27 AADT (Transect 58b; this transect has been modelled as a worst case to take account of the cumulative effect of the B383 and the M3 together)

5.51 Habitat mapping on APIS indicates that NOx and nitrogen-sensitive heathland is distributed throughout both Lightwater Country Park and Chobham Common (both part of the Thursley, Ash, Pirbright & Chobham SAC). Therefore, there is the potential that an increase in AADT along the M3 as a result of the WNP may increase the NOx concentrations and nitrogen deposition rates to the SAC, leading to a direct toxicity or fertiliser effect on designated heathland. The above traffic data were therefore run through an air quality model to undertake an AQIA.

Air Quality Impact Assessment

Toxicity Effects of NOx and NH_3

5.52 The Thursley, Ash, Pirbright & Chobham SAC is designated for two types of heathland habitats, both of which are potentially sensitive to direct toxicity effects from NOx. APIS sets a Critical Level of 30ug/m^3 NOx as a generic threshold for all types of vegetation.

5.53 The modelling predicts a significant reduction in atmospheric NOx concentrations between the current Baseline (2019) and the Do Something scenario (2037), which includes the WNP. For example, 13.9m from the M3 at the Lightwater Country Park, mean annual NOx is predicted to decrease from 73.23µg/m^3 in 2019 to 29.52µg/m^3 in 2037, even accounting for the cumulative growth anticipated across authorities. This is due to future improvements to vehicle emissions technologies and residents replacing older vehicles with newer, less polluting ones. According to the modelling data, this is forecast to offset the negative impacts of increasing traffic volumes under existing development scenarios. Therefore, the main effect of future development plans would occur as a retardation to the reduction in roadside NOx concentrations.

[76] Transect numbers for easier cross-referencing to the air quality modelling are also provided. Note that only transects with significant increases in NOx and NH_3 concentrations and nitrogen deposition rates are discussed in the main body of text.

5.54 Two key questions are whether the contribution of the WNP to this retardation effect is significant and whether the predicted NOx concentrations of the DS scenario are such that direct lethal effects on vegetation are to be expected. The highest contribution of the WNP alone at the closest point to the SAC of Transect 53 will be below 0.01µg/m^3, an effect size that is too small to model with precision and well below the 1% Critical Load criterion used by Natural England to dismiss air quality effects. The in-combination retardation effect on NOx concentrations at the roadside of Transect 53 equates to 1.31µg/m^3 or 4.36% of the Critical Level used for vegetation. A similar pattern is evident for the M3 at Transect 58b into Chobham Common beyond 10m from the roadside as discussed already for the SPA. However, for transect 53 the Critical Level would not be exceeded by 2037 meaning no adverse effect would be expected. This is also the case for all other modelled transects except 58b.

5.55 For transect 58b the 30µg/m^3 Critical Level would be exceeded and the in-combination dose would exceed the threshold level (1% of the critical level), meaning that significant ecological implications (i.e. a slowing of the rate of recovery of the heathland towards a healthier baseline) cannot be dismissed based purely on air quality criteria. However, as already discussed for the SPA, Chobham Common within 50-75m of the M3 is mown short as a firebreak, which will have a much greater effect on botanical composition than NOx concentrations. Moreover, APIS[77] identifies that negative effects of NOx/NO_2 in atmosphere (as distinct from its role in nitrogen deposition) are most likely to arise in the presence of equivalent concentrations of sulphur dioxide (SO_2). Vehicle exhausts do not emit SO_2 and APIS indicates that background SO_2 concentrations at Chobham Common are very low (a maximum of 1.24 µgm^{-3}) compared to a critical level for SO_2 of 10 µgm^{-3}. Since the SO_2 concentrations are so low no synergistic effect with NOx is expected. Finally, adverse effects for the WNP in-combination can be excluded based on the exceedingly small contribution of the plan to NOx concentrations; i.e. too small to model with precision and having 'no appreciable effect' on pollutant concentrations along the M3 (Advocate-General Sharpston).

5.56 Direct toxicity effects resulting from ammonia (NH_3) are also relevant to Thursley, Ash, Pirbright & Chobham SAC due to the presence of lichens and bryophytes in heathland. A stringent Critical Level for NH_3 of 1µg/m^3 is employed to determine potential ecological impacts of ammonia emissions from road traffic. The in-combination ammonia dose at Transect 58b equates to 1.32µg/m^3, which not only exceeds the 1% of the Critical Level threshold (132.25%), but the 1µg/m^3 Critical Level set for habitats harbouring lichens and bryophytes itself. **However**, the WNP's contribution to this concentration is minimal (i.e. too small to model with precision) and far below the 1% Critical Level for these species. Viewed in the context of Advocate-General Sharpston's words, this equates to 'no appreciable effect'. Overall, adverse effects of the WNP in-combination can be excluded based on the exceedingly small contribution of the plan to NH_3 concentrations at Transects 53 and 58b.

5.57 For all other transects either the critical levels for NOx or ammonia will not be exceeded, or the contribution of the Neighbourhood Plan is too small to show in modelling without false precision.

Total Nitrogen Deposition Rates (incl. NOx and NH_3)

5.58 The contribution of the WNP to the total annual mean nitrogen deposition rate at Transect 58b, its highest impact at any of the modelled transects, was already discussed in relation to the overlapping Thames Basin Heaths SPA and this analysis is not repeated here as it would apply equally to the heathland features (see Table 4 for data). In summary, while the in-combination nitrogen deposition equates to 71.9% of the Critical Load, the WNP only accounts for a small amount of 0.16% of the CL.

5.59 The likelihood of this additional in-combination nitrogen deposition having a material fertilising effect on qualifying heathlands depends on the distribution of this feature in the SAC. The highest in-combination nitrogen dose (between 2.3-7.19 kg N/ha/yr, equating to 23.04-71.9% of the CL) is modelled for up to 40m from the side of the M3. However, as highlighted in relation to the SPA, a 50-75m zone adjacent to the M3 is mown as a firebreak and this section is unlikely to support designated habitats. Therefore, even the in-combination nitrogen dose is unlikely to materially impede the Conservation Objectives of the SAC, due to the management practices on Chobham Common.

Recommendations

5.60 It is considered that the WNP will not result in adverse effects on the integrity of the Thursley, Ash, Pirbright & Chobham SAC regarding atmospheric pollution. This is due to the minimal contribution of the WNP to the in-combination NOx and NH_3 concentrations and nitrogen deposition rates. However, AECOM considers

[77] http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm

that the policy recommendation provided with regard to the overlapping Thames Basin Heaths SPA, will also result in additional protection to the interest features of the SAC.

Windsor Forest & Great Park SAC

General Setting of the SAC

5.61 In contrast to the Thames Basin Heaths SPA, the Windsor Forest & Great Park SAC is a continuous site, which lies primarily in the authority of Windsor & Maidenhead. At its closest point, the SAC lies approx. 2.3km to the east of Warfield Parish. The SAC is traversed by two roads, namely the A332 and the B3022 both of which connect the north-eastern part of the Bracknell Forest District with the authority of Windsor & Maidenhead. Broadleaved deciduous woodland dominated by oaks lies directly adjacent to both of these roads at various locations. According to the Department for Transport's road traffic statistics, the B3022 is a busy road with a total of 18,061 AADT at count point 946020[78]. AADT counts are similar at manual count point 36983, with 15,784 motor vehicles recorded in 2018[79].

5.62 While the Windsor Forest & Great Park SAC lies outside Warfield Parish (and indeed Bracknell Forest District), the short distance to the SAC lies within easy commuting distance for Warfield residents. This particularly applies to Warfield residents that commute to a workplace in Windsor, a town in the authority of Windsor & Maidenhead. While it is noted that a larger proportion of Warfield residents would work in Maidenhead (the much larger town compared to Windsor), the latter is still potentially a main commuter destination. According to Google Maps, both the A332 and the B3022 represent feasible routes from Warfield to Windsor, and as such require further consideration.

Commuter Traffic

5.63 The commuter data for the overarching Bracknell Forest District indicate that the authority of Windsor & Maidenhead is the second most important source of and the most frequent destination for commuter traffic. Of the 25,383 commuters travelling from Bracknell Forest District, 4,115 journeys (16.2%) are to Windsor & Maidenhead, which is more than to any other authority[80]. While new residents do not necessarily follow the same journey-to-work patterns than existing ones, Windsor & Maidenhead – given its proximity – is likely to be an important work destination for residents of the new Hayley Green site allocation.

Traffic Modelling

5.64 As discussed in relation to the Thames Basin Heaths SPA, due to traffic and air quality modelling for the overarching BFDP not being available at this stage, a detailed traffic and air quality assessment of the WNP is therefore required. Using the Bracknell Forest strategic transport model, Stantec modelled the expected increases in traffic flows along A and B roads passing within 200m of the Windsor Forest & Great Park SAC in a 10km zone of influence from Warfield Parish. This exercise identified the following road links as receiving increases in AADT due to the WNP[81]:

- B3022 traversing the SAC between Windsor and Bracknell – 48 AADT (Transect 8 of the air quality modelling)
- B383 passing adjacent to the southern side of the SAC near Bracknell – 34 AADT (Transect 11 of the air quality modelling)
- A332 traversing the SAC between Windsor and Bracknell – 42 AAT (Transect 16 of the air quality modelling)
- A329 (Blacknest Road) running adjacent to the SAC – 17 AADT (Transect 19 of the air quality modelling)

5.65 Broadleaved deciduous woodland occurs throughout the entire SAC and this additional traffic could have potential negative impacts on this feature by increasing atmospheric NOx and ammonia concentrations, and increasing nitrogen deposition rates. The above road links were run through an air quality model to

[78] The AADT count and location of this traffic count point can be accessed at https://roadtraffic.dft.gov.uk/manualcountpoints/946020 [Accessed on the 26/06/2020].
[79] The AADT count and location of this traffic count point can be accessed at https://roadtraffic.dft.gov.uk/manualcountpoints/36983 [Accessed on the 26/06/2020].
[80] Data for journey-to-work routes for Bracknell Forest residents were accessed at: https://www.nomisweb.co.uk/census/2011/WU03UK/chart/1132462290 {Accessed on the 26/06/2020].
[81] Transect numbers for easier cross-referencing to the air quality modelling are also provided. Note that only transects with significant increases in NOx and NH_3 concentrations and nitrogen deposition rates are discussed in the main body of text.

determine whether these increases in AADT would lead to material increases in NOx concentrations, ammonia concentrations and nitrogen deposition rates, both alone and in-combination (see the following section).

Air Quality Impact Assessment

5.66 One transect on each of four road links within the considered road network was modelled (see Table 5). In each case, the relevant roads lie within 200m of designated habitats that are sensitive to nitrogen deposition. Furthermore, traffic modelling for the relevant road links indicated that the relevant stretches of road are predicted to receive greater Annual Average Daily Traffic (AADT) flows due to the WNP. Several atmospheric pollutants were modelled as part of the AQIA, including nitrogen oxide (NOx), ammonia (NH_3) and the total nitrogen deposition rate. While it is noted that both NOx and NH_3 can be directly toxic to vegetation (and this is discussed below), their main air quality threat is as a source of nitrogen.

Toxicity Effects of NOx and NH_3

5.67 The modelling predicts a significant reduction in atmospheric NOx concentrations between the current Baseline (2019) and the Do Something scenario (2037), which includes the WNP. For example, at the nearest modelled receptors to the roadside, NOx concentrations are predicted to approx. halve at all modelled transects, which is primarily a result of future improvements to vehicle emissions technologies. Many people will replace older, more polluting vehicles with newer, less polluting ones, offsetting any negative impacts of increasing the overall traffic volume across the network. Therefore, the main impact of future development plans would occur as a retardation to the reduction in roadside NOx concentrations.

5.68 Two key questions are whether the contribution of the WNP to this retardation effect is significant and whether the predicted NOx concentrations of the DS scenario are such that direct lethal effects on vegetation are to be expected. The highest contribution of the WNP is predicted at the roadside of Transect 11, where an additional 0.03µg/m^3 (0.09% of the Critical Level of 30µg/m^3) is expected. Even the in-combination NOx concentrations at this location would 'only' result in an additional 0.35 µg/m^3 NOx (1.17% of the Critical Level). These low magnitude effects would happen in the NOx concentration ranges of 16.18-16.53µg/m^3. At no point on any transect is the critical level for NOx (75µg/m^3) forecast to be exceeded. Therefore, it is concluded that the WNP will not result in adverse impacts on the Windsor Forest & Great Park SAC regarding NOx concentrations, both alone and in-combination.

5.69 Direct toxicity effects resulting from ammonia (NH_3) are a potential concern in relation to the Windsor Forest & Great Park SAC due to the presence of lichens and bryophytes across the site. Therefore, a more stringent Critical Level for NH_3 of 1µg/m^3 has been used to assess potential ecological impacts of the WNP. Generally, it is worth noting that, compared to NOx, NH_3 concentrations are not predicted to improve in the Future Baseline scenario. Instead, ammonia is predicted to increase slightly at all modelled transects. Primarily, this is because the vehicle improvements that will reduce NOx, result in an associated increase in NH_3 emissions. Most importantly for the purposes of this assessment, the WNP alone will result in NH_3 concentrations below 0.01µg/m^3 at all modelled air quality transects. This contribution is likely to be more than zero, but too small to model with precision.

5.70 The highest in-combination NH_3 dose of 0.16µg/m^3 (16.01% of the Critical Level) was modelled at Transect 11 (2.2m from the roadside). This in-combination ammonia dose is far in excess of the 1% Critical Level for lichens and bryophytes, highlighting that negative impacts on these functional groups are likely to occur adjacent to the A332 due to traffic growth. **However**, the WNP's contribution to this concentration is imperceptible (i.e. too small to model with precision). Viewed in the context of Advocate-General Sharpston's words and those of Mr Justice Jay, this equates to 'no appreciable effect' or a 'very small indeed' contribution. Therefore, it is concluded that the WNP will not result in adverse impacts on the Windsor Forest & Great Park SAC regarding NH_3 concentrations, either alone or in-combination.

Total Nitrogen Deposition Rates (incl. NOx and NH_3)

5.71 The data for the two transects (Transects 8 and 11) with the WNP's highest influence on nitrogen deposition rates are summarised in Table 5. The highest nitrogen deposition rate arising from the WNP alone (measured as the difference between the DS and DM scenarios), amounts to 0.03 kg N/ha/yr at 3.2m from the roadside at transect 8. This is equivalent to 0.28% of the Critical Load (CL) for old acidophilous oak woods and Atlantic acidophilous beech forests, as identified on the Air Pollution Information System (APIS, both 10 kg N/ha/yr). Beyond 80m from the roadside, the contribution of the WNP drops to 'less than 0.01 kg N/ha/yr' i.e. too small to model with precision. Natural England air quality specialists and other statutory nature conservation bodies recommend the use of the 1% critical load as a threshold level, below which the contribution to atmospheric pollutants by development plans is regarded as imperceptible. The WNP's effect

of nitrogen deposition to the SAC is 0.28% alone at the roadside, being significantly below the deposition screening threshold of 1% of the critical load.

5.72 Therefore, as a next step, the in-combination nitrogen deposition rates (measured as the difference between the 'Do Something' and 'Future Baseline' scenarios) to the Windsor Forest & Great Park SAC were assessed. The highest in-combination nitrogen deposition dose (1.37 kg N/ha/yr at 2.2m from the roadside) was modelled at Transect 11, amounting to 13.73% of the nitrogen CL for SAC habitats. This is significantly higher than the 1% threshold and indicates that the in-combination growth around the SAC **could** lead to ecological shifts in its nitrogen-sensitive habitats.

5.73 A review of APIS also highlights that the feature 'old acidophilous oak woods with *Quercus robur* on sandy plains' is already exceeding its minimum CL significantly with a maximum of 27.8 kg N/ha/yr within a 5km grid square. This indicates that an exceedance of the 1% CL is likely to have a disproportionately higher impact in a site that is already receiving high amounts of background deposition. The data on source apportionment reveal that UK road transport accounts for 15% of the total nitrogen deposition, followed by 13.7% from agricultural sources (livestock and fertiliser). The local and regional traffic volume is evidently contributing significantly to nitrogen deposition in the SAC.

5.74 Given the large exceedance of the CL, in-combination effects of nitrogen deposition on the Windsor Forest & Great Park SAC from growth in Bracknell Forest and surrounding authorities cannot be excluded. However, AECOM considers that the contribution of the WNP to this in-combination effect is negligible (0.03 kg N/ha/yr at its highest, directly adjacent to the roadside of transect 8). While 'in combination' assessment is intended to pick up projects and plans too small to make a significant contribution on their own, case law has also been clear that this does not mean that all projects that make any contribution no matter how small must conclude adverse effects on integrity:

- Advocate-General Sharpston's Opinion in European Court of Justice Case C-258/11 in Paragraph 48 specified that '*the requirement for an effect to be 'significant' exists in order to lay down a de minimis threshold. Plans and projects that have no appreciable effect on the site can therefore be excluded. If all plans and projects capable of having any effect whatsoever on the site were to be caught by Article 6(3), activities on or near the site would risk being impossible by reason of legislative overkill.*'

- In Wealden v SSCLG [2017] EWHC 351 (Admin) (2017), Mr. Justice Jay accepted that if the contribution of an individual plan or project to traffic growth or resulting air quality effects was 'very small indeed' (quoting a notional 20 AADT), it could be legitimately and legally excluded from 'in combination' assessment. This view is in agreement with that of Advocate-General Sharpston.

