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South Oxfordshire Local Plan 2034 Final Publication Version 2nd

Habitats Regulations Assessment

Prepared by LUC in association Air Quality Assessments Ltd
December 2018

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Executive Summary

Introduction

This document presents the methodology and findings of the Habitats Regulations Assessment of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd (due to be published in January 2019), which is being produced by South Oxfordshire District Council. Once adopted, the Local Plan will set out policies and guidance for development in the District over the next 15 years to 2034.

Development plans, such as the South Oxfordshire Local Plan, are subject to a process called Habitats Regulations Assessment (HRA). The purpose of HRA is to identify any potential adverse effects of a plan on 'European sites'. European sites comprise those wildlife sites designated for their biodiversity value at European or international level. This includes:

- Special Protection Areas (SPAs): classified under the Birds Directive¹ for the protection of wild birds and their habitats.
- Special Areas of Conservation (SACs): designated under the Habitats Directive² and target particular habitats and/or species identified as being of European importance.
- Ramsar sites: support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

Sites that have started the formal process of becoming designated as one of the above are also considered in an HRA.

There are three main stages of HRA, which are as follows:

- Stage 1: Screening – determining whether the plan could lead to likely significant effects on a European site.
- Stage 2: Appropriate Assessments – if a likely significant effect is identified in Stage 1, it needs to be determined whether these will lead to an adverse effect on the integrity of the site(s) affected.
- Stage 3: If adverse effects on integrity are identified in Stage 2, alternative options for the plan must be considered. If there are no possible alternatives that could avoid the adverse effects, the plan will only be acceptable if it can be demonstrated that there are 'Imperative Reasons of Overriding Public Interest' for the plan to progress.

This report documents Stages 1 and 2, as it was not considered necessary to progress to Stage 3.

Methodology

This HRA drew on previous iterations of the HRA, which were carried out at earlier stages of the plan-making process. It documents the assessment of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd (due to be published in January 2019), taking into account relevant recent case law (see **Chapter 1** of the main report).

The HRA focused on the European sites that lie within 17km of the South Oxfordshire District boundary. This distance is based on the average travel to work distance for South Oxfordshire and includes the following sites:

- Aston Rowant SAC.
- Burnham Beeches SAC.
- Chilterns Beechwoods SAC.
- Cothill Fen SAC.
- Kennet and Lambourn Floodplain SAC.
- Little Wittenham SAC.
- Oxford Meadows SAC.
- River Lambourn SAC.

¹ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

² Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

- Hackpen Hills SAC.
- Hartslock Wood SAC
- Thames Basin Heaths SPA.
- Windsor Forest and Great Park SAC.

The HRA also considered the potential for 'in-combination' effects of the South Oxfordshire Local Plan with the effects of other plans and projects, in particular development proposed in neighbouring authorities' local plans.

Stage 1: Screening

The screening stage of the HRA has taken the approach of screening each Local Plan policy and site allocation individually. This concluded that the some policies could have significant effects on Aston Rowant SAC and/or Little Wittenham SAC, as shown in **Table 1** below.

Table 1: Outcomes of the HRA Screening stage

European site potentially affected	Type of effect	Policies with potential to lead to these effects
Aston Rowant SAC	Air pollution	<p>STRAT2: South Oxfordshire Housing and Employment Requirements.</p> <p>EMP1: The Amount and Distribution of New B-Class Employment Land.</p> <p>EMP12: Tourism.</p> <p>TRANS1a: Supporting Strategic Transport Investment across the Oxford to Cambridge Arc.</p> <p>TRANS1b: Supporting Strategic Transport Investment.</p> <p>TC1: Retail and Services Growth.</p>
Little Wittenham SAC	Recreation	<p>STRAT2: South Oxfordshire Housing and Employment Requirements.</p> <p>STRAT7: Land at Chalgrove Airfield.</p> <p>STRAT9: Land Adjacent to Culham Science Centre.</p> <p>STRAT10: Land at Berinsfield.</p> <p>H2: New Housing in Didcot.</p> <p>H3: Housing in the Towns of Henley-on-Thames, Thame and Wallingford.</p> <p>H4: Housing in Larger Villages.</p>

Stage 2: Appropriate Assessment

The Appropriate Assessment considered the effects identified in **Table 1** above in more detail.