5.75 The percentage increase in AADT due to the WNP alone was predicted to be 0.26% (38 AADT) at the B3022 and 0.25% (42 AADT) at the A322. While this exceeds the 20 AADT figure cited by Mr. Justice Jay, he cited that figure simply to illustrate what he envisaged as very small indeed, rather than to represent an actual threshold i.e. traffic growth in the low double figures. As illustrated in the modelling reported in this HRA such low flows translate into nitrogen deposition rates that are only marginally above that which cannot be accurately modelled at all. Given its low in-combination contribution to nitrogen deposition, it would appear to be 'legislative overkill' (in the words of Advocate-General Sharpston) to place a significant requirement for mitigation measures on the WNP, as even if the contribution of the NP was entirely mitigated it would have a negligible effect on forecast nitrogen deposition at the SAC. Furthermore, mitigation of atmospheric pollution impacts is typically undertaken at the overarching Local Plan level, with little power to deliver mitigation given to parish councils.

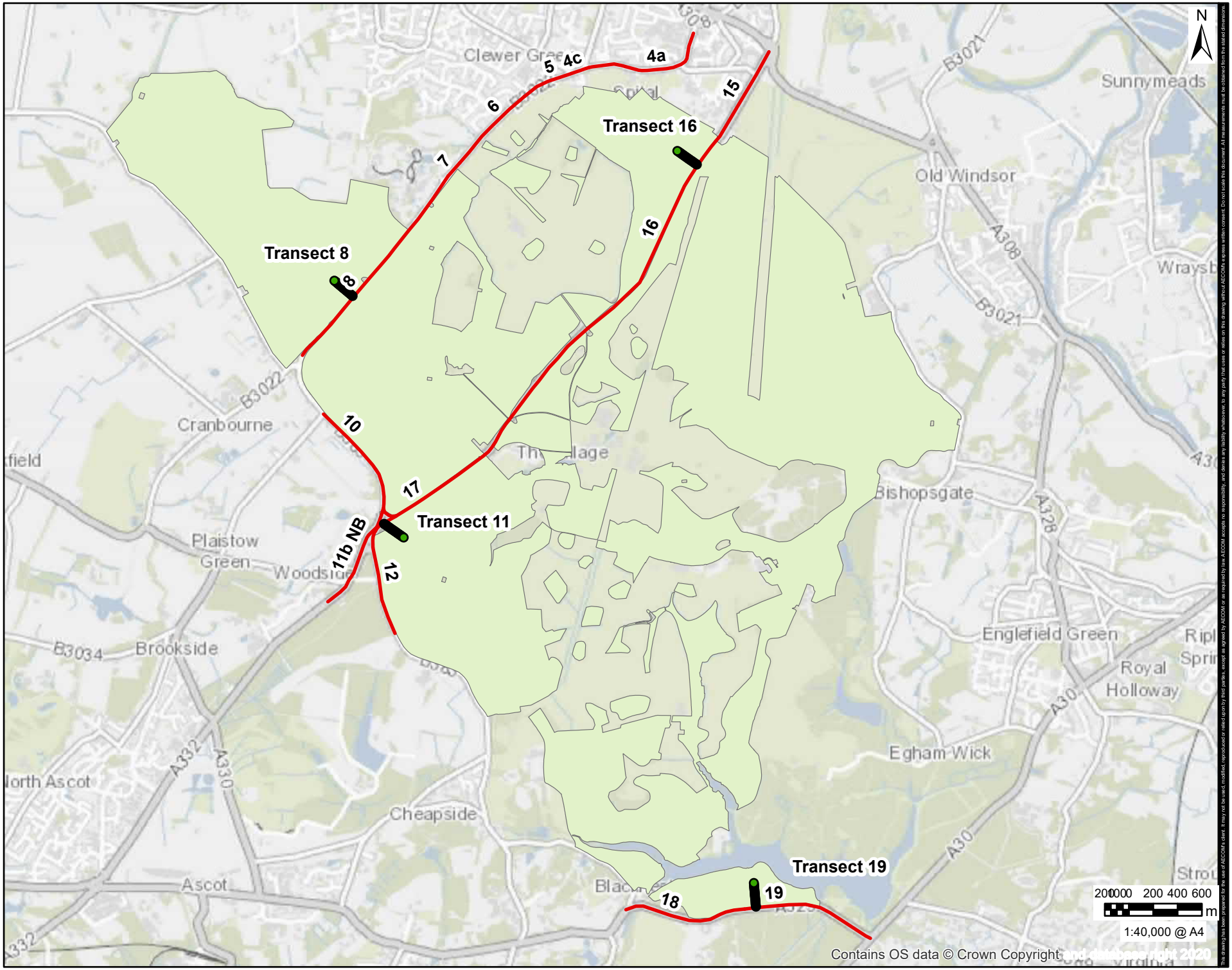
Recommendations

5.76 The WNP is being adopted ahead of the overarching Bracknell Forest Local Plan (BFLP). However, the emerging BFLP will be supported by its own traffic and air quality modelling work. This modelling exercise will include growth allocated in the WNP (i.e. the Hayley Green site allocation) and will supersede the air quality results presented in this HRA. Based on the levels / loads obtained for NOx, NO_3 and total nitrogen deposition, Bracknell Forest Council (BFC) will develop an overarching strategic policy for mitigating air quality impacts. Any mitigation measures identified in such a policy would be mandatory for constituent parish and developments coming forward under the Neighbourhood planning process. AECOM recommends that additional policy text should be added to the WNP, confirming that any overarching air quality mitigation policy developed for the emerging BFLP will be adhered to. **It is noted that Policy WNP2 (Hayley Green Allocation) of the WNP already refers to a requirement for the site to manage its**

effects on the road network. The following statement could be added to that policy: '*Measures to avoid and mitigate the impact of residential development upon Habitats Sites, in line with Policy WNP6 and the Thames Basin Heaths SPA SPD or any successor adopted mitigation strategy, in agreement with the Council and Natural England as part of the planning application.*'

5.77 Given its negligible individual contribution and provided the above precautionary statement is added to the WNP, it is concluded that the plan will not result in adverse effects on the integrity of the Windsor Forest & Great Park SAC regarding atmospheric pollution.

Figure 6: Map showing the modelled road network within 200m of the Windsor Forest & Great Park SAC and the four modelled transects (Transects 8, 11, 16 and 19).



AECOM

PROJECT
Warfield HRA

CLIENT
Warfield Neighbourhood Plan Group

CONSULTANT
AECOM
Sunley House
4 Bedford Park
Croydon CR0 2AP
United Kingdom
www.aecom.com

LEGEND
- Eco Transects
- Windsor Forest and Great Park SAC
- Modelled Road Network

NOTES
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ISSUE PURPOSE
FINAL

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SHEET TITLE
Windsor Forest and Great Park SAC Ecological Receptors

SHEET NUMBER
Figure 1

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Filename: C:\Users\Georgina.Harding\Documents\Project Folder\Warfield HRA\WarfieldWindsor.mxd

Table 5: Nitrogen deposition rates at two transects modelled for the Windsor Forest & Great Park SAC. The data present the transects with the largest % contribution of the WNP alone (Transect 8) and the highest % contribution of in-combination growth (Transect 11). The highest alone and in-combination contributions to nitrogen deposition are shaded grey.

Link	Distance from Roadside (m)	Baseline (2019)	Modelled Scenarios – Nitrogen Deposition Rates (kg/ha/yr)			Scenario Differences – Nitrogen Deposition Rates (kg/ha/yr)		Scenario Differences – % Contributions to Nitrogen Critical Load (10 kg/ha/yr)	
			Future Baseline[82] (FB, 2030)	Do Minimum[83] (DM, 2030)	Do Something[84] (DS, 2030)	DS – DM (WNP impact)	DS – FB (in-combination impact	DS – DM	DS – FB
Transect 8 (on B3022)	3.2	27.76	27.30	27.96	27.99	0.03	0.69	0.28	6.87
	10	25.10	24.80	25.20	25.22	0.02	0.42	0.18	4.2
	20	23.64	23.44	23.70	23.71	0.01	0.27	0.09	2.72
	30	22.96	22.81	23.00	23.01	0.01	0.21	0.1	2.07
	40	22.57	22.45	22.61	22.61	0.01	0.17	0.08	1.68
	50	22.32	22.21	22.35	22.35	0.00	0.14	0.04	1.42
	60	22.14	22.04	22.16	22.17	0.00	0.12	0.04	1.23
	70	22.01	21.92	22.03	22.03	0.01	0.11	0.06	1.13
	80[85]	21.90	21.82	21.92	21.93	0.00	0.10	0.03	1.01
Transect 11 (on A332)	2.2	30.94	30.33	31.68	31.70	0.02	1.37	0.2	13.73
	10	27.71	27.26	28.19	28.20	0.01	0.94	0.09	9.36
	20	25.96	25.61	26.30	26.30	0.01	0.70	0.09	6.96
	30	25.02	24.73	25.29	25.29	0.01	0.56	0.07	5.64
	40	24.42	24.17	24.64	24.65	0.01	0.48	0.06	4.78
	50	23.99	23.77	24.18	24.19	0.01	0.42	0.06	4.17
	60	23.67	23.47	23.84	23.84	0.00	0.37	0.03	3.72
	70	23.42	23.23	23.57	23.57	0.01	0.34	0.05	3.36
	80	23.21	23.05	23.35	23.35	0.00	0.30	0.02	3.03

[82] Future Baseline scenario: Current traffic volume, accounting for improvements in vehicle emission technology by 2030.
[83] Do Minimum scenario: Forecast traffic volume by 2030 excluding the Warfield Neighbourhood Plan.
[84] Do Something scenario: Forecast traffic growth by 2030 including the WNP.
[85] Note that data are only shown for up to a distance of 80m from the roadside, because hereafter the contribution of the WNP drops to zero at both transects.

6. Conclusions & Recommendations

6.1 This HRA assessment identified the relevant European sites linking to WNP and undertook the screening of the Plan's policies. The European sites that were considered due to being located within 10km of the Warfield Parish boundary and potentially linking to the Plan were:

- Thames Basin Heaths SPA
- Thursley, Ash, Pirbright & Chobham Common SAC
- Windsor Forest & Great Park SAC

6.2 The following impact pathways were considered in the HRA: recreational pressure, functionally linked habitat, atmospheric pollution (primarily nitrogen deposition) and adverse effects from construction activities (e.g. dust emission, noise and visual disturbance, water surface runoff). Many of the European sites and linking impact pathways were screened out from Appropriate Assessment (AA, see LSEs section) and the following paragraphs summarise the sites and linking impact pathways that required AA.

Thames Basin Heaths SPA

Recreational Pressure

6.3 Overall, it is concluded that, given the adequate policy framework included in the WNP (i.e. appropriate recognition of the need to mitigate recreational effects in the SPA using SANG and SAMM), there will be no adverse effects of the plan on the site integrity of the Thames Basin Heaths SPA regarding the impact pathway recreational pressure.

6.4 To provide adequate SANG for the mitigation of its share in population growth, it is recommended that the developer of the Hayley Green site contact Bracknell Forest Council to explore the feasibility of contributing payments to one of the strategic SANGs already in place across the authority. It is likely to prove difficult to deliver a sufficiently large greenspace of at least 10ha on-site **and** fulfilling the required SANG criteria. Furthermore, the Hayley Green development could not become occupied until a SANG is functional, indicating that investment into a existing SANG is likely to be the most time-effective approach.

Thames Basin Heaths SPA

Atmospheric Pollution

6.5 Overall, the Appropriate Assessment demonstrated that individual toxicity effects of NOx and NH_3 in the SPA could be excluded both alone and in-combination. This is due to breeding SPA birds being more dependent on overall habitat structure than precise botanical composition. Furthermore, NOx and ammonia concentrations are forecast to exceed the critical level (30 μgm^{-3} for NOx and 3 μgm^{-3} for ammonia) by 2037 at only one transect. This is link 58b (B383/M3 south of Chobham Common) where the critical level for both pollutants will be exceeded up to 30m from the motorway. However, the vegetation within this zone at Chobham Common is regularly mown as permanent short grassland to serve as a firebreak. This management activity is likely to continue for as long as the M3 remains a motorway i.e. in perpetuity. This will have a much greater effect on vegetation structure and composition than pollutant concentrations in atmosphere.

6.6 Given its negligible individual contribution to the observed in-combination nitrogen deposition rate to the Thames Basin Heaths SPA, it is concluded that the plan will not result in adverse effects on the integrity of the SPA regarding atmospheric pollution, even 'in combination' with other plans and projects. However, as a precautionary measure AECOM recommends that, notwithstanding the conclusion of this assessment, additional policy text should be added to the WNP, confirming that any overarching air quality mitigation policy developed for the emerging Bracknell Forest Local Plan (BFLP) will be adhered to. It is noted that of the WNP already refers to a requirement for the site to manage its effects on the road network. The following statement could be added to **Policy WNP2 (Hayley Green Allocation)**: '***Measures to avoid and mitigate the impact of residential development upon Habitats Sites, in line with Policy WNP6 and the Thames Basin Heaths SPA SPD or any successor adopted mitigation strategy, in agreement with the Council***

and Natural England as part of the planning application.' AECOM considers that the recommended policy statement provides additional protection to the Thames Basin Heaths SPA, by aligning the WNP with a potential future atmospheric pollution mitigation policy.

Thursley, Ash, Pirbright & Chobham SAC

Atmospheric Pollution

6.7 Regarding toxicity effects on qualifying heathland in the Thursley, Ash, Pirbright & Chobham SAC, air quality modelling data show that the contribution of the WNP to roadside NOx and NH_3 concentrations is exceedingly small (i.e. too small to model with precision) and unlikely to have an appreciable effect on pollutant concentrations. Overall, adverse effects of the WNP in-combination can be excluded based on the exceedingly small contribution of the plan to NOx and NH_3 concentrations at Transects 53 and 58b (both along the M3).

6.8 The contribution of the WNP to the total annual mean nitrogen deposition rate was highest at Transect 58b. However, it is considered that the WNP will not result in adverse effects on the integrity of the Thursley, Ash, Pirbright & Chobham SAC regarding nitrogen deposition. This is due to the minimal contribution of the WNP to the in-combination nitrogen deposition rates. Notwithstanding this, AECOM considers that the policy recommendation provided with regard to the overlapping Thames Basin Heaths SPA, will also result in additional protection to the interest features of the SAC.

Windsor Forest & Great Park SAC

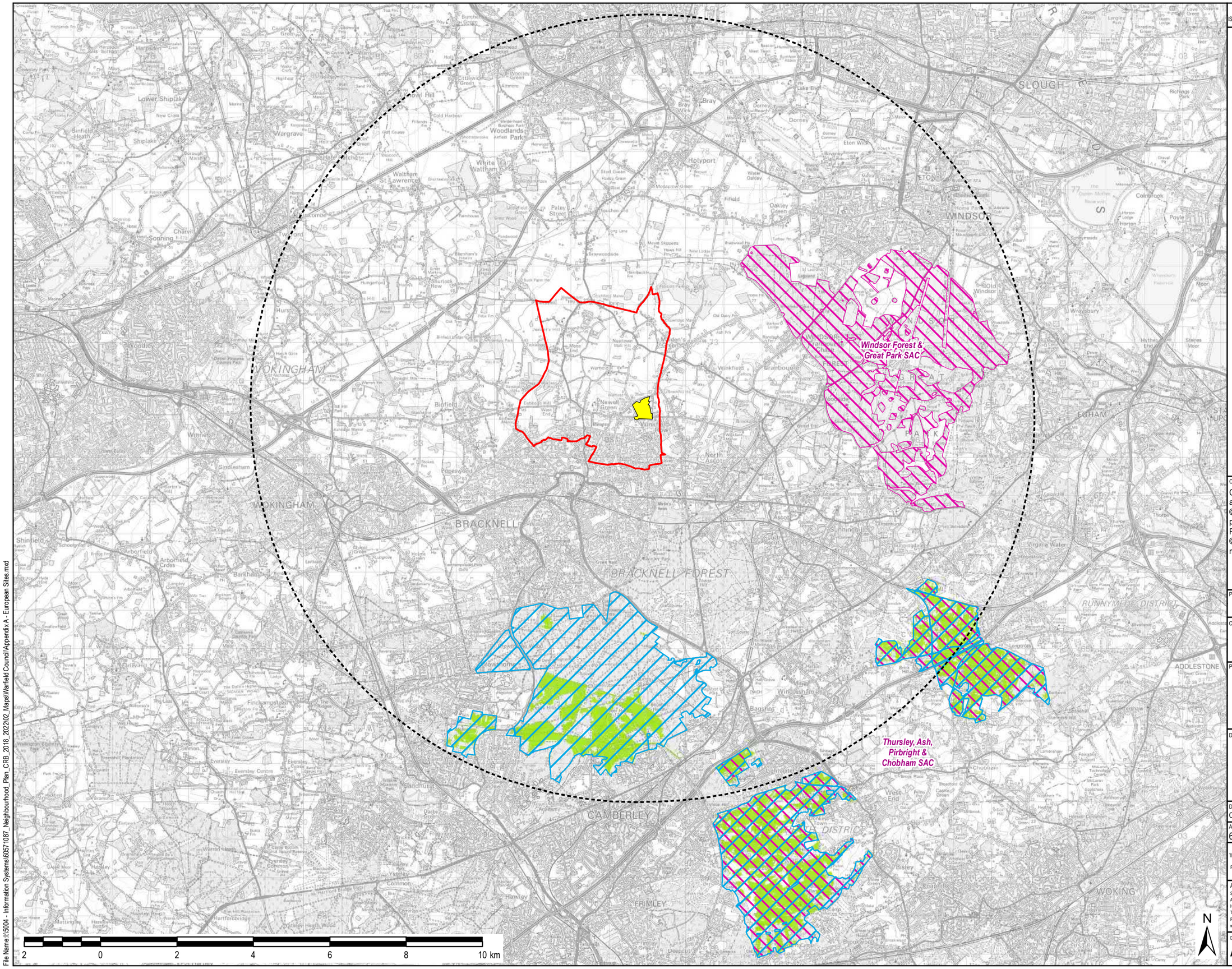
Atmospheric Pollution

6.9 Despite the in-combination NH_3 concentrations at Transect 8 exceeding the 1% of the Critical Level, AECOM considers that the WNP's contribution to this is imperceptible (i.e. too small to model with precision). Viewed in the context of Advocate-General Sharpston's words and those of Mr Justice Jay, this equates to 'no appreciable effect' or a 'very small indeed' contribution. Therefore, it is concluded that the WNP will not result in adverse impacts on the Windsor Forest & Great Park SAC regarding NH_3 concentrations, either alone or in-combination.