Air pollution

Air quality modelling was undertaken to determine whether adverse effects on Aston Rowant SAC would arise as a result of the Local Plan. This was informed by traffic modelling work undertaken by Atkins on behalf of South Oxfordshire District Council. The air quality modelling concluded that both nitrogen oxides and nitrogen deposition would increase at some of the specific receptor locations at the SAC periphery. These increases would be more than 1% of the long-term environmental standard, which has been used as the threshold above which effects have the potential to be significant. However, the Appropriate Assessment concluded that these effects would not be expected to result in any material changes to the qualifying features of the SAC. This is for a number of reasons, including the fact that

figures used are likely to be highly precautionary; the 1% threshold would be exceeded for less than 0.1% of the SAC as a whole, much of the M40 lies within a cutting and the existing habitats within proximity to the road are resilient to the effects of nutrient deposition.

Recreation

The increase in visitors at Little Wittenham SAC as a result of the Local Plan would be within that predicted and planned for by the Earth Trust, which manages the site. However, the Local Plan, in-combination with other plans is expected to exceed the number of visitors planned for by the Earth Trust. However, adverse effects on integrity are unlikely to occur due to a number of factors. These include the limited sensitivity of the site's qualifying feature, being its great crested newt population, and suitable existing and planned future management of Little Wittenham SAC. In addition, Policies ENV5 (Green Infrastructure in new developments) and CF5 (Open Space, Sport and Recreation in new residential development) should help to divert visits to Little Wittenham SAC.

In-combination effects

The Appropriate Assessment took into account potential effects of the Local Plan in-combination with other plans and projects. It was concluded that no adverse effects on the integrity of European sites were likely to arise as a result of in-combination effects.

Conclusion

This HRA has concluded that the South Oxfordshire Local Plan 2034 Final Publication Version 2nd is not likely to lead to adverse effects on the integrity of any European sites, either alone or in-combination with other plans and projects.

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1 Introduction

- 1.1 LUC has been commissioned by South Oxfordshire District Council to carry out a Habitats Regulations Assessment (HRA) of its Local Plan. This report presents the methodology and findings of the HRA of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd (due to be published in January 2019).

Background to the preparation of the new Local Plan

- 1.2 South Oxfordshire District Council (SODC) is producing a new Local Plan for the District, which will replace the Core Strategy and saved policies of the Local Plan 2011. Once adopted, the Local Plan will set out policies and guidance for development in the District over the next 15 years to 2034. The Council adopted its Local Plan 2011 in 2006, and then adopted its Core Strategy in December 2012; the Core Strategy included some 'saved' policies from the Local Plan 2011, including some strategic allocations.
- 1.3 The Core Strategy set out the Council's approach to development in the District up to 2027 and provided for the development of 5,214 new homes and 14.7 ha of employment land over the Plan period¹. At the time that the Core Strategy was adopted the Council was intending to produce a number of other Development Plan Documents (DPDs), which together with the Core Strategy, the saved policies of the Local Plan 2011 and adopted Neighbourhood Development Plans would comprise the Development Plan for the District.
- 1.4 In April 2014 a Strategic Housing Market Assessment (SHMA) for Oxfordshire was published, setting out levels of housing need across the county up to 2031. The SHMA showed that more homes would be required in South Oxfordshire than were provided for in the adopted Core Strategy. Following the publication of the SHMA, the district authorities in Oxfordshire also made a commitment to assist in providing for Oxford City's unmet housing need. The Council therefore decided to review the existing plan and extend it to cover the period up to 2031; this was subsequently amended to 2034. Work on a Sites and General Policies DPD had commenced but was halted once the decision was made to review the Core Strategy. The intended content of that DPD has instead been incorporated into the new Local Plan.
- 1.5 The Council has rolled forward many of the strategic allocations and policies from the adopted Core Strategy into the South Oxfordshire Local Plan 2034. The main areas of change involve addressing how to distribute the additional housing required and planning for the associated infrastructure.
- 1.6 In June 2014 the Council consulted on an Issues and Scope document for the Local Plan 2031. This explained the background to the preparation of the new Local Plan and presented a number of broad options for the distribution of the additional housing required in South Oxfordshire. Consultation questions were also put forward relating to issues such as transport infrastructure and Gypsy and Traveller sites.
- 1.7 The Council then consulted on a refined options document in February 2015. The refined options document was supported by an HRA³ that was also produced by LUC and commented on by Natural England and the Environment Agency. Later, in June 2016 the Council published its first preferred options document. This consultation focused on the headline issues for the Local Plan with the intention to add the detail later through a second preferred options consultation.
- 1.8 Consultation on the Second Preferred Options version of the Local Plan (Regulation 18 consultation) took place between March and May 2017. A previous version of the HRA was made available for comment alongside it.