6.10 Given the large exceedance of the CL, in-combination effects of nitrogen deposition on the Windsor Forest & Great Park SAC from growth in Bracknell Forest and surrounding authorities cannot be excluded. **However**, the contribution of the WNP to this in-combination effect is negligible (0.03 kg N/ha/yr at its highest, directly adjacent to the roadside of transect 8). Adverse effects of the WNP on the Windsor Forest & Great Park SAC regarding nitrogen deposition can therefore be excluded, both alone and in-combination. Furthermore, AECOM considers that the policy recommendation provided with regard to the Thames Basin Heaths SPA and the Thursley, Ash, Pirbright & Chobham SAC, will also result in additional protection to the interest features of the Windsor Forest & Great Park SAC.

Appendix A Figures

Appendix 1: European sites within 10km of the Warfield Neighbourhood Plan area.



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Warfield Neighbourhood Plan Area
- Hayley Green Residential Site
- 10km Buffer of Residential Site
- Thames Basin Heaths Special Protection Area (SPA) Within 10km of Warfield Parish
- Special Area of Conservation (SAC) Within 10km of Warfield Parish
- Lowland Heathland within Thames Basin Heaths SPA

Purpose of Issue
FINAL

Client
WARFIELD COUNCIL

Project Title
WARFIELD NEIGHBOURHOOD PLAN HRA

Drawing Title
EUROPEAN SITES WITHIN 10K OF HAYLEY GREEN ALLOCATION

Drawn	Checked	Approved	Date
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AECOM
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
APPENDIX A

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Appendix B European Sites

Windsor Forest and Great Park SAC

Introduction

6.11 The Windsor Forest and Great Park SAC is internationally important for its landscape dominated by dry oaks, which supports internationally rare invertebrates, such as beetles and other species associated with ancient trees or dead wood. The SAC comprises damp, shady woodland, open parkland, grazed wood pasture, ponds / wetland, grassland and scrub. Most importantly, the site has one of the largest concentrations of ancient trees, especially oaks, in Europe. Special micro-habitats in ancient trees include rot cavities, sap runs, dead limbs, detached bark, pools and fungal fruiting bodies.

6.12 The SAC lies upon alluvial sediments which in turn rest on poorly-draining sandy and silty underlying soils. These soils can be moderately acidic, meaning that a portion of the vegetation is typical for acid grassland and heathland. While large parts of the site are highly modified in character (e.g. planted avenues of trees, broad vistas), some parts of the SAC have a highly characteristic oak – bracken – bramble vegetation, NVC type W10. Parts that are open to the public are very popular tourist destinations, especially for hikers, cyclists and horse riders. The closest part of the SAC lies approx. 2.4km to the north-east of Warfield Parish.

Qualifying Features[86]

6.13 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

- Old acidophilous oak woods with *Quercus robur* on sandy plains

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

- Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer

Annex II species that are a primary reason for selection of this site

- Violet click beetle *Limoniscus violaceus*

Conservation Objectives[87]

6.14 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;

6.15 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.

[86] https://sac.jncc.gov.uk/site/UK0012586 [Accessed on the 21/05/2020]
[87] http://publications.naturalengland.org.uk/publication/5175000009015296 [Accessed on the 21/05/2020]

Threats / Pressures to Site Integrity[88]

6.16 Natural England's Site Improvement Plan highlights the following threats and pressures to the site integrity of the Windsor Forest & Great Park SAC:

- Forestry and woodland management
- Invasive species
- Disease
- Air pollution: Impact of atmospheric nitrogen deposition

Thames Basin Heaths SPA

Introduction

6.17 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.

6.18 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 part of the Thames Basin Heaths SPA lies approx. 3.3km to the south of Warfield Parish in the south of Bracknell Forest.

Qualifying Features[89]

6.19 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

Conservation Objectives[90]

6.20 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;

6.21 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

[88] http://publications.naturalengland.org.uk/publication/6625232836100096 [Accessed on the 21/05/2020]
[89] http://publications.naturalengland.org.uk/publication/4952859267301376 [Accessed on the 21/05/2020]
[90] http://publications.naturalengland.org.uk/publication/4952859267301376 [Accessed on the 21/05/2020]

- 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.

Threats & Pressures to Site Integrity[91]

6.22 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

Thursley, Ash, Pirbright and Chobham SAC

Introduction

6.23 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.

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

6.25 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. 7.2km to the south-east of Warfield Parish.

[91] http://publications.naturalengland.org.uk/publication/6249258780983296 [Accessed on the 21/05/2020]

Qualifying Features[92]

6.26 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*

Conservation Objectives[93]

6.27 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;

6.28 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.

Threats & Pressures to Site Integrity[94]

6.29 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

[92] http://archive.jncc.gov.uk/default.aspx?page=2051 [Accessed on the 21/05/2020]
[93] https://sac.jncc.gov.uk/site/UK0012793 [Accessed on the 21/05/2020]
[94] http://publications.naturalengland.org.uk/publication/6249258780983296 [Accessed on the 21/05/2020]

Appendix C Policy Screening

Appendix 2: Screening table showing the Test of Likely Significant Effects (LSEs) results of policies contained within the Warfield Neighbourhood Plan (WNP). Where a screening result is shaded in green there are no LSEs on European sites. Orange shading means that there is a potential for LSEs on European sites from the impact pathways identified in the box.

Policy	Description	Test of Likely Significant Effects (LSEs)
Housing		
Policy WNP1: A Spatial Plan for the Parish	The Parish will continue to be defined by the urban area in the south of the Parish, the 'countryside wedge', and the Metropolitan Green Belt to the north where development is by definition inappropriate. The Neighbourhood Plan defines the Settlement Boundaries of Newell Green, Warfield Street and Hayley Green, these areas are shown on the Policies Map. Proposals for infill development within their boundaries will be supported, provided they accord with the development management policies of the Bracknell Forest Development Plan and with the relevant policies of the Warfield Neighbourhood Plan. Proposals for development outside these settlement boundaries will only be supported if they are appropriate forms of development and they are consistent with development plan policies relating to the historic environment, heritage assets, landscape character, protecting the natural environment and where they will not compromise the delivery of the green infrastructure network.	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that defines the Parish boundaries and the Neighbourhood Plan area. It further stipulates that development should primarily occur as infill to existing settlements and that the Warfield Neighbourhood Plan (WNP) must accord with the overarching Bracknell Forest Development Plan. The policy does not provide for a location and / or quantum of residential or employment development. The policy is therefore screened out from Appropriate Assessment.
Policy WNP2: Hayley Green Allocation	The Neighbourhood Plan allocates land at Hayley Green (as shown on the policies map) for a comprehensive mixed-use allocation of approximately 235 dwellings containing:	There is a potential for Likely Significant Effects of this policy on European sites. This is a policy providing for 235 dwellings at Hayley Green. As such, the policy provides for potential net additional residential development leading to an

	i. Open market, 'entry level', intermediate and affordable rented homes; ii. A public open green space of approximately 4 hectares for public use and informal play using natural materials; iii. A safe and convenient cycle and pedestrian connection onto Hayley Green and the B3034 Forest Road to Westmorland Park and Edmunds Lane to link to the existing pedestrian and cycle infrastructure and connect to the retail and employment areas at Whitegrove; iv. Appropriate capacity and safety improvements to the local highway network; and v. A footpath linking Hayley Green (road) and the Cricketers Public House across the public open green space. The whole allocation should be delivered as one single outline planning application to ensure that the site is developed comprehensively. Any planning applications for piecemeal development that would undermine this objective will not be supported. The application should include: vi. A detailed masterplan to be submitted for approval prior to any planning applications being submitted. The masterplan should include a detailed access and movement strategy showing footpath and cycleway connectivity to existing facilities in the area; vii. An Infrastructure Delivery Plan that demonstrates the delivery of infrastructure in accordance with policy requirements and includes supporting infrastructure (including land) secured by planning obligation; viii. A housing mix which favours 1, 2 and 3 bed family and starter homes and homes designed for older people; ix. A landscape strategy to demonstrate how any effects on the local landscape character will be satisfactorily mitigated;	increase in the local population. It is also noted that the policy provides for capacity improvements in the local highway network. Importantly, the policy also provides for 4ha of open green space for public usage. The provision of local greenspace will likely absorb some recreational pressure near the allocation, because the distance to greenspaces predicts the likelihood of visiting. This might extend some protection to the Thames Basin Heaths SPA, which is sensitive to recreational pressure. Notwithstanding, a more detailed assessment of this policy needs to be undertaken in the Appropriate Assessment. **The relevant impact pathways are:** • **Atmospheric pollution** • **Recreational pressure** • **Loss of functionally linked habitat** The policy is therefore screened in for Appropriate Assessment.

	x. A heritage statement which considers the setting of listed buildings nearby; xi. An ecology, green infrastructure and boundary treatment strategy to demonstrate how existing environmental assets, including trees, will be protected and enhancements such as bat roosting and bird nesting features will be integrated into the built development, xii. A flood risk assessment and sustainable drainage strategy to demonstrate how the scheme will not increase surface water flood risk on site and on any adjoining land as well as run-off from the completed development; xiii. A drainage connection to the nearest point of adequate capacity; xiv. A transport strategy to demonstrate how the scheme will manage its traffic effects on the road network and how it will encourage and enable walking and cycling to facilities and services at County Lane; xv. An Archaeological Assessment and Evaluation to provide information on which a decision on the need for mitigation can be made; and xvi. Details of street sections and the appearance and elevation of buildings having regard to the Design Supplementary Planning Document and the Street Scene Supplementary Planning Document.	
Policy WNP3 – Promoting Good Design in Newell Green	Development proposals in the Newell Green Character Area, as shown on the Policies Map, will be supported, provided they are of a high quality design that responds positively to the Character Area Study and have full regard to the following design principles and the recommendations of the BFC Character Area Assessment: I. Proposals respect the significance of the Warfield Memorial Ground and Priory Fields as a central focus for the settlement and the retention of their open character;	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that sets the conditions for proposals in the Newell Green Character Area, including good design criteria, plot ratio and planting characteristics. The policy does not provide for a location and / or quantum of residential or employment development. Therefore, this policy is screened out from Appropriate Assessment.

	II. The significance of larger buildings set in large plots in establishing the settlement character whereby proposals for plot subdivision will not normally be appropriate; III. Development along Newell Green, Forest Road and Osborne Lane should seek to maintain the existing plot ratio and be in the form of semi-detached or small terraces and 2 storeys in height; IV. Building materials should principally be of red brick under slate roofs; and, V. Proposals should reinforce deciduous tree and hedgerow planting and front boundaries should be formed by hedgerows or low brick walls; close boarded fencing will be resisted. Infill development should minimise its impact on the street scene and avoid unacceptable harm on the amenity of adjoining residential properties. In all other respects proposals should accord with relevant policies of the neighbourhood plan and development plan.	
Policy WNP4: Promoting Good Design in Warfield Street	Development proposals in the Warfield Street Character Area, as shown on the Policies Map, will be supported, provided they are of high quality design and respond positively to the Character Area Study and have full regard to the following design principles and the recommendations of the BFC Character Area Assessment: I. Design respects the rural character of the village and the setting of Newell Hall, Priory Cottage, Knibbs Nook/Wee Knibbs, Pear Tree Cottage and Horseshoe House; II. Development fronting Warfield Street should be in the form of 2 storey housing	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that sets the conditions for proposals in the Warfield Street Character Area, including good design criteria and planting characteristics. The policy does not provide for a location and / or quantum of residential or employment development. Therefore, this policy is screened out from Appropriate Assessment.

	with red brick or white render; III. Proposals retain or re-provide as necessary trees and boundary hedges to improve consistency to the street frontage along Warfield Street and particularly at the gateway of the settlement to maintain the sense of separation; and IV. On the settlement fringes a lower density less formal pattern of development will be acceptable. Infill development should minimise its impact on the street scene and avoid unacceptable harm on the amenity of adjoining residential properties. In all other respects proposals should accord with relevant policies of the neighbourhood plan and development plan.	
Policy WNP5: Promoting Good Design in Hayley Green	Development proposals in the Hayley Green Character Area, as shown on the Policies Map, will be supported, provided they are of high quality design and respond positively to the Character Area Study and have full regard to the following design principles and the recommendations of the BFC Character Area Assessment: I. Design respects the rural character of the settlement and the setting of The Moat House, the Barn at Hayley Green Farm and Warfield House; II. Development fronting Forest Road should maintain the regular plot patterns and be in the form of 2 storey red brick semi-detached or small terraced housing on small to medium sized plots; III. Proposals should retain or re-provide as necessary tree and hedgerow planting to improve consistency to the street frontage along Forest Road; and	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that sets the conditions for proposals in the Hayley Green Character Area, including good design criteria and planting characteristics. The policy does not provide for a location and / or quantum of residential or employment development. Therefore, this policy is screened out from Appropriate Assessment.

	IV. At the settlement gateways tree and hedgerow planting should reinforce local landscape character and to maintain the sense of separation with the adjacent settlements of Warfield Street and Winkfield Row. Infill development should minimise its impact on the street scene and avoid unacceptable harm on the amenity of adjoining residential properties. New development to the north of the settlement should relate to the prevailing settlement character with lower densities forming the transitional edge with the countryside and to protect the setting of heritage assets at Hayley Green Farm. In all other respects proposals should accord with relevant policies of the neighbourhood plan and development plan.	
Policy WNP6 – Suitable Alternative Natural Greenspace	Development proposals shall include measures to mitigate the impact of residential development upon the Thames Basin Heaths Special Protection Area (SPA) in agreement with the BFC and Natural England. This will include the provision of a bespoke SANG, a financial contribution towards Strategic Access Management and Monitoring and any other measures that are required to satisfy Habitats Regulations, the BFC Thames Basin Heaths SPA Avoidance and Mitigation Strategy and relevant guidance.	There are no Likely Significant Effects of this policy on European sites. This is a positive mitigation policy, intending to protect the Thames Basin Heaths SPA from additional recreational pressure due to housing development put forward by the WNP. The policy stipulates that mitigation must be comprised of SANG and Strategic Access Management and Monitoring (SAMM) provision. Importantly, this policy aligns the WNP with the requirements of the Habitats Regulations and the Thames Basin Heaths SPA Avoidance and Mitigation Strategy. Conforming to these legal means that adverse effects on site integrity will be avoided. The policy does not provide for a location and / or quantum of residential or employment development. It is therefore screened out from Appropriate Assessment.
Policy WNP7 – Local Gaps	The neighbourhood plan defines the following Local Gaps, as shown on the policies map, for the purpose of preventing coalescence of the following settlements: i. Newell Green ii. Warfield Street iii. Hayley Green Development proposals within Local Gaps should not harm either individually or	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that identifies and preserves Local Gaps in the area covered by the WNP. Any development proposals must not affect their function or open character. While the qualifying species of the European sites most relevant to this HRA are not specifically dependent on green corridors for commuting and / or feeding, it is recognised that this is a positive policy for the protection of habitats and biodiversity.

	cumulatively their function and open character. Proposals in a Local Gap will be required to demonstrate how they might reinforce the positive characteristics of the Gap and maintain its integrity.	The policy does not provide for a location and / or quantum of residential or employment development. Therefore, this policy is screened out from Appropriate Assessment.
Policy WNP8 – Enhancing Green Infrastructure	The Neighbourhood Plan proposes the establishment of the Warfield Green Infrastructure Network within the Parish, as shown on the Policies Map. Development proposals on land that adjoins the network will be required to demonstrate how they enhance the visual characteristics and biodiversity of the network and to ensure their landscape schemes, layouts, access and public open space provision and other amenity requirements contribute to the maintenance an improvement of the network including the ecological value of The Cut and Bull Brook. Proposals that lead to the loss of land or features that form part of the network, that reduce its environmental quality or will prejudice the completion of the comprehensive network will be required to demonstrate that such loss is unavoidable.	There are no Likely Significant Effects of this policy on European sites. This is an environmental protection policy that proposes the establishment of a Green Infrastructure Network in Warfield Parish. Development proposals must demonstrate how they maintain or improve the visual characteristics and biodiversity in such corridors. The policy does not provide for a location and / or quantum of residential or employment development. It is therefore screened out from Appropriate Assessment.
Policy WNP9 – Local Green Space Designations	The Neighbourhood Plan designates Local Green Spaces in the following locations, as shown on the Green Infrastructure Policies Map: 1. Chuff Corner 2. Warfield Memorial Ground 3. Hayley Green Wood Proposals for development on the designated land will be resisted unless they are ancillary to the use of the land for a public recreational purpose or are required for a statutory utility infrastructure purpose	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that designates Local Green Spaces at Chuff Corner, Warfield Memorial Ground and Hayley Green Wood. Similar to policy WNP6 (Suitable Alternative Natural Greenspace), this is a positive policy likely providing at least some mitigation for the Thames Basin Heaths SPA from additional recreational pressure due to housing development. While it is noted that not all new residents might visit local greenspaces, the protection of these greenspaces ensures that some recreational pressure is absorbed locally. This particularly applies to dog walkers, who tend to undertake frequent and relatively short visits from home. The policy does not provide for a location and / or quantum of residential or employment development.

		It is therefore screened out from Appropriate Assessment.
Policy WNP10 – Supporting Community Assets	Proposals that will lead to the unnecessary loss of the following community facilities and assets will be resisted: i. Warfield Memorial Ground and its facilities ii. Westmorland Park and its facilities iii. Larks Hill and the Community Orchard iv. Priory Field and the football pitches v. Piggy Wood vi. Garth Meadow and pond vii. Frost Folly Country Car park viii. Land at Derbyshire Green ix. Land at Warfield Chase x. Whitegrove Copse xi. Priory Lane Copse xii. The Newt Reserve at Flemish Place xiii. Land at Edmunds Green xiv. Land at Edmunds Meadow xv. Edmunds Lane beside The Cut xvi. The Chestnuts xvii. Harvest Hill play area and lake xviii. All Saints Rise Play area xix. Goddard Way Play area, amenity land & meadow xx. Brownlow Hall, Newell Green xxi. Whitegrove Community Centre xxii. The Cricketers, Plough & Harrow, The Yorkshire Rose, The Shepherds House, The New Leathern Bottle and the Spice Lounge xxiii. Retail properties at Whitegrove xxiv. Moss End Garden Village xxv. Jealotts Hill Community Landshare Proposals to improve the viability of an established community use of the buildings and ancillary land by way of its extension or partial redevelopment will be supported, subject to other planning considerations.	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that protects specific community facilities and assets from development, including car parks, greens, woods and play areas. Such facilities are not related to impact pathways on European sites. Furthermore, the policy does not provide for a location and / or quantum of residential or employment development. The policy is therefore screened out from Appropriate Assessment.

	Proposals to establish a new doctor's surgery or a new dentist facility will be supported, provided they are located outside the Green Belt and have sufficient offstreet car parking spaces.	
Policy WNP11 – Supporting Rural Diversification	The plan will support the local economy with the re-use of existing buildings in the countryside provided that: i. It is necessary for the purposes of agriculture, small scale enterprise that meets community or other land based rural business needs; ii. It would not adversely affect the character, function or appearance of the land, buildings of historical interest or nature conservation interests nor adversely affect residential amenity or road safety; iii. It will enable farm diversification or recreation that benefits the rural economy without harming the open character of the land; and iv. where there is a loss of an existing use it would not give rise to a future need for another building to fulfil the function of the building being re-used; Proposals for housing development in the countryside to serve the essential uses of agriculture or some other special need will only be granted in very special circumstances and be in accordance with all other planning policies applicable to that location, including but not limited to policies applying within the Green Belt. Housing proposals will be required to demonstrate that the occupation of the dwelling is tied by condition to the established agricultural use.	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that aims at the diversification of rural areas in Warfield through the re-use of existing buildings in the countryside. However, the policy does not provide for a location and / or quantum of residential or employment development. Therefore the policy is screened out from Appropriate Assessment.
Policy WNP12 – Protecting and Enhancing Heritage and Biodiversity	Development proposals must seek to avoid having any significant adverse effects on designated environmental, landscape and heritage assets, including the Warfield Conservation Area and the network of Local Nature Reserves in the south of the Parish. Developments must deliver no net loss to biodiversity or heritage value and wherever possible deliver a net gain. Where effects are unavoidable then the	There are no Likely Significant Effects of this policy on European sites. This is a positive environmental protection policy stipulating that development proposals should not adversely affect environmental assets and achieve environmental net gain wherever possible. Mature trees, hedgerows, woodland and other wildlife habitat should be enhanced. The policy thereby also extends protection to the interest features of the Thames Basin Heaths SPA and the Windsor Forest and Great Park SAC.

	proposals must show how these effects will be mitigated to the satisfaction of the Parish Council and local planning authority. Development proposals must contribute to and enhance the natural environment by ensuring the protection of local assets such as mature trees, hedgerows and woodland, and the provision of additional habitat for wildlife and green spaces for the community.	The policy does not provide for a location and / or quantum of residential or employment development. Therefore, the policy is screened out from Appropriate Assessment.
Policy WNP13 – Promoting Dark Skies	Development proposals beyond the built-up area boundary of Bracknell should be designed in a way that minimises light pollution. Proposals for any necessary street and external lighting should be energy efficient, reduce light scatter and comply with the current guidelines established for rural areas by the Institute of Lighting Engineers (IoLE). Proposals for development will be expected to demonstrate the measures to be taken in response to the IoLE guidelines.	There are no Likely Significant Effects of this policy on European sites. This is an environmental protection policy that minimises light pollution beyond the built-up area of Bracknell. Any necessary lighting is to be energy efficient and to minimise light scatter. While none of the nearby European sites are particularly sensitive to light pollution, it is considered that this is a positive policy as it will minimise any effects on wildlife species that are sensitive to lighting (e.g. bats). The policy does not provide for a location and / or quantum of residential or employment development. Therefore, this policy is screened out from Appropriate Assessment.
Policy WNP14 – Drainage Infrastructure	New and improved foul and surface water drainage infrastructure will be encouraged and supported to meet the identified needs of the community, subject to other policies in the development plan.	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that supports the provision of new foul and surface water drainage infrastructure to meet community needs. This is particularly important to support the provision of new housing (e.g. Policy WNP2) and to ensure that this can be served adequately. However, the European sites identified relevant to Warfield are not primarily sensitive to the water quality and / or flow impact pathways. The policy does not provide for a location and / or quantum of residential or employment development. Therefore, the policy is screened out from Appropriate Assessment.

Policy WNP15 – Parking, Garaging and Ancillary Buildings	All new development in Warfield must make adequate provision for off-road parking for the numbers and types of vehicles likely to be attracted by the development. Parking provision should not overly dominate the street scene and should replicate parking solutions in the immediate vicinity to maintain the character of the area. Where planning permission is required, buildings should not dominate visually and should be subservient to the main dwelling or other principal building and its landscaping. They should be visually subservient and should not obscure or dominate the house frontage or approach and should be softened with adjacent planting to reduce their impact on the wider streetscape. Parking requirements should fully comply with the Bracknell Forest Parking Standards applicable at the time of application. This includes provision for flexibility in the number of parking spaces that need to be provided where this is supported by robust evidence.	There are no Likely Significant Effects of this policy on European sites. This is a development management policy that details the provision and character of off-road parking in Warfield Parish. However, this theme is not associated with impact pathways linking to European sites. The policy does not provide for a location and / or quantum of residential or employment development. Therefore, the policy is screened out from Appropriate Assessment.

Appendix D Air Quality Impact Assessment Modelling Data

Appendix 3: Total annual mean NOx (µg/m^3) obtained from air quality modelling.

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
Thames Basin Heaths SPA & Thursley, Ash, Pirbright & Chobham SAC	**Transect 20**	2.9	34.64	16.71	16.92	16.92	0.00	0.21
		10	25.35	13.69	13.80	13.81	0.00	0.12
		20	21.21	12.35	12.43	12.43	0.00	0.08
		30	19.42	11.77	11.83	11.83	0.00	0.06
		40	18.42	11.45	11.50	11.50	0.00	0.05
		50	17.78	11.25	11.29	11.29	0.00	0.04
		60	17.34	11.11	11.14	11.14	0.00	0.04
		70	17.02	11.00	11.04	11.04	0.00	0.03
		80	16.77	10.92	10.96	10.96	0.00	0.03
		90	16.57	10.86	10.89	10.89	0.00	0.03
		100	16.42	10.81	10.84	10.84	0.00	0.03
		110	16.29	10.77	10.80	10.80	0.00	0.03

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		120	16.18	10.74	10.76	10.76	0.00	0.03
		130	16.09	10.71	10.73	10.73	0.00	0.03
		140	16.01	10.68	10.71	10.71	0.00	0.03
		150	15.95	10.66	10.68	10.69	0.00	0.02
		160	15.89	10.64	10.67	10.67	0.00	0.02
		170	15.84	10.63	10.65	10.65	0.00	0.02
		180	15.79	10.61	10.63	10.63	0.00	0.02
		190	15.75	10.60	10.62	10.62	0.00	0.02
		200	15.72	10.59	10.61	10.61	0.00	0.02
	Transect 32							
		4.6	32.74	16.17	16.34	16.34	0.00	0.17
		10	28.90	14.92	15.05	15.05	0.00	0.14
		20	25.47	13.80	13.91	13.91	0.00	0.11
		30	23.73	13.24	13.33	13.33	0.00	0.09
		40	22.65	12.89	12.98	12.98	0.00	0.08

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		50	21.91	12.66	12.73	12.73	0.00	0.08
		60	21.36	12.48	12.55	12.55	0.00	0.07
		70	20.94	12.35	12.41	12.41	0.00	0.07
		80	20.59	12.24	12.30	12.30	0.00	0.07
		90	20.30	12.15	12.21	12.21	0.00	0.06
		100	20.06	12.07	12.13	12.13	0.00	0.06
		110	19.84	12.00	12.06	12.06	0.00	0.06
		120	19.66	11.94	12.00	12.00	0.00	0.06
		130	19.49	11.89	11.94	11.94	0.00	0.05
		140	19.34	11.84	11.89	11.89	0.00	0.05
		150	19.21	11.80	11.85	11.85	0.00	0.05
		160	19.08	11.76	11.81	11.81	0.00	0.05
		170	18.97	11.73	11.78	11.78	0.00	0.05
		180	18.87	11.69	11.74	11.74	0.00	0.05

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		190	18.78	11.66	11.71	11.71	0.00	0.05
		200	18.69	11.64	11.69	11.69	0.00	0.05
	Transect 41							
		9	49.84	21.16	21.73	21.73	0.00	0.57
		10	48.11	20.64	21.18	21.18	0.00	0.54
		20	37.71	17.51	17.88	17.88	0.00	0.37
		30	32.68	16.00	16.29	16.29	0.00	0.29
		40	29.67	15.10	15.34	15.34	0.00	0.24
		50	27.67	14.50	14.71	14.71	0.00	0.21
		60	26.23	14.07	14.26	14.26	0.00	0.18
		70	25.13	13.75	13.91	13.91	0.00	0.16
		80	24.28	13.49	13.64	13.64	0.00	0.15
		90	23.58	13.29	13.42	13.42	0.00	0.14
		100	23.01	13.12	13.24	13.24	0.00	0.13
		110	22.53	12.97	13.09	13.09	0.00	0.12

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		120	22.12	12.85	12.97	12.97	0.00	0.11
		130	21.77	12.75	12.85	12.85	0.00	0.11
		140	21.46	12.66	12.76	12.76	0.00	0.10
		150	21.18	12.57	12.67	12.67	0.00	0.10
		160	20.94	12.50	12.60	12.60	0.00	0.09
		170	20.73	12.44	12.53	12.53	0.00	0.09
		180	20.53	12.38	12.47	12.47	0.00	0.09
		190	20.36	12.33	12.42	12.42	0.00	0.08
		200	20.20	12.28	12.37	12.37	0.00	0.08
	Transect 44							
		2.3	42.61	18.91	19.42	19.42	0.00	0.52
		10	31.74	15.53	15.84	15.84	0.00	0.32
		20	26.24	13.83	14.04	14.04	0.00	0.21
		30	23.46	12.97	13.13	13.13	0.00	0.16
		40	21.77	12.45	12.58	12.58	0.00	0.13

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		50	20.63	12.10	12.21	12.21	0.00	0.11
		60	19.81	11.85	11.94	11.94	0.00	0.09
		70	19.19	11.66	11.74	11.74	0.00	0.08
		80	18.71	11.51	11.58	11.58	0.00	0.07
		90	18.32	11.39	11.45	11.45	0.00	0.07
		100	18.00	11.29	11.35	11.35	0.00	0.06
		110	17.73	11.21	11.26	11.26	0.00	0.06
		120	17.51	11.14	11.19	11.19	0.00	0.05
		130	17.32	11.08	11.13	11.13	0.00	0.05
		140	17.15	11.03	11.07	11.07	0.00	0.05
		150	17.00	10.98	11.03	11.03	0.00	0.04
		160	16.88	10.94	10.98	10.98	0.00	0.04
		170	16.76	10.91	10.95	10.95	0.00	0.04
		180	16.66	10.88	10.91	10.91	0.00	0.04

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		190	16.57	10.85	10.88	10.88	0.00	0.03
		200	16.48	10.82	10.86	10.86	0.00	0.03
	Transect 53							
		13.9	73.23	28.21	29.52	29.52	0.00	1.31
		20	65.12	25.89	27.00	27.00	0.00	1.11
		30	56.44	23.41	24.31	24.31	0.00	0.90
		40	50.72	21.77	22.54	22.54	0.00	0.77
		50	46.63	20.61	21.28	21.28	0.00	0.67
		60	43.53	19.72	20.32	20.32	0.00	0.59
		70	41.10	19.03	19.56	19.56	0.00	0.54
		80	39.14	18.47	18.96	18.96	0.00	0.49
		90	37.51	18.00	18.45	18.45	0.00	0.45
		100	36.15	17.61	18.03	18.03	0.00	0.42
		110	34.98	17.28	17.67	17.67	0.00	0.39
		120	33.98	17.00	17.36	17.36	0.00	0.37

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		130	33.10	16.75	17.09	17.09	0.00	0.34
		140	32.32	16.52	16.85	16.85	0.00	0.33
		150	31.63	16.33	16.64	16.64	0.00	0.31
		160	31.02	16.15	16.45	16.45	0.00	0.29
		170	30.47	15.99	16.27	16.27	0.00	0.28
		180	29.97	15.85	16.12	16.12	0.00	0.27
		190	29.51	15.72	15.98	15.98	0.00	0.26
		200	29.09	15.60	15.85	15.85	0.00	0.25
	Transect 58b							
		3.5	164.46	54.94	60.32	60.32	0.00	5.39
		10	122.95	42.51	46.19	46.19	0.00	3.68
		20	93.84	33.96	36.54	36.54	0.00	2.58
		30	78.18	29.41	31.42	31.42	0.00	2.01
		40	68.24	26.54	28.20	28.20	0.00	1.66
		50	61.27	24.53	25.95	25.95	0.00	1.42

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		60	56.13	23.05	24.29	24.29	0.00	1.24
		70	52.13	21.90	23.01	23.01	0.00	1.11
		80	48.95	20.99	21.99	21.99	0.00	1.00
		90	46.35	20.25	21.16	21.16	0.00	0.92
		100	44.20	19.63	20.48	20.48	0.00	0.84
		110	42.36	19.11	19.89	19.89	0.00	0.78
		120	40.78	18.66	19.39	19.39	0.00	0.73
		130	39.42	18.27	18.95	18.95	0.00	0.69
		140	38.23	17.93	18.58	18.58	0.00	0.65
		150	37.18	17.63	18.24	18.24	0.00	0.62
		160	36.24	17.36	17.94	17.94	0.00	0.58
		170	35.40	17.12	17.68	17.68	0.00	0.56
		180	34.64	16.90	17.44	17.44	0.00	0.53
		190	33.96	16.71	17.22	17.22	0.00	0.51

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		200	33.33	16.53	17.02	17.02	0.00	0.49
Windsor Forest & Great Park SAC	**Transect 8**	3.2	26.74	14.52	14.85	14.87	0.02	0.35
		10	22.07	12.99	13.19	13.21	0.01	0.22
		20	19.51	12.16	12.29	12.30	0.01	0.14
		30	18.33	11.78	11.87	11.88	0.01	0.11
		40	17.65	11.55	11.64	11.64	0.01	0.09
		50	17.21	11.41	11.48	11.48	0.00	0.07
		60	16.90	11.31	11.37	11.37	0.00	0.06
		70	16.66	11.23	11.29	11.29	0.00	0.06
		80	16.49	11.18	11.23	11.23	0.00	0.05
		90	16.34	11.13	11.17	11.18	0.00	0.05
		100	16.23	11.09	11.13	11.14	0.00	0.04
		110	16.13	11.06	11.10	11.10	0.00	0.04
		120	16.05	11.04	11.07	11.07	0.00	0.04

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		130	15.98	11.01	11.05	11.05	0.00	0.04
		140	15.92	10.99	11.03	11.03	0.00	0.03
		150	15.87	10.98	11.01	11.01	0.00	0.03
		160	15.82	10.96	10.99	10.99	0.00	0.03
		170	15.78	10.95	10.98	10.98	0.00	0.03
		180	15.74	10.93	10.96	10.96	0.00	0.03
		190	15.71	10.92	10.95	10.95	0.00	0.03
		200	15.67	10.91	10.94	10.94	0.00	0.03
	Transect 11							
		2.2	33.79	17.15	17.90	17.93	0.03	0.78
		10	27.90	15.21	15.72	15.74	0.02	0.53
		20	24.71	14.17	14.55	14.56	0.01	0.39
		30	23.01	13.61	13.92	13.93	0.01	0.32
		40	21.92	13.26	13.52	13.53	0.01	0.27
		50	21.16	13.01	13.23	13.24	0.01	0.23