³ South Oxfordshire District Council (December 2012) *Core Strategy* (Table 4.1)

- 1.9 Consultation on the Publication version (Version 1) of the Local Plan (Regulation 19 consultation) took place between October and November 2017. An HRA Report was published to accompany the pre-submission consultation in October 2017, however this was subsequently updated following the public consultation and the completion of air dispersion modelling (January 2018).
- 1.10 The Local Plan 2034 Final Publication Version 2nd includes a vision for South Oxfordshire to 2034, strategic objectives and a strategy for how these will be achieved. The plan allocates sites for development and provides a policy framework which will be used to assess planning proposals and applications. The Local Plan provides the broad strategic framework for growth in the District and identifies strategic growth locations; Neighbourhood Development Plans (NDP) will set out non-strategic policies and allocations.
- 1.11 The Publication Version Local Plan (October 2017) proposed four new strategic allocations at Berinsfield, Chalgrove, Culham and Wheatley. However, the Council has since undertaken a review of its strategic allocations. Initially, 15 potential strategic development sites were identified. These were then subject to a filtering exercise, based on known constraints, which ruled out five of these sites. Ten potential strategic development sites were then considered for allocation, including the four strategic allocations in the previous Publication Version of the Local Plan (October 2017), and were subject to a high-level consideration of their potential impacts on European sites in September 2018. Following this, the Council have taken forward seven strategic development allocations to be included within the Local Plan.

The requirement to undertake Habitats Regulations Assessment of Development Plans

- 1.12 The requirement to undertake HRA of development plans was confirmed by the amendments to the Habitats Regulations published for England and Wales in July 2007 and updated in 2010 and again in 2012. These updates were consolidated into the Conservation of Habitats and Species Regulations 2017⁴.
- 1.13 The HRA refers to the assessment of the potential effects of a development plan on one or more European Sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs):
- SPAs are classified under the European Council Directive “on the conservation of wild birds” (79/409/EEC; ‘Birds Directive’) for the protection of wild birds and their habitats (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).
 - SACs are designated under the Habitats Directive and target particular habitats (Annex 1) and/or species (Annex II) identified as being of European importance.
- 1.14 Currently, the Government also expects potential SPAs (pSPAs), possible SACs (pSACs) and Ramsar sites to be included within the assessment⁵.
- Ramsar sites support internationally important wetland habitats and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).
- 1.15 Candidate SACs (cSACs) and Sites of Community Importance (SCIs), which are sites that have been adopted by the European Commission but not yet formally designated by the government, must also be considered.
- 1.16 For ease of reference during HRA, these three designations are collectively referred to as European sites, despite Ramsar designations being at the wider international level.
- 1.17 The overall purpose of the HRA is to conclude whether or not a proposal or policy, or whole development plan would adversely affect the integrity of the site in question. This is judged in

⁴ *The Conservation of Habitats and Species Regulations 2017* (Statutory Instrument 2017 No. 1012) consolidate the Conservation of Habitats and Species Regulations 2010 with subsequent amendments.

⁵ Department of Communities and Local Government (July 2018) *National Planning Policy Framework* (para 176).

terms of the implications of the plan for a site's 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated). Significantly, HRA is based on the precautionary principle. Where uncertainty or doubt remains, an adverse effect should be assumed.

Stages of Habitats Regulations Assessment

1.18 **Table 1.1** below summarises the stages involved in carrying out a full HRA based on various guidance documents^{6,7}. This HRA presents the methodology and findings of Stage 1: Screening.

Table 1.1: Stages in HRA

Stage	Task	Outcome
Stage 1: Screening (the 'Significance Test')	Description of the plan. Identification of potential effects on European Sites. Assessing the effects on European Sites.	Where effects are unlikely, prepare a 'finding of no significant effect report'. Where effects judged likely, or lack of information to prove otherwise, proceed to Stage 2.
Stage 2: Appropriate Assessment (the 'Integrity Test')	Gather information (plan and European Sites). Impact prediction. Evaluation of impacts in view of conservation objectives. Where impacts considered to affect qualifying features, identify alternative options. Assess alternative options. If no alternatives exist, define and evaluate mitigation measures where necessary.	Appropriate Assessment report describing the plan, European site baseline conditions, the adverse effects of the plan on the European site, how these effects will be avoided through, firstly, avoidance, and secondly, mitigation including the mechanisms and timescale for these mitigation measures. If effects remain after all alternatives and mitigation measures have been considered proceed to Stage 3.
Stage 3: Assessment where no alternatives exist and adverse impacts remain taking into account mitigation	Identify and demonstrate 'imperative reasons of overriding public interest' (IROPI). Demonstrate no alternatives exist. Identify potential compensatory measures.	This stage should be avoided if at all possible. The test of IROPI and the requirements for compensation are extremely onerous.