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		60	20.58	12.82	13.02	13.02	0.00	0.21
		70	20.12	12.67	12.85	12.86	0.00	0.19
		80	19.75	12.55	12.72	12.72	0.00	0.17
		90	19.45	12.45	12.60	12.61	0.00	0.16
		100	19.20	12.37	12.51	12.51	0.00	0.14
		110	18.98	12.30	12.43	12.43	0.00	0.13
		120	18.80	12.24	12.36	12.36	0.00	0.13
		130	18.63	12.18	12.30	12.30	0.00	0.12
		140	18.49	12.14	12.25	12.25	0.00	0.11
		150	18.37	12.10	12.20	12.20	0.00	0.11
		160	18.26	12.06	12.16	12.16	0.00	0.10
		170	18.16	12.03	12.12	12.13	0.00	0.10
		180	18.07	12.00	12.09	12.09	0.00	0.09
		190	17.98	11.97	12.06	12.06	0.00	0.09

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		200	17.91	11.95	12.03	12.03	0.00	0.09
	Transect 16							
		3.9	30.22	16.18	16.50	16.53	0.03	0.35
		10	24.98	14.44	14.65	14.66	0.02	0.22
		20	21.75	13.38	13.51	13.52	0.01	0.14
		30	20.33	12.91	13.01	13.01	0.01	0.11
		40	19.53	12.64	12.73	12.73	0.01	0.09
		50	19.01	12.48	12.55	12.55	0.00	0.07
		60	18.65	12.36	12.42	12.42	0.00	0.07
		70	18.38	12.27	12.33	12.33	0.00	0.06
		80	18.18	12.21	12.26	12.26	0.00	0.05
		90	18.02	12.15	12.20	12.20	0.00	0.05
		100	17.89	12.11	12.15	12.16	0.00	0.05
		110	17.79	12.08	12.12	12.12	0.00	0.04
		120	17.70	12.05	12.09	12.09	0.00	0.04

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		130	17.62	12.02	12.06	12.06	0.00	0.04
		140	17.56	12.00	12.04	12.04	0.00	0.04
		150	17.50	11.98	12.02	12.02	0.00	0.04
		160	17.45	11.97	12.00	12.00	0.00	0.04
		170	17.41	11.95	11.99	11.99	0.00	0.03
		180	17.37	11.94	11.97	11.97	0.00	0.03
		190	17.34	11.93	11.96	11.96	0.00	0.03
		200	17.31	11.92	11.95	11.95	0.00	0.03
	Transect 19							
		3.75	22.33	13.41	13.53	13.54	0.01	0.13
		10	20.11	12.69	12.78	12.78	0.00	0.09
		20	18.85	12.28	12.35	12.35	0.00	0.07
		30	18.30	12.11	12.16	12.16	0.00	0.06
		40	18.00	12.01	12.06	12.06	0.00	0.05
		50	17.80	11.95	11.99	11.99	0.00	0.05

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		60	17.67	11.90	11.94	11.94	0.00	0.04
		70	17.57	11.87	11.91	11.91	0.00	0.04
		80	17.49	11.84	11.88	11.88	0.00	0.04
		90	17.43	11.82	11.86	11.86	0.00	0.04
		100	17.38	11.81	11.85	11.85	0.00	0.04
		110	17.33	11.79	11.83	11.83	0.00	0.04
		120	17.30	11.78	11.82	11.82	0.00	0.04
		130	17.27	11.77	11.81	11.81	0.00	0.04
		140	17.24	11.77	11.80	11.80	0.00	0.03
		150	17.22	11.76	11.79	11.79	0.00	0.03
		160	17.20	11.75	11.78	11.79	0.00	0.03
		170	17.18	11.75	11.78	11.78	0.00	0.03
		180	17.16	11.74	11.77	11.77	0.00	0.03
		190	17.15	11.74	11.77	11.77	0.00	0.03

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		200	17.13	11.73	11.76	11.76	0.00	0.03

Appendix 4: Total annual mean NH_3 ($\mu g/m^3$) obtained from air quality modelling.

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
Thames Basin Heaths SPA & Thursley, Ash, Pirbright & Chobham SAC	**Transect 20**	2.9	2.25	2.44	2.48	2.48	0.00	0.04
		10	1.76	1.86	1.88	1.88	0.00	0.02
		20	1.54	1.60	1.62	1.62	0.00	0.02
		30	1.45	1.49	1.50	1.50	0.00	0.01
		40	1.39	1.43	1.44	1.44	0.00	0.01
		50	1.36	1.39	1.40	1.40	0.00	0.01
		60	1.34	1.36	1.37	1.37	0.00	0.01
		70	1.32	1.34	1.35	1.35	0.00	0.01
		80	1.31	1.33	1.33	1.33	0.00	0.01
		90	1.30	1.32	1.32	1.32	0.00	0.01
		100	1.29	1.31	1.31	1.31	0.00	0.01
		110	1.28	1.30	1.30	1.30	0.00	0.01
		120	1.28	1.29	1.30	1.30	0.00	0.01
		130	1.27	1.29	1.29	1.29	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		140	1.27	1.28	1.29	1.29	0.00	0.01
		150	1.26	1.28	1.28	1.28	0.00	0.01
		160	1.26	1.27	1.28	1.28	0.00	0.01
		170	1.26	1.27	1.28	1.28	0.00	0.01
		180	1.25	1.27	1.27	1.27	0.00	0.01
		190	1.25	1.27	1.27	1.27	0.00	0.00
		200	1.25	1.26	1.27	1.27	0.00	0.00
	Transect 32							
		4.6	2.00	2.13	2.15	2.16	0.00	0.02
		10	1.83	1.94	1.96	1.96	0.00	0.02
		20	1.69	1.77	1.78	1.78	0.00	0.02
		30	1.61	1.68	1.69	1.69	0.00	0.02
		40	1.56	1.62	1.64	1.64	0.00	0.02
		50	1.53	1.58	1.60	1.60	0.00	0.01
		60	1.51	1.56	1.57	1.57	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		70	1.49	1.53	1.55	1.55	0.00	0.01
		80	1.47	1.52	1.53	1.53	0.00	0.01
		90	1.46	1.50	1.51	1.51	0.00	0.01
		100	1.45	1.49	1.50	1.50	0.00	0.01
		110	1.44	1.47	1.49	1.49	0.00	0.01
		120	1.43	1.46	1.48	1.48	0.00	0.01
		130	1.42	1.46	1.47	1.47	0.00	0.01
		140	1.41	1.45	1.46	1.46	0.00	0.01
		150	1.40	1.44	1.45	1.45	0.00	0.01
		160	1.40	1.43	1.44	1.44	0.00	0.01
		170	1.39	1.43	1.44	1.44	0.00	0.01
		180	1.39	1.42	1.43	1.43	0.00	0.01
		190	1.38	1.42	1.43	1.43	0.00	0.01
		200	1.38	1.41	1.42	1.42	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
	Transect 41							
		9	2.86	3.14	3.28	3.28	0.00	0.14
		10	2.77	3.04	3.17	3.17	0.00	0.13
		20	2.22	2.40	2.49	2.49	0.00	0.09
		30	1.95	2.09	2.16	2.16	0.00	0.07
		40	1.79	1.91	1.96	1.96	0.00	0.06
		50	1.69	1.78	1.83	1.83	0.00	0.05
		60	1.61	1.69	1.74	1.74	0.00	0.04
		70	1.55	1.63	1.67	1.67	0.00	0.04
		80	1.51	1.58	1.61	1.61	0.00	0.03
		90	1.47	1.53	1.57	1.57	0.00	0.03
		100	1.44	1.50	1.53	1.53	0.00	0.03
		110	1.42	1.47	1.50	1.50	0.00	0.03
		120	1.39	1.44	1.47	1.47	0.00	0.03
		130	1.37	1.42	1.45	1.45	0.00	0.03

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		140	1.36	1.40	1.43	1.43	0.00	0.02
		150	1.34	1.39	1.41	1.41	0.00	0.02
		160	1.33	1.37	1.39	1.39	0.00	0.02
		170	1.32	1.36	1.38	1.38	0.00	0.02
		180	1.31	1.35	1.37	1.37	0.00	0.02
		190	1.30	1.34	1.36	1.36	0.00	0.02
		200	1.29	1.33	1.35	1.35	0.00	0.02
	Transect 44							
		2.3	2.57	2.80	2.89	2.89	0.00	0.09
		10	2.04	2.17	2.23	2.23	0.00	0.05
		20	1.77	1.86	1.90	1.90	0.00	0.04
		30	1.63	1.70	1.73	1.73	0.00	0.03
		40	1.55	1.60	1.63	1.63	0.00	0.02
		50	1.49	1.54	1.56	1.56	0.00	0.02
		60	1.45	1.49	1.51	1.51	0.00	0.02

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		70	1.42	1.46	1.47	1.47	0.00	0.02
		80	1.40	1.43	1.44	1.44	0.00	0.01
		90	1.38	1.41	1.42	1.42	0.00	0.01
		100	1.36	1.39	1.40	1.40	0.00	0.01
		110	1.35	1.38	1.39	1.39	0.00	0.01
		120	1.34	1.36	1.37	1.37	0.00	0.01
		130	1.33	1.35	1.36	1.36	0.00	0.01
		140	1.32	1.34	1.35	1.35	0.00	0.01
		150	1.31	1.33	1.34	1.34	0.00	0.01
		160	1.31	1.33	1.33	1.33	0.00	0.01
		170	1.30	1.32	1.33	1.33	0.00	0.01
		180	1.29	1.31	1.32	1.32	0.00	0.01
		190	1.29	1.31	1.32	1.32	0.00	0.01
		200	1.29	1.30	1.31	1.31	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
	Transect 53							
		13.9	3.05	3.53	3.91	3.91	0.00	0.37
		20	2.76	3.16	3.48	3.48	0.00	0.32
		30	2.44	2.77	3.03	3.03	0.00	0.26
		40	2.23	2.51	2.73	2.73	0.00	0.22
		50	2.08	2.33	2.52	2.52	0.00	0.19
		60	1.97	2.19	2.36	2.36	0.00	0.17
		70	1.88	2.08	2.23	2.23	0.00	0.15
		80	1.81	1.99	2.13	2.13	0.00	0.14
		90	1.75	1.92	2.04	2.04	0.00	0.13
		100	1.70	1.85	1.97	1.97	0.00	0.12
		110	1.66	1.80	1.91	1.91	0.00	0.11
		120	1.62	1.76	1.86	1.86	0.00	0.10
		130	1.59	1.72	1.81	1.81	0.00	0.10
		140	1.56	1.68	1.77	1.77	0.00	0.09

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	1.54	1.65	1.74	1.74	0.00	0.09
		160	1.52	1.62	1.71	1.71	0.00	0.08
		170	1.50	1.60	1.68	1.68	0.00	0.08
		180	1.48	1.58	1.65	1.65	0.00	0.08
		190	1.46	1.55	1.63	1.63	0.00	0.07
		200	1.45	1.54	1.61	1.61	0.00	0.07
	Transect 58b							
		3.5	7.06	8.33	9.65	9.65	0.00	1.32
		10	5.29	6.18	7.09	7.09	0.00	0.92
		20	4.09	4.72	5.36	5.37	0.00	0.65
		30	3.45	3.95	4.45	4.45	0.00	0.51
		40	3.05	3.46	3.88	3.88	0.00	0.42
		50	2.76	3.12	3.48	3.48	0.00	0.36
		60	2.56	2.87	3.19	3.19	0.00	0.32
		70	2.40	2.68	2.96	2.96	0.00	0.28

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	2.27	2.53	2.78	2.78	0.00	0.26
		90	2.17	2.40	2.64	2.64	0.00	0.23
		100	2.08	2.30	2.52	2.52	0.00	0.22
		110	2.01	2.21	2.41	2.41	0.00	0.20
		120	1.95	2.14	2.32	2.32	0.00	0.19
		130	1.89	2.07	2.25	2.25	0.00	0.18
		140	1.85	2.02	2.18	2.18	0.00	0.17
		150	1.81	1.97	2.12	2.12	0.00	0.16
		160	1.77	1.92	2.07	2.07	0.00	0.15
		170	1.74	1.88	2.02	2.02	0.00	0.14
		180	1.71	1.85	1.98	1.98	0.00	0.14
		190	1.68	1.81	1.94	1.94	0.00	0.13
		200	1.66	1.78	1.91	1.91	0.00	0.13
Windsor Forest & Great Park SAC	**Transect 8**	3.2	1.61	1.71	1.79	1.79	0.00	0.08

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		10	1.36	1.42	1.47	1.47	0.00	0.05
		20	1.22	1.26	1.29	1.29	0.00	0.03
		30	1.16	1.19	1.21	1.21	0.00	0.02
		40	1.12	1.15	1.16	1.17	0.00	0.02
		50	1.10	1.12	1.13	1.14	0.00	0.02
		60	1.08	1.10	1.11	1.11	0.00	0.01
		70	1.07	1.08	1.10	1.10	0.00	0.01
		80	1.06	1.07	1.09	1.09	0.00	0.01
		90	1.05	1.07	1.08	1.08	0.00	0.01
		100	1.05	1.06	1.07	1.07	0.00	0.01
		110	1.04	1.05	1.06	1.06	0.00	0.01
		120	1.04	1.05	1.06	1.06	0.00	0.01
		130	1.03	1.04	1.05	1.05	0.00	0.01
		140	1.03	1.04	1.05	1.05	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	1.03	1.04	1.04	1.04	0.00	0.01
		160	1.02	1.03	1.04	1.04	0.00	0.01
		170	1.02	1.03	1.04	1.04	0.00	0.01
		180	1.02	1.03	1.03	1.03	0.00	0.01
		190	1.02	1.03	1.03	1.03	0.00	0.01
		200	1.02	1.02	1.03	1.03	0.00	0.01
	Transect 11							
		2.2	1.93	2.09	2.25	2.25	0.00	0.16
		10	1.63	1.73	1.84	1.84	0.00	0.11
		20	1.47	1.54	1.62	1.62	0.00	0.08
		30	1.38	1.44	1.51	1.51	0.00	0.07
		40	1.33	1.38	1.43	1.43	0.00	0.06
		50	1.29	1.33	1.38	1.38	0.00	0.05
		60	1.26	1.30	1.34	1.34	0.00	0.04
		70	1.23	1.27	1.31	1.31	0.00	0.04

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	1.22	1.25	1.28	1.28	0.00	0.04
		90	1.20	1.23	1.26	1.26	0.00	0.03
		100	1.19	1.21	1.24	1.25	0.00	0.03
		110	1.18	1.20	1.23	1.23	0.00	0.03
		120	1.17	1.19	1.22	1.22	0.00	0.03
		130	1.16	1.18	1.21	1.21	0.00	0.02
		140	1.15	1.17	1.20	1.20	0.00	0.02
		150	1.14	1.17	1.19	1.19	0.00	0.02
		160	1.14	1.16	1.18	1.18	0.00	0.02
		170	1.13	1.15	1.17	1.17	0.00	0.02
		180	1.13	1.15	1.17	1.17	0.00	0.02
		190	1.12	1.14	1.16	1.16	0.00	0.02
		200	1.12	1.14	1.16	1.16	0.00	0.02
	Transect 16							
		3.9	2.10	2.22	2.28	2.29	0.00	0.06

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		10	1.82	1.89	1.93	1.93	0.00	0.04
		20	1.64	1.69	1.72	1.72	0.00	0.03
		30	1.57	1.60	1.62	1.62	0.00	0.02
		40	1.53	1.55	1.57	1.57	0.00	0.02
		50	1.50	1.52	1.54	1.54	0.00	0.01
		60	1.48	1.50	1.51	1.51	0.00	0.01
		70	1.47	1.48	1.49	1.50	0.00	0.01
		80	1.45	1.47	1.48	1.48	0.00	0.01
		90	1.45	1.46	1.47	1.47	0.00	0.01
		100	1.44	1.45	1.46	1.46	0.00	0.01
		110	1.43	1.45	1.46	1.46	0.00	0.01
		120	1.43	1.44	1.45	1.45	0.00	0.01
		130	1.42	1.44	1.44	1.44	0.00	0.01
		140	1.42	1.43	1.44	1.44	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	1.42	1.43	1.44	1.44	0.00	0.01
		160	1.42	1.43	1.43	1.43	0.00	0.01
		170	1.41	1.42	1.43	1.43	0.00	0.01
		180	1.41	1.42	1.43	1.43	0.00	0.01
		190	1.41	1.42	1.43	1.43	0.00	0.01
		200	1.41	1.42	1.42	1.42	0.00	0.01
	Transect 19							
		3.75	1.29	1.35	1.37	1.37	0.00	0.03
		10	1.18	1.21	1.23	1.23	0.00	0.02
		20	1.11	1.14	1.15	1.15	0.00	0.01
		30	1.08	1.10	1.11	1.12	0.00	0.01
		40	1.07	1.08	1.10	1.10	0.00	0.01
		50	1.06	1.07	1.08	1.08	0.00	0.01
		60	1.05	1.06	1.07	1.07	0.00	0.01
		70	1.04	1.06	1.07	1.07	0.00	0.01

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	1.04	1.05	1.06	1.06	0.00	0.01
		90	1.04	1.05	1.06	1.06	0.00	0.01
		100	1.03	1.05	1.06	1.06	0.00	0.01
		110	1.03	1.04	1.05	1.05	0.00	0.01
		120	1.03	1.04	1.05	1.05	0.00	0.01
		130	1.03	1.04	1.05	1.05	0.00	0.01
		140	1.03	1.04	1.05	1.05	0.00	0.01
		150	1.03	1.04	1.05	1.05	0.00	0.01
		160	1.03	1.04	1.04	1.05	0.00	0.01
		170	1.02	1.04	1.04	1.04	0.00	0.01
		180	1.02	1.03	1.04	1.04	0.00	0.01
		190	1.02	1.03	1.04	1.04	0.00	0.01
		200	1.02	1.03	1.04	1.04	0.00	0.01

Appendix 5: Total annual mean nitrogen deposition (kg/ha/yr) obtained from air quality modelling.

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
Thames Basin Heaths SPA & Thursley, Ash, Pirbright & Chobham SAC	**Transect 20**	2.9	20.52	20.47	20.69	20.70	0.01	0.23
		10	17.30	17.23	17.35	17.36	0.01	0.13
		20	15.85	15.80	15.88	15.88	0.00	0.09
		30	15.23	15.18	15.24	15.25	0.00	0.07
		40	14.88	14.84	14.89	14.89	0.00	0.05
		50	14.65	14.62	14.67	14.67	0.00	0.05
		60	14.50	14.47	14.51	14.51	0.00	0.04
		70	14.38	14.36	14.39	14.40	0.00	0.04
		80	14.30	14.27	14.31	14.31	0.00	0.04
		90	14.23	14.20	14.24	14.24	0.00	0.04
		100	14.17	14.15	14.18	14.18	0.00	0.03
		110	14.13	14.11	14.14	14.14	0.00	0.03
		120	14.09	14.07	14.10	14.10	0.00	0.03
		130	14.06	14.04	14.07	14.07	0.00	0.03

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		140	14.03	14.01	14.04	14.04	0.00	0.03
		150	14.01	13.99	14.02	14.02	0.00	0.03
		160	13.99	13.97	14.00	14.00	0.00	0.03
		170	13.97	13.95	13.98	13.98	0.00	0.03
		180	13.95	13.94	13.96	13.96	0.00	0.03
		190	13.94	13.92	13.95	13.95	0.00	0.03
		200	13.93	13.91	13.94	13.94	0.00	0.03
	Transect 32							
		4.6	19.03	18.82	18.95	18.96	0.01	0.13
		10	17.90	17.73	17.84	17.84	0.01	0.12
		20	16.88	16.74	16.84	16.84	0.00	0.10
		30	16.36	16.24	16.33	16.33	0.00	0.09
		40	16.03	15.93	16.01	16.02	0.00	0.09
		50	15.81	15.71	15.79	15.80	0.00	0.08
		60	15.64	15.55	15.63	15.63	0.00	0.08

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		70	15.51	15.43	15.50	15.50	0.00	0.08
		80	15.40	15.32	15.40	15.40	0.00	0.08
		90	15.31	15.24	15.31	15.31	0.00	0.07
		100	15.23	15.16	15.23	15.23	0.00	0.07
		110	15.16	15.10	15.17	15.17	0.00	0.07
		120	15.10	15.04	15.11	15.11	0.00	0.07
		130	15.05	14.99	15.05	15.05	0.00	0.07
		140	15.00	14.94	15.01	15.01	0.00	0.07
		150	14.95	14.90	14.96	14.96	0.00	0.06
		160	14.91	14.86	14.92	14.92	0.00	0.06
		170	14.88	14.83	14.89	14.89	0.00	0.06
		180	14.85	14.79	14.86	14.86	0.00	0.06
		190	14.81	14.76	14.82	14.83	0.00	0.06
		200	14.79	14.74	14.80	14.80	0.00	0.06

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
	Transect 41							
		9	24.89	24.66	25.41	25.41	0.00	0.75
		10	24.30	24.07	24.79	24.79	0.00	0.72
		20	20.72	20.52	21.01	21.01	0.00	0.49
		30	18.98	18.81	19.18	19.18	0.00	0.38
		40	17.94	17.79	18.10	18.10	0.00	0.31
		50	17.24	17.11	17.37	17.37	0.00	0.27
		60	16.73	16.62	16.85	16.85	0.00	0.24
		70	16.35	16.25	16.46	16.46	0.00	0.21
		80	16.05	15.95	16.15	16.15	0.00	0.19
		90	15.81	15.72	15.90	15.90	0.00	0.18
		100	15.61	15.53	15.69	15.69	0.00	0.17
		110	15.44	15.36	15.52	15.52	0.00	0.15
		120	15.30	15.22	15.37	15.37	0.00	0.15
		130	15.17	15.10	15.24	15.24	0.00	0.14

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		140	15.06	15.00	15.13	15.13	0.00	0.13
		150	14.97	14.91	15.03	15.03	0.00	0.13
		160	14.88	14.83	14.95	14.95	0.00	0.12
		170	14.80	14.75	14.87	14.87	0.00	0.12
		180	14.74	14.69	14.80	14.80	0.00	0.11
		190	14.67	14.63	14.74	14.74	0.00	0.11
		200	14.62	14.58	14.68	14.68	0.00	0.10
	Transect 44							
		2.3	22.73	22.50	23.00	23.00	0.00	0.50
		10	19.20	19.01	19.32	19.32	0.00	0.31
		20	17.39	17.25	17.46	17.46	0.00	0.21
		30	16.48	16.36	16.53	16.53	0.00	0.16
		40	15.92	15.82	15.96	15.96	0.00	0.13
		50	15.54	15.46	15.57	15.57	0.00	0.11
		60	15.27	15.20	15.30	15.30	0.00	0.10

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		70	15.07	15.01	15.09	15.09	0.00	0.08
		80	14.91	14.85	14.93	14.93	0.00	0.08
		90	14.78	14.73	14.80	14.80	0.00	0.07
		100	14.67	14.63	14.69	14.69	0.00	0.06
		110	14.58	14.54	14.60	14.60	0.00	0.06
		120	14.51	14.47	14.52	14.52	0.00	0.05
		130	14.44	14.41	14.46	14.46	0.00	0.05
		140	14.39	14.35	14.40	14.40	0.00	0.05
		150	14.34	14.31	14.35	14.35	0.00	0.05
		160	14.30	14.27	14.31	14.31	0.00	0.04
		170	14.26	14.23	14.27	14.27	0.00	0.04
		180	14.23	14.20	14.24	14.24	0.00	0.04
		190	14.20	14.17	14.21	14.21	0.00	0.04
		200	14.17	14.14	14.18	14.18	0.00	0.04

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
	Transect 53							
		13.9	27.12	27.05	29.08	29.08	0.00	2.03
		20	25.09	24.98	26.71	26.71	0.00	1.73
		30	22.90	22.77	24.17	24.17	0.00	1.40
		40	21.45	21.30	22.49	22.49	0.00	1.19
		50	20.40	20.26	21.30	21.30	0.00	1.04
		60	19.61	19.47	20.39	20.39	0.00	0.92
		70	18.98	18.85	19.68	19.68	0.00	0.83
		80	18.48	18.34	19.10	19.10	0.00	0.76
		90	18.05	17.93	18.63	18.63	0.00	0.70
		100	17.70	17.58	18.23	18.23	0.00	0.65
		110	17.40	17.28	17.89	17.89	0.00	0.60
		120	17.14	17.03	17.59	17.59	0.00	0.56
		130	16.91	16.80	17.34	17.34	0.00	0.53
		140	16.71	16.61	17.11	17.11	0.00	0.50

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	16.53	16.43	16.91	16.91	0.00	0.48
		160	16.37	16.27	16.73	16.73	0.00	0.45
		170	16.22	16.13	16.56	16.56	0.00	0.43
		180	16.09	16.00	16.42	16.42	0.00	0.41
		190	15.97	15.89	16.28	16.28	0.00	0.40
		200	15.86	15.78	16.16	16.16	0.00	0.38
	Transect 58b							
		3.5	52.25	53.30	60.47	60.49	0.02	7.19
		10	41.07	41.34	46.33	46.34	0.01	5.00
		20	33.27	33.19	36.73	36.74	0.01	3.54
		30	29.06	28.87	31.65	31.65	0.00	2.78
		40	26.38	26.15	28.45	28.45	0.00	2.30
		50	24.49	24.25	26.23	26.23	0.00	1.98
		60	23.09	22.86	24.59	24.59	0.00	1.73
		70	22.00	21.78	23.32	23.32	0.00	1.55

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	21.13	20.92	22.32	22.32	0.00	1.40
		90	20.42	20.22	21.49	21.50	0.00	1.28
		100	19.83	19.64	20.82	20.82	0.00	1.18
		110	19.33	19.14	20.24	20.24	0.00	1.10
		120	18.90	18.72	19.74	19.74	0.00	1.02
		130	18.52	18.35	19.31	19.31	0.00	0.96
		140	18.20	18.04	18.94	18.94	0.00	0.91
		150	17.91	17.75	18.61	18.61	0.00	0.86
		160	17.65	17.50	18.32	18.32	0.00	0.82
		170	17.42	17.28	18.05	18.06	0.00	0.78
		180	17.21	17.07	17.82	17.82	0.00	0.75
		190	17.02	16.89	17.61	17.61	0.00	0.71
		200	16.85	16.72	17.41	17.41	0.00	0.69
Windsor Forest & Great Park SAC	**Transect 8**	3.2	27.76	27.30	27.96	27.99	0.03	0.69

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		10	25.10	24.80	25.20	25.22	0.02	0.42
		20	23.64	23.44	23.70	23.71	0.01	0.27
		30	22.96	22.81	23.00	23.01	0.01	0.21
		40	22.57	22.45	22.61	22.61	0.01	0.17
		50	22.32	22.21	22.35	22.35	0.00	0.14
		60	22.14	22.04	22.16	22.17	0.00	0.12
		70	22.01	21.92	22.03	22.03	0.01	0.11
		80	21.90	21.82	21.92	21.93	0.00	0.10
		90	21.82	21.75	21.84	21.84	0.00	0.09
		100	21.75	21.69	21.77	21.77	0.00	0.08
		110	21.70	21.64	21.71	21.72	0.00	0.08
		120	21.65	21.59	21.67	21.67	0.00	0.08
		130	21.61	21.55	21.62	21.63	0.00	0.07
		140	21.58	21.52	21.59	21.59	0.00	0.07

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	21.55	21.49	21.56	21.56	0.00	0.07
		160	21.52	21.47	21.53	21.53	0.00	0.06
		170	21.49	21.45	21.51	21.51	0.00	0.06
		180	21.47	21.43	21.49	21.49	0.00	0.06
		190	21.45	21.41	21.47	21.47	0.00	0.05
		200	21.44	21.39	21.45	21.45	0.00	0.06
	Transect 11							
		2.2	30.94	30.33	31.68	31.70	0.02	1.37
		10	27.71	27.26	28.19	28.20	0.01	0.94
		20	25.96	25.61	26.30	26.30	0.01	0.70
		30	25.02	24.73	25.29	25.29	0.01	0.56
		40	24.42	24.17	24.64	24.65	0.01	0.48
		50	23.99	23.77	24.18	24.19	0.01	0.42
		60	23.67	23.47	23.84	23.84	0.00	0.37
		70	23.42	23.23	23.57	23.57	0.01	0.34

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	23.21	23.05	23.35	23.35	0.00	0.30
		90	23.04	22.89	23.17	23.17	0.00	0.28
		100	22.90	22.76	23.01	23.01	0.00	0.26
		110	22.78	22.65	22.89	22.89	0.00	0.24
		120	22.68	22.55	22.77	22.78	0.00	0.23
		130	22.59	22.47	22.68	22.68	0.00	0.21
		140	22.51	22.39	22.59	22.60	0.00	0.20
		150	22.44	22.33	22.52	22.52	0.00	0.19
		160	22.38	22.27	22.45	22.45	0.00	0.18
		170	22.32	22.22	22.39	22.39	0.00	0.17
		180	22.27	22.17	22.34	22.34	0.00	0.17
		190	22.23	22.13	22.29	22.29	0.00	0.16
		200	22.19	22.09	22.25	22.25	0.00	0.16
	Transect 16							
		3.9	32.56	32.08	32.61	32.63	0.02	0.55

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		10	29.59	29.26	29.59	29.60	0.01	0.35
		20	27.75	27.52	27.74	27.74	0.01	0.23
		30	26.94	26.76	26.92	26.93	0.00	0.17
		40	26.47	26.33	26.46	26.47	0.01	0.14
		50	26.18	26.05	26.17	26.17	0.00	0.12
		60	25.97	25.86	25.96	25.96	0.00	0.11
		70	25.82	25.72	25.81	25.81	0.00	0.09
		80	25.70	25.61	25.70	25.70	0.00	0.09
		90	25.61	25.53	25.60	25.61	0.00	0.08
		100	25.54	25.46	25.53	25.53	0.00	0.08
		110	25.48	25.40	25.47	25.47	0.00	0.07
		120	25.43	25.36	25.42	25.42	0.00	0.07
		130	25.38	25.31	25.38	25.38	0.00	0.06
		140	25.35	25.28	25.34	25.34	0.00	0.06

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		150	25.31	25.25	25.31	25.31	0.00	0.06
		160	25.29	25.22	25.28	25.28	0.00	0.06
		170	25.26	25.20	25.26	25.26	0.00	0.05
		180	25.24	25.18	25.24	25.24	0.00	0.06
		190	25.22	25.16	25.22	25.22	0.00	0.05
		200	25.20	25.15	25.20	25.20	0.00	0.05
	Transect 19							
		3.75	24.46	24.19	24.39	24.41	0.02	0.22
		10	23.21	23.02	23.17	23.18	0.01	0.16
		20	22.49	22.37	22.48	22.49	0.01	0.12
		30	22.19	22.08	22.18	22.18	0.00	0.10
		40	22.01	21.92	22.01	22.02	0.00	0.10
		50	21.90	21.82	21.91	21.91	0.00	0.09
		60	21.83	21.75	21.83	21.83	0.00	0.09
		70	21.77	21.70	21.78	21.78	0.00	0.08

European Site	Transect	Distance from Road (m)	Baseline 2019	Future Baseline 2037	Do Minimum 2037	Do Something 2037	Scenario 1: WNP Alone	Scenario 2: In-combination Impact
		80	21.73	21.66	21.73	21.73	0.00	0.08
		90	21.69	21.62	21.70	21.70	0.00	0.08
		100	21.66	21.60	21.67	21.67	0.00	0.08
		110	21.64	21.58	21.65	21.65	0.00	0.08
		120	21.62	21.56	21.63	21.63	0.00	0.07
		130	21.60	21.54	21.61	21.61	0.00	0.07
		140	21.59	21.53	21.60	21.60	0.00	0.07
		150	21.57	21.52	21.59	21.59	0.00	0.07
		160	21.56	21.51	21.58	21.58	0.00	0.07
		170	21.55	21.50	21.57	21.57	0.00	0.07
		180	21.54	21.49	21.56	21.56	0.00	0.07
		190	21.54	21.48	21.55	21.55	0.00	0.07
		200	21.53	21.47	21.54	21.54	0.00	0.07

Appendix E Traffic & Air Quality Modelling Methodology

Georgina.harding@aecom.com
helen.venfield@aecom.com

Project name:
Warfield Air Quality - HRA

Project ref:
60571087

From:
By: Georgina, Harding
Checked by: Helen Venfield
Approved by: Michele Hackman

Date: 28/01/2021

To:
James Riley
james.d.riley@aecom.com

CC:
helen.venfield@aecom.com

Warfield Neighbourhood Plan

Overview

Warfield Neighbourhood Plan Group has prepared a Neighbourhood Plan (NP). This project assesses impact on air quality of the NP's policies on internationally designated ecological sites that require a Habitats Regulation Assessment (HRA).

The Warfield Neighbourhood Plan Group is led by Warfield Parish Council, but the area it encompasses is under the jurisdiction of Bracknell Forest Council. The Plan is predicted to cause an increase in local traffic which will affect roads beyond the Council's jurisdiction. As such, roads in the nearby Council areas of Surrey Heath and the Royal Borough of Windsor and Maidenhead will be affected. One of the main issues regarding an increase in road traffic is atmospheric pollution, particularly through nitrogen deposition on sensitive habitats. For the Warfield NP, the Thames Basin Heath Special Protection Area (SPA) and Windsor Forest & Great Park Special Area of Conservation (SAC) have been identified as being sensitive to potential increases in road traffic. This project considers the impact of changes in traffic flow on concentrations of nitrogen oxides (NOx), ammonia (NH_3) and nitrogen deposition at the closest ecological receptors within The Thames Basin Heath SPA and Windsor Forest & Great Park SAC.

Methodology

Traffic Data

The road network consists of several links adjacent to the SAC and SPA. There are three main areas of focus: road links south of Bracknell (around the Thames Basin Heath SPA), the M3 from Bagshot to Brick Hill (Thames Basin Heath SPA) and road links around Windsor Forest Great Park SAC. Traffic data in the form of 24-hour AADT (Annual Average Daily Traffic) based on 2019 data and forecast to 2037 are shown in Table 1. Baseline traffic data were calculated and provided by an external traffic team.

The traffic data provided AM and PM peak hour traffic flows for east and west bound traffic. These were combined to avoid extrapolating differences which may only occur in one peak hour and used to estimate daily average speeds. The Base and Future Base scenarios (both without the Neighbourhood Plan) used 2019 traffic data. The future year without the Neighbourhood Plan (2037 Do-Minimum) traffic flows were calculated by an external traffic team. It is anticipated that daily average flows will increase between 2019 and 2037 on a majority of road links. The Neighbourhood Plan is predicted to further increase daily average flows in 2037 compared with the situation without the Neighbourhood Plan (but with expected traffic growth) by less than 55 vehicles per day. The heavy-duty vehicle (HDV) percentage and average speed were also calculated by an external traffic team.