1.19 In assessing the effects of the Local Plan in accordance with Regulation 105 of the Conservation of Habitats and Species Regulations 2017⁸, there are potentially two tests to be applied by the competent authority: a 'Significance Test', followed if necessary by an Appropriate Assessment which will inform the 'Integrity Test'. The relevant sequence of questions is as follows:

- Step 1: Under Reg. 105(1)(b), consider whether the plan is directly connected with or necessary to the management of the sites. If not –
- Step 2: Under Reg. 105(1)(a) consider whether the plan is likely to have a significant effect on the site, either alone or in combination with other plans or projects (the 'Significance Test'). [These two steps are undertaken as part of Stage 1: Screening shown in **Table 1.1** above.] If Yes –

⁶ *Planning for the Protection of European Sites. Guidance for Regional Spatial Strategies and Local Development Documents.* Department for Communities and Local Government (DCLG), August 2006.

⁷ *The HRA Handbook.* David Tyldesley & Associates, a subscription based online guidance document: <https://www.dtapublications.co.uk/handbook/>

⁸ SI No. 2017/2012

- Step 3: Under Reg. 105(1), make an Appropriate Assessment of the implications for the site in view of its current conservation objectives (the 'Integrity Test'). In so doing, it is mandatory under Reg. 105(2) to consult Natural England, and optional under Reg. 105(3) to take the opinion of the general public. [This step is undertaken during Stage 2: Appropriate Assessment shown in **Table 1.1** above.]
 - Step 4: In accordance with Reg.105(4), but subject to Reg.107, give effect to the land use plan only after having ascertained that the plan will not adversely affect the integrity of the European site.
- 1.20 It is normally anticipated that an emphasis on Stages 1 and 2 of this process will, through a series of iterations, help ensure that potential adverse effects are identified and eliminated through the avoidance of likely significant effects at Stage 1, and through Appropriate Assessment at Stage 2 by the inclusion of mitigation measures designed to avoid, reduce or abate effects. The need to consider alternatives could imply more onerous changes to a plan document. It is generally understood that so called 'imperative reasons of overriding public interest' (IROPI) are likely to be justified only very occasionally and would involve engagement with both the Government and European Commission.
- 1.21 The HRA should be undertaken by the 'competent authority' - in this case SODC, and LUC has been commissioned to do this on its behalf. The HRA also requires close working with Natural England as the statutory nature conservation body⁹ in order to obtain the necessary information and agree the process, outcomes and any mitigation proposals. The Environment Agency, while not a statutory consultee for the HRA, is also in a strong position to provide advice and information throughout the process.

Recent Case Law Changes

- 1.22 This HRA has been prepared in accordance with recent case law findings, including most notably the recent 'People over Wind' and 'Holohan' rulings from the Court of Justice for the European Union (CJEU).
- 1.23 The recent 'People over Wind, Peter Sweetman v Coillte Teoranta' judgment ruled that Article 6(3) of the Habitats Directive should be interpreted as meaning that mitigation measures should be assessed as part of an Appropriate Assessment, and should not be taken into account at the screening stage. The precise wording of the ruling is as follows:
- "Article 6(3)must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of measures intended to avoid or reduce the harmful effects of the plan or project on that site.*
- 1.24 In light of the above, the HRA screening stage for the South Oxfordshire Local Plan 2034 has not relied upon avoidance or mitigation measures to draw conclusions as to whether the Local Plan would result in likely significant effects on European sites, with any such measures being considered at the Appropriate Assessment stage as appropriate. This is discussed in more detail in **Section 3** below.
- 1.25 This HRA also fully considers the recent Holohan v An Bord Pleanala (9 Nov 2018) CJEU judgement which stated that:
- Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that an 'appropriate assessment' must, on the one hand, catalogue the entirety of habitat types and species for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the conservation objectives of the site.*

⁹ Regulation 5 of *The Conservation of Habitats and Species Regulations 2017* (Statutory Instrument 2017 No. 1012).

Article 6(3) of Directive 92/43 must be interpreted as meaning that the competent authority is permitted to grant to a plan or project consent which leaves the developer free to determine subsequently certain parameters relating to the construction phase, such as the location of the construction compound and haul routes, only if that authority is certain that the development consent granted establishes conditions that are strict enough to guarantee that those parameters will not adversely affect the integrity of the site.

Article 6(3) of Directive 92/43 must be interpreted as meaning that, where the competent authority rejects the findings in a scientific expert opinion recommending that additional information be obtained, the 'appropriate assessment' must include an explicit and detailed statement of reasons capable of dispelling all reasonable scientific doubt concerning the effects of the work envisaged on the site concerned.

- 1.26 In undertaking this HRA, LUC has fully considered the potential for effects on species and habitats, including those not listed as qualifying features, to result in secondary effects upon the qualifying features of European sites, including the potential for complex interactions and dependencies. In addition, the potential for offsite impacts, such as through impacts to functionally linked land, and or species and habitats located beyond the boundaries of European site, but which may be important in supporting the ecological processes of the qualifying features, has also been fully considered in this HRA.

Previous HRA work

- 1.27 The South Oxfordshire Core Strategy was subject to HRA throughout its preparation and, while the HRA of the South Oxfordshire Local Plan 2034 is being undertaken as a separate exercise, there is a significant body of relatively recent HRA work and supporting evidence which can be drawn from. The HRA for the Core Strategy¹⁰ assessed the potential for impacts on the following six European sites that all fall within 17 km of the four main towns in South Oxfordshire (Didcot, Thame, Wallingford and Henley-on-Thames). This approach reflected the average travel to work distance in the District and recognised the fact that the effects of development within South Oxfordshire may be transmitted to European sites outside of the District boundary. The following sites fall within the 17km buffer:
- Aston Rowant SAC.
 - Chilterns Beechwoods SAC.
 - Cothill Fen SAC.
 - Hartslock Wood SAC.
 - Little Wittenham SAC.
 - Oxford Meadows SAC.
- 1.28 Likely significant effects were not able to be ruled out during the screening stage of the HRA of the Core Strategy; therefore Appropriate Assessment was undertaken in relation to the following potential significant effects:
- Effects on Aston Rowant SAC, Chilterns Beechwoods SAC and Hartslock Wood SAC¹¹ as a result of increased air pollution from vehicle traffic linked to population growth at Henley-on-Thames, Thame and Wallingford.
 - Effects on Cothill Fen SAC in relation to reduced groundwater levels as a result of increased water demand from new development and water quality issues arising from wastewater discharges¹².

¹⁰ http://www.southoxon.gov.uk/sites/default/files/Appropriate%20Assessment_2.pdf

¹¹ The Core Strategy HRA only considered sites within 17km of the main towns and did not consider proximity to major roads until the Appropriate Assessment stage. The European sites screened in therefore differs from this HRA.

¹² Since the Core Strategy HRA was written, the district's Water Cycle Strategy has progressed; the additional information has informed the screening of this HRA.

- Effects on Little Wittenham SAC in relation to increased visitor pressure arising from the expected population growth at Didcot and Wallingford.
 - Effects on Oxford Meadows SAC in relation to air pollution from increased traffic volume on the A34, direct land take from the SAC to facilitate improvements to the A34¹³ and increased demand for water¹².
- 1.29 As a result of the work carried out during the Appropriate Assessment stage it was concluded that none of the above European sites would be significantly affected by the proposals in the Core Strategy either alone or in combination with other plans and policies. However, it was noted that the HRA would need to be updated as further policies within the Local Development Framework (LDF) were defined, particularly those associated with the allocation of housing developments within the larger villages. This recommendation is superseded by the requirement for HRA of the South Oxfordshire Local Plan 2034 which will replace the further LDF documents referred to in the HRA of the Core Strategy. The Local Plan 2034 Final Publication Version 2nd includes policies for the distribution of housing and these are assessed in full in this HRA.
- 1.30 SODC undertook HRA work in relation to the Local Plan 2031 Issues and Scope document, which was presented in Appendix 3 of the Sustainability Appraisal (SA) Scoping Report (June 2014)¹⁴. This HRA work focused on European sites within South Oxfordshire and within 17km of the plan boundary. This drew on the 17km buffer distance identified for the Core Strategy, but amended it to include the District boundary. This is a more precautionary approach than using a 17km distance from the main towns (as used in the Core Strategy) and reflects the fact that effects could arise outside of the main towns in the District.
- 1.31 For each of the 12 European sites within 17 km of the District boundary, information was provided on the qualifying features, conservation objectives and potential implications for the Local Plan 2031 (as it was at the time). Consideration was also given to the potential impacts of other plans, such as Local Plans produced by neighbouring authorities. Because the Local Plan was at such an early stage it was not possible to begin assessing the likelihood of policies and proposals in the Plan having significant effects on the integrity of the European sites. However, the information set out in the document represents important evidence on which the HRA work for the Local Plan can be based and has been drawn on during the preparation of this report.
- 1.32 LUC was then appointed by SODC to carry out an HRA of the spatial distribution of housing for the level of growth identified in the former Core Strategy and four growth scenarios for the Local Plan 2031 (now 2034)¹⁵. Those growth scenarios and the spatial distribution have evolved into what is now the Local Plan.
- 1.33 The HRA of the spatial distribution strategy concluded that there would be no likely significant effects on European sites; however the HRA screening of the four growth scenarios identified uncertainty regarding whether there would be likely significant effects in relation to increased air pollution, increased recreation pressure and increased demand for water abstraction and treatment.
- 1.34 The report advised that at that stage in the assessment and plan making process, it was not possible to determine a scale of growth above which housing scenarios would be likely to have significant effects on European sites, although it was noted that higher levels of growth were more likely to result in likely significant effects. Therefore, in order to reach more certain conclusions during later stages of the HRA work for the Local Plan, it was advised that the following data would be required:
- Traffic data showing likely increases in Average Annual Daily Traffic (AADT) as a result of the Local Plan 2031 along the stretches of 'A' roads which lie within 200 m of Aston Rowant SAC, Burnham Beeches SAC, Chilterns Beechwoods SAC, Kennet and Lambourn Floodplain SAC, Oxford Meadows SAC, River Lambourn SAC and Windsor Forest and Great Park SAC. Air quality modelling could also be required should the traffic projections reveal significant traffic increases in the vicinity of the European sites.