Table 1 Traffic Data

	Base 2019/Future Base 2037			2037 Do Minimum			2037 Do Something			
Road Link ID	AADT	HDV %	Daily Mean Speed (kph)	AADT	HDV %	Daily Mean Speed (kph)	AADT	HDV %	Daily Mean Speed (kph)	Change in ADDT between DM and DS
4a	19667	1.0	30	20471	1.1	28	20500	1.1	28	29
4b	19667	1.0	30	20471	1.1	28	20500	1.1	28	29
4c	19667	1.0	30	20471	1.1	28	20500	1.1	28	29
5	14052	0.5	36	14563	0.8	34	14601	0.8	34	38
6	14052	0.5	55	14563	0.8	54	14601	0.8	54	38
7	14052	0.5	48	14563	0.8	45	14601	0.8	45	38
8	**14053**	**0.5**	**79**	**15349**	**0.9**	**75**	**15397**	**0.9**	**75**	**48**
10	10240	0.0	89	13669	0.0	83	13669	0.0	83	0
10a	10240	0.0	89	13669	0.0	83	13669	0.0	83	0
11a SB	**14289**	**0.0**	**85**	**16235**	**0.0**	**82**	**16268**	**0.0**	**82**	**33**
11b NB	**14250**	**0.0**	**85**	**16868**	**0.0**	**82**	**16879**	**0.0**	**82**	**11**
11b NBa	14250	0.0	85	16868	0.0	82	16879	0.0	82	11
12	8916	0.0	91	10938	0.0	88	10938	0.0	88	0
15	15873	0.0	30	16979	0.0	29	17020	0.0	29	41
16	**15873**	**0.0**	**78**	**16979**	**0.0**	**78**	**17020**	**0.0**	**78**	**41**
17	15873	0.0	82	16979	0.0	80	17020	0.0	80	41
17a	15873	0.0	82	16979	0.0	80	17020	0.0	80	41
18	4979	0.8	77	5229	0.7	77	5246	0.7	77	17
19	**4979**	**0.8**	**84**	**5229**	**0.7**	**85**	**5246**	**0.7**	**85**	**17**
20	**14513**	**1.2**	**82**	**14920**	**1.2**	**82**	**14935**	**1.2**	**82**	**15**
21	6858	1.4	83	7219	1.5	81	7222	1.5	81	3
24	11828	1.9	40	11605	1.5	40	11605	1.5	40	0
25	11828	1.9	40	11605	1.5	40	11605	1.5	40	0
26	11828	1.9	34	11605	1.5	34	11605	1.5	34	0
27	11828	1.9	34	11605	1.5	34	11605	1.5	34	0
28	11828	1.9	34	11605	1.5	34	11605	1.5	34	0
29	11828	1.9	40	11605	1.5	40	11605	1.5	40	0
30	11828	1.9	34	11605	1.5	34	11605	1.5	34	0
32	**13824**	**2.0**	**32**	**13896**	**2.2**	**31**	**13921**	**2.2**	**31**	**25**
36	49665	5.6	63	51386	5.9	63	51386	5.9	63	0
40a*	49665	5.60	77	51200	5.88	64	51200	5.88	64	0
41	**62731**	**5.1**	**88**	**66489**	**5.3**	**87**	**66543**	**5.3**	**87**	**54**
41a	62731	5.1	88	66489	5.3	87	66543	5.3	87	54
42	31366	5.1	69	33244	5.3	68	33272	5.3	68	28
42a	31366	5.1	69	33244	5.3	68	33272	5.3	68	28
44	**29584**	**2.1**	**92**	**31316**	**2.1**	**92**	**31341**	**2.1**	**92**	**25**
45	17315	2.7	50	18361	2.5	50	18370	2.5	50	9
53	**121955**	**9.9**	**108**	**138122**	**10.6**	**105**	**138159**	**10.6**	**105**	**37**
53a	121955	9.9	108	138122	10.6	105	138159	10.6	105	37
58	**20062**	**1.0**	**78**	**24518**	**1.3**	**70**	**24545**	**1.3**	**70**	**27**
60	131260	9.9	106	149891	10.5	103	149895	10.5	103	4
60a	131260	9.9	106	149891	10.5	103	149895	10.5	103	4

Notes: Road links in **bold** were identified as key links to be modelled.

***** Link 40a was manually calculated based on the assumption that AADT on Link 36 and Link 40a would equate to AADT on Link 41. The calculated ADDT for Link 40a is comparable to 2019 ADDT estimates made by the DFT.

Receptors

Ecological receptors were taken on 10 links identified by the ecology team as being key links to be modelled. These are in bold in Table 1. Transects were located to the north of these road links, where possible, so that they are predominantly downwind of the road. The ecological receptors were placed perpendicular to the road, every 10 metres, up to 200m from the road. The closest receptor to each road was placed at the edge of the designated site. The ecological receptors relevant to this project are included in Table 2.

Table 2 Receptor locations, height and distance from road

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 16_3.9m	496296	174789	0	3.9	Windsor Forest Great Park SAC
Link 16_10m	496291	174792	0	10	Windsor Forest Great Park SAC
Link 16_20m	496283	174798	0	20	Windsor Forest Great Park SAC
Link 16_30m	496274	174804	0	30	Windsor Forest Great Park SAC
Link 16_40m	496266	174810	0	40	Windsor Forest Great Park SAC
Link 16_50m	496258	174815	0	50	Windsor Forest Great Park SAC
Link 16_60m	496250	174821	0	60	Windsor Forest Great Park SAC
Link 16_70m	496242	174827	0	70	Windsor Forest Great Park SAC
Link 16_80m	496233	174833	0	80	Windsor Forest Great Park SAC
Link 16_90m	496225	174838	0	90	Windsor Forest Great Park SAC
Link 16_100m	496217	174844	0	100	Windsor Forest Great Park SAC
Link 16_110m	496209	174850	0	110	Windsor Forest Great Park SAC
Link 16_120m	496201	174855	0	120	Windsor Forest Great Park SAC
Link 16_130m	496193	174861	0	130	Windsor Forest Great Park SAC
Link 16_140m	496184	174867	0	140	Windsor Forest Great Park SAC
Link 16_150m	496176	174873	0	150	Windsor Forest Great Park SAC
Link 16_160m	496168	174878	0	160	Windsor Forest Great Park SAC
Link 16_170m	496160	174884	0	170	Windsor Forest Great Park SAC
Link 16_180m	496152	174890	0	180	Windsor Forest Great Park SAC
Link 16_190m	496143	174896	0	190	Windsor Forest Great Park SAC
Link 16_200m	496135	174901	0	200	Windsor Forest Great Park SAC
Link 8_3.2m	493463	173707	0	3.2	Windsor Forest Great Park SAC
Link 8_10m	493458	173712	0	10	Windsor Forest Great Park SAC
Link 8_20m	493450	173718	0	20	Windsor Forest Great Park SAC
Link 8_30m	493442	173725	0	30	Windsor Forest Great Park SAC
Link 8_40m	493435	173731	0	40	Windsor Forest Great Park SAC
Link 8_50m	493427	173737	0	50	Windsor Forest Great Park SAC
Link 8_60m	493419	173744	0	60	Windsor Forest Great Park SAC
Link 8_70m	493412	173750	0	70	Windsor Forest Great Park SAC
Link 8_80m	493404	173757	0	80	Windsor Forest Great Park SAC

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 8_90m	493396	173763	0	90	Windsor Forest Great Park SAC
Link 8_100m	493389	173770	0	100	Windsor Forest Great Park SAC
Link 8_110m	493381	173776	0	110	Windsor Forest Great Park SAC
Link 8_120m	493373	173782	0	120	Windsor Forest Great Park SAC
Link 8_130m	493366	173789	0	130	Windsor Forest Great Park SAC
Link 8_140m	493358	173795	0	140	Windsor Forest Great Park SAC
Link 8_150m	493350	173802	0	150	Windsor Forest Great Park SAC
Link 8_160m	493343	173808	0	160	Windsor Forest Great Park SAC
Link 8_170m	493335	173815	0	170	Windsor Forest Great Park SAC
Link 8_180m	493327	173821	0	180	Windsor Forest Great Park SAC
Link 8_190m	493320	173827	0	190	Windsor Forest Great Park SAC
Link 8_200m	493312	173834	0	200	Windsor Forest Great Park SAC
Link 19_3.75m	496782	168682	0	3.75	Windsor Forest Great Park SAC
Link 19_10m	496782	168688	0	10	Windsor Forest Great Park SAC
Link 19_20m	496781	168698	0	20	Windsor Forest Great Park SAC
Link 19_30m	496780	168708	0	30	Windsor Forest Great Park SAC
Link 19_40m	496779	168718	0	40	Windsor Forest Great Park SAC
Link 19_50m	496778	168728	0	50	Windsor Forest Great Park SAC
Link 19_60m	496777	168738	0	60	Windsor Forest Great Park SAC
Link 19_70m	496776	168748	0	70	Windsor Forest Great Park SAC
Link 19_80m	496776	168758	0	80	Windsor Forest Great Park SAC
Link 19_90m	496775	168768	0	90	Windsor Forest Great Park SAC
Link 19_100m	496774	168778	0	100	Windsor Forest Great Park SAC
Link 19_110m	496773	168788	0	110	Windsor Forest Great Park SAC
Link 19_120m	496772	168798	0	120	Windsor Forest Great Park SAC
Link 19_130m	496771	168808	0	130	Windsor Forest Great Park SAC
Link 19_140m	496770	168818	0	140	Windsor Forest Great Park SAC
Link 19_150m	496769	168828	0	150	Windsor Forest Great Park SAC
Link 19_160m	496769	168838	0	160	Windsor Forest Great Park SAC
Link 19_170m	496768	168848	0	170	Windsor Forest Great Park SAC
Link 19_180m	496767	168858	0	180	Windsor Forest Great Park SAC
Link 19_190m	496766	168868	0	190	Windsor Forest Great Park SAC
Link 19_200m	496765	168878	0	200	Windsor Forest Great Park SAC
Link 11_2.2m	493721	171833	0	2.2	Windsor Forest Great Park SAC
Link 11_10m	493727	171828	0	10	Windsor Forest Great Park SAC
Link 11_20m	493736	171823	0	20	Windsor Forest Great Park SAC

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 11_30m	493744	171817	0	30	Windsor Forest Great Park SAC
Link 11_40m	493752	171811	0	40	Windsor Forest Great Park SAC
Link 11_50m	493760	171805	0	50	Windsor Forest Great Park SAC
Link 11_60m	493768	171800	0	60	Windsor Forest Great Park SAC
Link 11_70m	493777	171794	0	70	Windsor Forest Great Park SAC
Link 11_80m	493785	171788	0	80	Windsor Forest Great Park SAC
Link 11_90m	493793	171783	0	90	Windsor Forest Great Park SAC
Link 11_100m	493801	171777	0	100	Windsor Forest Great Park SAC
Link 11_110m	493809	171771	0	110	Windsor Forest Great Park SAC
Link 11_120m	493818	171765	0	120	Windsor Forest Great Park SAC
Link 11_130m	493826	171760	0	130	Windsor Forest Great Park SAC
Link 11_140m	493834	171754	0	140	Windsor Forest Great Park SAC
Link 11_150m	493842	171748	0	150	Windsor Forest Great Park SAC
Link 11_160m	493850	171742	0	160	Windsor Forest Great Park SAC
Link 11_170m	493858	171737	0	170	Windsor Forest Great Park SAC
Link 11_180m	493867	171731	0	180	Windsor Forest Great Park SAC
Link 11_190m	493875	171725	0	190	Windsor Forest Great Park SAC
Link 11_200m	493883	171719	0	200	Windsor Forest Great Park SAC
Link 44_2.3m	485508	165856	0	2.3	Thames Basin Heath SPA
Link 44_10m	485515	165854	0	10	Thames Basin Heath SPA
Link 44_20m	485525	165853	0	20	Thames Basin Heath SPA
Link 44_30m	485535	165851	0	30	Thames Basin Heath SPA
Link 44_40m	485545	165849	0	40	Thames Basin Heath SPA
Link 44_50m	485555	165847	0	50	Thames Basin Heath SPA
Link 44_60m	485564	165846	0	60	Thames Basin Heath SPA
Link 44_70m	485574	165844	0	70	Thames Basin Heath SPA
Link 44_80m	485584	165842	0	80	Thames Basin Heath SPA
Link 44_90m	485594	165840	0	90	Thames Basin Heath SPA
Link 44_100m	485604	165839	0	100	Thames Basin Heath SPA
Link 44_110m	485614	165837	0	110	Thames Basin Heath SPA
Link 44_120m	485623	165835	0	120	Thames Basin Heath SPA
Link 44_130m	485633	165833	0	130	Thames Basin Heath SPA
Link 44_140m	485643	165832	0	140	Thames Basin Heath SPA
Link 44_150m	485653	165830	0	150	Thames Basin Heath SPA
Link 44_160m	485663	165828	0	160	Thames Basin Heath SPA
Link 44_170m	485673	165827	0	170	Thames Basin Heath SPA

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 44_180m	485683	165825	0	180	Thames Basin Heath SPA
Link 44_190m	485692	165823	0	190	Thames Basin Heath SPA
Link 44_200m	485702	165821	0	200	Thames Basin Heath SPA
Link 20_2.9m	485021	165128	0	2.9	Thames Basin Heath SPA
Link 20_10m	485027	165124	0	10	Thames Basin Heath SPA
Link 20_20m	485035	165118	0	20	Thames Basin Heath SPA
Link 20_30m	485044	165113	0	30	Thames Basin Heath SPA
Link 20_40m	485052	165107	0	40	Thames Basin Heath SPA
Link 20_50m	485060	165101	0	50	Thames Basin Heath SPA
Link 20_60m	485068	165095	0	60	Thames Basin Heath SPA
Link 20_70m	485076	165090	0	70	Thames Basin Heath SPA
Link 20_80m	485085	165084	0	80	Thames Basin Heath SPA
Link 20_90m	485093	165078	0	90	Thames Basin Heath SPA
Link 20_100m	485101	165073	0	100	Thames Basin Heath SPA
Link 20_110m	485109	165067	0	110	Thames Basin Heath SPA
Link 20_120m	485117	165061	0	120	Thames Basin Heath SPA
Link 20_130m	485126	165055	0	130	Thames Basin Heath SPA
Link 20_140m	485134	165050	0	140	Thames Basin Heath SPA
Link 20_150m	485142	165044	0	150	Thames Basin Heath SPA
Link 20_160m	485150	165038	0	160	Thames Basin Heath SPA
Link 20_170m	485158	165032	0	170	Thames Basin Heath SPA
Link 20_180m	485167	165027	0	180	Thames Basin Heath SPA
Link 20_190m	485175	165021	0	190	Thames Basin Heath SPA
Link 20_200m	485183	165015	0	200	Thames Basin Heath SPA
Link 58b_3.5m	496495	164548	0	3.5	Thames Basin Heath SPA
Link 58b_10m	496497	164554	0	10	Thames Basin Heath SPA
Link 58b_20m	496501	164563	0	20	Thames Basin Heath SPA
Link 58b_30m	496504	164572	0	30	Thames Basin Heath SPA
Link 58b_40m	496508	164582	0	40	Thames Basin Heath SPA
Link 58b_50m	496511	164591	0	50	Thames Basin Heath SPA
Link 58b_60m	496515	164601	0	60	Thames Basin Heath SPA
Link 58b_70m	496518	164610	0	70	Thames Basin Heath SPA
Link 58b_80m	496521	164619	0	80	Thames Basin Heath SPA
Link 58b_90m	496525	164629	0	90	Thames Basin Heath SPA
Link 58b_100m	496528	164638	0	100	Thames Basin Heath SPA
Link 58b_110m	496532	164648	0	110	Thames Basin Heath SPA

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 58b_120m	496535	164657	0	120	Thames Basin Heath SPA
Link 58b_130m	496538	164666	0	130	Thames Basin Heath SPA
Link 58b_140m	496542	164676	0	140	Thames Basin Heath SPA
Link 58b_150m	496545	164685	0	150	Thames Basin Heath SPA
Link 58b_160m	496549	164695	0	160	Thames Basin Heath SPA
Link 58b_170m	496552	164704	0	170	Thames Basin Heath SPA
Link 58b_180m	496556	164713	0	180	Thames Basin Heath SPA
Link 58b_190m	496559	164723	0	190	Thames Basin Heath SPA
Link 58b_200m	496562	164732	0	200	Thames Basin Heath SPA
Link 41_9m	490649	164824	0	9	Thames Basin Heath SPA
Link 41_10m	490649	164823	0	10	Thames Basin Heath SPA
Link 41_20m	490642	164816	0	20	Thames Basin Heath SPA
Link 41_30m	490636	164808	0	30	Thames Basin Heath SPA
Link 41_40m	490629	164800	0	40	Thames Basin Heath SPA
Link 41_50m	490623	164793	0	50	Thames Basin Heath SPA
Link 41_60m	490616	164785	0	60	Thames Basin Heath SPA
Link 41_70m	490610	164778	0	70	Thames Basin Heath SPA
Link 41_80m	490604	164770	0	80	Thames Basin Heath SPA
Link 41_90m	490597	164762	0	90	Thames Basin Heath SPA
Link 41_100m	490591	164755	0	100	Thames Basin Heath SPA
Link 41_110m	490584	164747	0	110	Thames Basin Heath SPA
Link 41_120m	490578	164739	0	120	Thames Basin Heath SPA
Link 41_130m	490571	164732	0	130	Thames Basin Heath SPA
Link 41_140m	490565	164724	0	140	Thames Basin Heath SPA
Link 41_150m	490559	164716	0	150	Thames Basin Heath SPA
Link 41_160m	490552	164709	0	160	Thames Basin Heath SPA
Link 41_170m	490546	164701	0	170	Thames Basin Heath SPA
Link 41_180m	490539	164693	0	180	Thames Basin Heath SPA
Link 41_190m	490533	164686	0	190	Thames Basin Heath SPA
Link 41_200m	490526	164678	0	200	Thames Basin Heath SPA
Link 32_4.6m	488085	166453	0	4.6	Thames Basin Heath SPA
Link 32_10m	488088	166449	0	10	Thames Basin Heath SPA
Link 32_20m	488095	166442	0	20	Thames Basin Heath SPA
Link 32_30m	488101	166434	0	30	Thames Basin Heath SPA
Link 32_40m	488108	166426	0	40	Thames Basin Heath SPA
Link 32_50m	488114	166419	0	50	Thames Basin Heath SPA