¹³ Not included in the South Oxfordshire Local Plan and covered by Vale of White Horse District Council's Core Policy 34

¹⁴ <http://www.southoxon.gov.uk/services-and-advice/planning-and-building/planning-policy/evidence-studies/sustainability-appraisal->

¹⁵ LUC (January 2015) *Habitats Regulations Assessment for South Oxfordshire District Council* - <http://www.southoxon.gov.uk/sites/default/files/HRA%20phase%201%20report.pdf>

- Information about levels of headroom at the sewage treatment works that serve the four main towns and 12 villages at which housing development is to be provided and about water availability in the relevant abstraction zones, in order to assess whether adverse effects could occur on the integrity of Burnham Beeches SAC, Cothill Fen SAC, Kennet and Lambourn Floodplain SAC, Little Wittenham SAC, Oxford Meadows SAC, River Lambourn SAC, Thames Basin Heaths SPA, and Windsor Forest and Great Park SAC.
 - Depending on the outcome of consultation with Natural England, it was identified that it may also be necessary to obtain data about recreational use of European sites, for example via visitor surveys.
- 1.35 In March 2017, LUC then carried out an HRA of the Second Preferred Options version of the Local Plan. Refinement of the Local Plan since the HRA of the Local Plan growth scenarios and additional information allowed some potential effects, for example those associated with changes to water quality or quantity to be screened out the assessment. However, there was insufficient information to rule out significant effects in relation to the following:
- Potential impacts due to recreation pressure at Little Wittenham SAC.
 - Potential air pollution impacts at Aston Rowant SAC, Burnham Beeches SAC; Chilterns Beechwoods SAC; and Windsor Forest & Great Park SAC.
- 1.36 The HRA formed part of the consultation on the Second Preferred Options Local Plan¹⁶ and some comments (**Appendix 4**) were received in relation to the HRA.
- 1.37 A further iteration of the HRA was published alongside the Publication Version Local Plan (October 2017), and this was subsequently updated again following the completion of air dispersion modelling (January 2018).
- 1.38 In May 2018, the Council decided to review the strategic housing allocations included in the emerging Local Plan. In September 2018, LUC carried out a preliminary review of reasonable alternative strategic sites and potential development scenarios, in order to give an initial view on whether these would result in likely significant effects on European sites. Whilst this followed HRA principles, it was not a formal HRA Screening exercise. The purpose of the review was to feed into the site assessment process being undertaken by the Council in the Autumn of 2018 in order to consider potential modifications of the Publication Version of the South Oxfordshire Local Plan (October 2017). As stated in **Paragraph 1.11**, ten potential strategic development sites were considered for allocation, including the four strategic allocations in the previous Publication version of the Local Plan (October 2017). The review concluded that all development scenarios would likely require further consideration with regards to their potential effects on European sites in relation to air pollution, water quality and quantity, and recreation impacts. Following this, the Council have taken forward seven strategic development allocations to be included within the Final Publication Version 2nd of the South Oxfordshire Local Plan (due to be published in January 2019).

Structure of the HRA report

- 1.39 This chapter (**Chapter 1**) has introduced the requirement to undertake HRA of the Local Plan and has set out relevant background information. The remainder of the report is structured as follows:
- **Chapter 2: The Local Plan** summarises the content of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd, which is the subject of this report.
 - **Chapter 3: HRA Screening Methodology** sets out the approach used and the specific tasks undertaken during the screening stage of the HRA.
 - Chapter 4: HRA Screening Assessment describes the findings of the screening stage of the HRA.

¹⁶ Consultation on the South Oxfordshire Local Plan 2033 Second Preferred Options took place in March – May 2017.

- **Chapter 5: Appropriate Assessment** sets out the methodology and findings of the Appropriate Assessment stage of the HRA.
- **Chapter 6: Conclusions** summarises the HRA conclusions for the South Oxfordshire Local Plan 2034 Final Publication Version 2nd and describes the next steps to be undertaken.

2 The Local Plan

- 2.1 The South Oxfordshire Local Plan 2034 Final Publication Version 2nd sets out the overall vision for South Oxfordshire to 2034, strategic objectives and a strategy for how these will be achieved. The plan allocates sites for development and provides a policy framework that will be used to assess planning proposals and applications in the District. These are summarised below.

Summary of the Local Plan

Local Plan vision

- 2.2 The strategic vision for South Oxfordshire District in 2034 presented in the Local Plan is as follows:

Our Vision for 2034

South Oxfordshire will remain a beautiful and prosperous place to live. It will be an attractive place for people to work and spend their leisure time.

By meeting our housing and employment need and the creation of new, sustainable and vibrant places, we will have provided enough homes and jobs for those wishing to live and work here. New development will meet the highest standards of design with necessary associated infrastructure.

We have continued to support development at the towns and larger villages. Growth will support employment opportunities and deliver regeneration and infrastructure with a focus on delivering housing and employment at Science Vale. We will also strengthen the heart of the District by allocating new development at strategic locations.

Science Vale¹⁷ will have continued to grow as a world-renowned science, research and innovation led hub that attracts business, creates job opportunities, and delivers housing growth. Roads and rail links will have been improved and pedestrian and cycle networks will have made it easier for people to get around, in particular to major employment sites. Didcot will be a flourishing Garden Town, being both the gateway to and the heart of Science Vale.

Through careful management of the Oxford Green Belt we will have made provision towards Oxford city's unmet housing needs whilst protecting the important setting of Oxford and also making appropriate provision for housing, business growth and urban and rural regeneration. The North Wessex Downs and Chilterns Areas of Outstanding Natural Beauty will be protected and enhanced, whilst also allowing for appropriate and sustainable growth in places. Our rich and varied history is celebrated, protected and enhanced for the benefit of residents and visitors.

We will plan for new development at seven strategic locations; Grenoble Road, Culham, Berinsfield, Wheatley, Northfield, Chalgrove, and North of Bayswater Brook. We will exceed people's high expectations in terms of healthy living, sustainable travel and the design of buildings, homes and public spaces. Everyone will have access to high quality leisure, retail and cultural facilities which will also attract visitors. South Oxfordshire will continue to be a tourist destination, helping our towns and villages to remain vibrant and prosperous. Communities will thrive, and through neighbourhood planning and community engagement, they will have their say on how their local area is shaped.

¹⁷ Science Vale is an area in Southern Oxfordshire, crossing the border of South Oxfordshire and the Vale of White Horse. It is one of the most successful science clusters in the UK. This activity is concentrated around the three centres for science at Harwell Campus, Culham Science Centre, and Milton Park, but is supported by a number of important settlements including Didcot, Wantage and Grove.

Strategic objectives

2.3 The Local Plan sets out eight strategic objectives, which will need to be achieved to deliver the plan's strategic vision. The objectives also set out how the key sustainability issues facing the District will be addressed.

Objective 1 - Settlements

- OBJ 1.1: Support the settlement hierarchy, the growth and development of Didcot Garden Town, the delivery of new development in the heart of the District, the growth of our market towns and the vitality of our villages;
- OBJ 1.2: Support rural communities and 'their way of life', recognising that this is what attracts people to the District;
- OBJ 1.3: Meet identified housing needs by delivering high-quality, sustainable, attractive places for people to live and work; and
- OBJ 1.4: Focus growth in Science Vale through delivering homes and jobs, retail and leisure facilities and enhanced transport infrastructure.