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	Ecological Designation
Link 32_60m	488121	166411	0	60	Thames Basin Heath SPA
Link 32_70m	488127	166403	0	70	Thames Basin Heath SPA
Link 32_80m	488133	166396	0	80	Thames Basin Heath SPA
Link 32_90m	488140	166388	0	90	Thames Basin Heath SPA
Link 32_100m	488146	166380	0	100	Thames Basin Heath SPA
Link 32_110m	488153	166373	0	110	Thames Basin Heath SPA
Link 32_120m	488159	166365	0	120	Thames Basin Heath SPA
Link 32_130m	488166	166357	0	130	Thames Basin Heath SPA
Link 32_140m	488172	166350	0	140	Thames Basin Heath SPA
Link 32_150m	488178	166342	0	150	Thames Basin Heath SPA
Link 32_160m	488185	166334	0	160	Thames Basin Heath SPA
Link 32_170m	488191	166327	0	170	Thames Basin Heath SPA
Link 32_180m	488198	166319	0	180	Thames Basin Heath SPA
Link 32_190m	488204	166311	0	190	Thames Basin Heath SPA
Link 32_200m	488211	166304	0	200	Thames Basin Heath SPA
Link 53_13.9m	491371	162242	0	13.9	Thames Basin Heath SPA
Link 53_20m	491375	162237	0	20	Thames Basin Heath SPA
Link 53_30m	491380	162229	0	30	Thames Basin Heath SPA
Link 53_40m	491386	162221	0	40	Thames Basin Heath SPA
Link 53_50m	491392	162212	0	50	Thames Basin Heath SPA
Link 53_60m	491397	162204	0	60	Thames Basin Heath SPA
Link 53_70m	491403	162196	0	70	Thames Basin Heath SPA
Link 53_80m	491409	162188	0	80	Thames Basin Heath SPA
Link 53_90m	491415	162180	0	90	Thames Basin Heath SPA
Link 53_100m	491420	162171	0	100	Thames Basin Heath SPA
Link 53_110m	491426	162163	0	110	Thames Basin Heath SPA
Link 53_120m	491432	162155	0	120	Thames Basin Heath SPA
Link 53_130m	491438	162147	0	130	Thames Basin Heath SPA
Link 53_140m	491443	162139	0	140	Thames Basin Heath SPA
Link 53_150m	491449	162130	0	150	Thames Basin Heath SPA
Link 53_160m	491455	162122	0	160	Thames Basin Heath SPA
Link 53_170m	491461	162114	0	170	Thames Basin Heath SPA
Link 53_180m	491466	162106	0	180	Thames Basin Heath SPA
Link 53_190m	491472	162098	0	190	Thames Basin Heath SPA
Link 53_200m	491478	162089	0	200	Thames Basin Heath SPA

Model Setup

Road traffic emissions of NO_x were derived using Defra's current Emission Factor Toolkit (EFT v10.1) and associated tools[1]. Road traffic emissions of NH_3 were derived using Air Quality Consultants' Calculator for Road Emissions of Ammonia (CREAM) V1A)[2].

Detailed dispersion modelling was undertaken using ADMS-Roads v5.0 to model concentrations of NOx and NH_3 using the parameters in Table 3 for the following scenarios:

1. 2019 Baseline – 2019 traffic data, emission factors and background concentrations;
2. 2037 Future Baseline – 2019 traffic data, 2030 emission factors and background concentrations (the latest projected year available from Defra);
3. 2037 Do -Minimum – 2037 traffic data without Neighbourhood Plan, 2030 emission factors and background concentrations;
4. 2037 Do-Something – 2037 traffic data with Neighbourhood Plan in place, 2030 emission factors and background concentrations.

Table 3 General ADMS-Roads Model Conditions

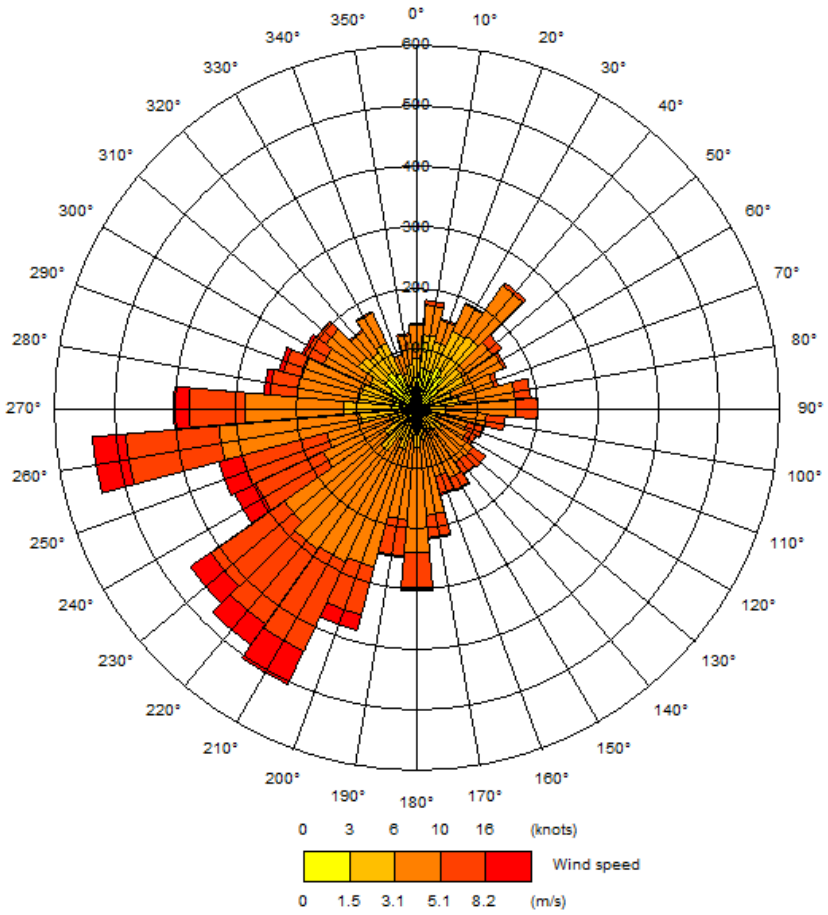
Variables	ADMS-Roads Model Input
Surface roughness at source	0.5m
Surface roughness at Metrological Site	0.2m
Minimum Monin-Obukhov length for stable conditions	30m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = 0m for ecological receptors.
Emissions	NO_x – Defra's EFT v10.1. NH_3 – CREAM V1A
Meteorological data	1 year (2019) hourly sequential data from Heathrow Airport meteorological station.
Receptors	Ecological
Model output	Long-term (annual) mean NO_x and NH_3 concentrations.

[1] https://laqm.defra.gov.uk/
[2] https://www.agconsultants.co.uk/resources/ammonia-emissions-from-roads-for-assessing-impacts

Meteorological Data

One year (2019) of hourly sequential observation data from Heathrow Airport meteorological station has been used in this assessment to correspond with the baseline year. The station is located approximately 10km east of the closest ecological site (Windsor Forest Great Park SAC) and experiences meteorological conditions that are representative of those experienced within the air quality study area. Figure 1 shows that the dominant direction of wind is from the south-west, as is typical for the UK. The wind speed ranges from 0-18 knots (0- ~9.3 m/s).

Figure 1 Wind Rose of Heathrow Met Data 2019



Background Data

Background data for NO_2 and NO_x concentrations for 2019 and 2030 have been sourced from Defra's 2018-based background maps for receptors within the nearest 1km by 1km grid squares (Table 4). The data shows that the mapped background concentrations are predicted to decrease between 2019 and 2030.

Table 4 Defra Mapped Background Pollutant Concentrations (µg/m³)

Grid Square (X, Y)	Local Authority	Annual Mean Concentrations			
		2019 NOx	2019 NO_2	2030 NOx	2030 NO_2
495500,175500	Windsor & Maidenhead	18.0	13.3	12.9	9.8
493500,173500	Windsor & Maidenhead	14.7	11.1	10.6	8.2
496500,174500	Windsor & Maidenhead	16.1	12.0	11.5	8.8
496500,168500	Windsor & Maidenhead	15.9	11.9	11.4	8.7
493500,174500	Windsor & Maidenhead	15.6	11.7	11.4	8.7
493500,171500	Bracknell Forest	15.8	11.9	11.3	8.7
485500,165500	Bracknell Forest	14.3	10.8	10.1	7.9
488500,166500	Bracknell Forest	14.8	11.1	10.4	8.1
490500,164500	Surrey Heath	15.8	11.9	11.0	8.5
491500,162500	Surrey Heath	18.9	13.9	12.7	9.7
496500,164500	Surrey Heath	18.3	13.6	12.2	9.3
489500,160500	Surrey Heath	18.5	13.6	12.7	9.7

Ecological Data

The annual mean critical levels of NOx and NH_3 concentrations above which adverse effects on ecosystems may occur based on present knowledge are summarised in Table 5.

Table 5 Annual Mean Critical Levels (NOx and NH_3)

Pollutant	Critical Level
Oxides of nitrogen (NOx)	30 µg/m³
Ammonia (NH_3)	3 µg/m³ 1 µg/m³ for lichens and bryophytes

The Air Pollution Information System[3] (APIS) provides 'a searchable database and information on pollutants and their impacts on habitats and species'. The parameters for *Atlantic acidophilous beech forests* in the Windsor Forest and Great Park SAC and for *Dwarf Shrub Heath* in the Thames Basin SPA were taken from APIS and are presented in Table 6.

No change in the APIS concentrations or deposition rates have been assumed from the APIS 2016-2018 values to 2019 nor to the future year.

[3] http://www.apis.ac.uk/

Table 6 Air Pollution Information System (APIS) Data of the Ecological Receptors.

Receptor	Av. N Dep Rate kgN/ha/yr	Critical Load Av. N Dep Rate kgN/ha/yr	Total Av. Acid Dep Rate keq/ha/yr	Nitrogen Av. Acid Dep Rate keq/ha/yr	Critical Load Nitrogen Av. Acid Dep Rate keq/ha/yr	Ammonia µg/m^3	Habitat	APIS Data Year
Link 16 (Transect)	24.56	10 - 20	1.94	1.75	0.357-2.763	1.35	Atlantic acidophilous beech forests	2016 - 2018
Link 19 (Transect)	20.93	10 - 20	1.69	1.5	0.357-2.763	0.97	Atlantic acidophilous beech forests	2016 - 2018
Link 11 (Transect)	21.07	10 - 20	1.68	1.51	0.357-2.763	1.02	Atlantic acidophilous beech forests	2016 - 2018
Link 8 (Transect)	20.93	10 - 20	1.69	1.5	0.357-2.763	0.97	Atlantic acidophilous beech forests	2016 - 2018
Link 44 (Transect)	13.45	10 - 20	1.108	0.96	1.035-2.344	1.18	Dwarf Shrub Heath	2016 - 2018
Link 20 (Transect)	13.45	10 - 20	1.108	0.96	1.035-2.344	1.18	Dwarf Shrub Heath	2016 - 2018
Link 58b (Transect)	12.65	10 - 20	1.06	0.903	1.035-2.344	1.06	Dwarf Shrub Heath	2016 - 2018
Link 41 (Transect)	13.14	10 - 20	1.1	0.939	1.035-2.344	1.07	Dwarf Shrub Heath	2016 - 2018
Link 32 (Transect)	13.45	10 - 20	1.108	0.96	1.035-2.344	1.18	Dwarf Shrub Heath	2016 - 2018
Link 53 (Transect)	13.14	10 - 20	1.1	0.939	1.035-2.344	1.07	Dwarf Shrub Heath	2016 - 2018

Verification

Local air quality monitoring was conducted by Surrey Heath Council near the M3. This allowed a comparison between modelled and measured concentrations to be made which enabled the model results to be adjusted so that they could be brought in-line with measured concentrations. Though the Royal Borough of Windsor and Maidenhead (RBWM) conducts air quality monitoring on the modelled road network, these were not deemed appropriate for this assessment as they represent 'stop-start' traffic in congested urban areas whereas all ecological receptors are located in open areas with free-flowing traffic. Therefore, RBWM's monitoring data was excluded from the verification process. Diffusion tube monitoring data from Surrey Heath Council used for verification is presented in Table 7.

Table 7 Surrey Heath Council Diffusion Tube Monitoring Data used for Verification

Tube ID	Location	Site Type	X,Y	Height (m)	Annual Mean NO_2 ug/m^3 2019
SH5	Chestnut Avenue	Roadside	489465,160596	1.75	32.5
SH7	M3 Brickhill roadside	Roadside	496105,164401	1.75	39.5
SH35	Prior End	Roadside	489196,160203	1.75	28.0
SH36	Youlden Drive	Roadside	489355,160385	1.75	30.0
SH37	Crawley Drive	Roadside	489083,160265	1.75	33.4

The results of the monitoring were compared to modelled results for the same locations, and a verification factor calculated in line with methods outlined in LAQM TG(16). Details of this comparison can be found in Table 8.

Table 8 Summary of NO_2 Verification Exercise

Tube ID	*Measured Road NO_X Contribution ($\mu g/m^3$)*	*Modelled Road NO_X Contribution ($\mu g/m^3$) before adjustment*	*Road NO_X Factor*	*Monitored NO_2 ($\mu g/m^3$)*	*Modelled NO_2 ($\mu g/m^3$) before adjustment*	*Modelled NO_2 ($\mu g/m^3$) after adjustment*
SH5	37.4	24.7	1.51	32.5	26.5	32.7
SH7	53.1	22.1	2.41	39.5	25.1	30.8
SH35	27.9	18.5	1.51	28.0	23.4	28.2
SH36	32.1	29.9	1.07	30.0	29.0	36.3
SH37	39.3	17.6	2.24	33.4	22.9	27.5
		Overall Road NO_x Factor	**1.53**			

Table 8 shows that the unadjusted model under predicts the annual mean concentrations of NOx. To account for this bias, the factor of the difference between the modelled and measured road NO_X contribution at the diffusion tube locations were compared, in line with the methodology described in LAQM.TG(16). The model under-predicted the road NO_X contribution by 33-50 %. The uncertainty of the adjusted model was considered using the Route Mean Square Error (RMSE) calculation. An RMSE value of within 10% of the national air quality objective of 40 $\mu g/m^3$ for NO_2 is considered to demonstrate good agreement, i.e. 4 $\mu g/m^3$. The RMSE value for the adjusted model is approximately 5.5 $\mu g/m^3$ which is within 14% of the NO_2 objective and is considered acceptable.

Therefore, the NO_x verification factor used is 1.53. In the absence of verification for NH_3, a factor of 1.0 has been used based upon professional judgement and experience of verification studies in other areas.

Deposition velocities

Deposition of nitrogen from road traffic derived NH_3 and NO_2 are estimated using the AQTAG deposition velocities that are cited in the 2020 IAQM guidance[4], as shown in Table 9. Deposition velocities for short vegetation were applied to data for the transects with 'dwarf shrub heath' the dominant feature (Thames Basin SPA), whilst deposition velocities for forest were applied to data for those transects with 'Atlantic acidophilous beech forests' present (Windsor SAC).

Table 9 Air Pollution Information System (APIS) Data of the Ecological Receptors.

Pollutant	Habitat	Nitrogen deposition conversion rates	Deposition velocity
NO_2	Forest	1 $\mu g/m^3$ NO_2= 0.29 kgN/ha/yr	0.003 m/s
NH_3	Forest	1 $\mu g/m^3$ NH_3 = 7.8 kgN/ha/yr	0.030 m/s
NO_2	Short Vegetation	1 $\mu g/m^3$ NO_2= 0.14 kgN/ha/yr	0.0015 m/s
NH_3	Short Vegetation	1 $\mu g/m^3$ NH_3 = 5.19 kgN/ha/yr	0.020 m/s

Limitations

The following limitations are recognised:

- It has been assumed that the verification factor derived from the Surrey Heath Council monitoring data is representative of the whole modelled area;
- In the absence of monitoring data for NH_3 a verification factor has been used based upon professional judgement and experience of the CREAM tool;
- Without background monitoring data, it is assumed that the Defra and APIS concentrations correctly represent the background NO_x, NO_2 and NH_3 concentrations for the baseline and future year;

[4] https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

- The composition of the vehicle fleet outside of London was updated with the release of EFT v10.1. Air Quality Consultants' CREAM V1A tool was based upon the previous version of Defra's EFT (v9.1), therefore there are some differences in the vehicle fleets used to predict future concentrations of NOx and NH_3 respectively.

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