Objective 2 - Housing

- OBJ 2.1: Deliver a wide range of housing options to cater for the housing needs of our community (including self-build and older person's accommodation);
- OBJ 2.2: Support the regeneration of housing and facilities to strengthen communities, and address deprivation issues; and
- OBJ 2.3: Support meeting the economic and housing needs of the county as a whole, reflecting the special character of South Oxfordshire

Objective 3 - Economy

- OBJ 3.1: Improve employment opportunities and employment land provision, providing high quality local jobs to help retain more of its skilled residents in the local workforce;
- OBJ 3.2: Aim to reduce commuting distances by supporting business growth in locations close to existing business areas, transport connections and broadband provision;
- OBJ 3.3: Ensure economic and housing growth are balanced, to support sustainable journeys to work, recognising that we cannot determine where people work –some of whom will choose to travel to employment locations beyond our District, such as London, Reading and Oxford;
- OBJ 3.4: Support the retail and service sectors as well as low and high-tech industries;
- OBJ 3.5: Create the conditions whereby world-renowned and cutting edge industries choose to locate and grow their businesses here, contributing to a strong and successful economy, in line with the Strategic Economic Plan for Oxfordshire;
- OBJ 3.6: Inspire the next generation of workers by planning for high quality education facilities; and
- OBJ 3.7: Encourage tourism by protecting our built and natural assets, such as the Thames, and providing services and facilities for visitors.

Objective 4 - Infrastructure

- OBJ 4.1: Ensure that essential infrastructure is delivered to support our existing residents and services as well as growth; and
- OBJ 4.2: Make sustainable transport, walking and cycling an attractive and viable choice for people, whilst recognising that car travel and parking provision will continue to be important in this rural District.

Objective 5 - Design

- Deliver high quality, innovative, well designed and locally distinctive developments in sustainable locations in accordance with the South Oxfordshire Design Guide; and

- OBJ 5.2: Support development that respects the scale and character of our towns and villages, enhancing the special character of our historic settlements and the surrounding countryside.

Objective 6 - Community

- OBJ 6.1: Champion neighbourhood planning, empowering local communities to direct development within their area and provide support to ensure neighbourhood plans are deliverable, achievable and sustainable;
- OBJ 6.2: Provide access to high quality leisure, recreation, cultural, community and health facilities; and
- OBJ 6.3: Ensure all communities have access to the services and facilities they value, supporting access to sport and recreation and the health and wellbeing of everyone.

Objective 7 - Natural and built environment

- OBJ 7.1: Protect and enhance the natural environment, including biodiversity, the landscape, green infrastructure and our waterways, placing particular importance on the value of the Oxford Green Belt, our two Areas of Outstanding Natural Beauty and the River Thames; and
- OBJ 7.2: Conserve and enhance our rich and varied historic assets and their settings, celebrating these as some of our strongest attributes.

Objective 8 - Climate change

- OBJ 8.2: Minimise carbon emissions and other pollution such as water, air, noise and light, and increase our resilience to the likely impact of climate change, especially flooding.

Spatial strategy

- 2.4 The preferred strategy of SODC, as set out in the Local Plan, supports the delivery of new housing and economic growth and translates the Local Plan vision and objectives under inter-related spatial themes to:
- Support a strong network of vibrant settlements including the regeneration of town centres, making the whole District more sustainable, recognising the rural nature of South Oxfordshire and the effects generated by nearby major centres.
 - Support a movement strategy that strengthens connections to key places and enables initiatives to prosper, allows a choice of transport modes and manages traffic to improve environmental quality.
 - Create a thriving economy in urban and rural areas with a range of work opportunities including more high value jobs and enable the up-skilling of our workforce to support existing and new businesses.
 - Deliver sufficient new homes to meet the needs of the communities and economy supported by appropriate infrastructure, services and facilities.
 - Maintain and enhance the built, historic and natural environment and ensure good quality developments and change.
- 2.5 The Local Plan seeks to build upon the existing settlement hierarchy and actively create a sustainable pattern of development throughout the District. It identifies strategic allocations at seven locations at Grenoble Road, Culham, Berinsfield, Chalgrove, Wheatley, Northfield, Chalgrove and North of Bayswater Brook.
- 2.6 SODC is committed to providing 22,775 homes under the Oxfordshire Growth Deal, to meet the District's own need and to meet a proportion of Oxford City's unmet need. The Local Plan intends to make provision for at least 28,419 homes over the plan period, which will be met through a variety of supply sources as summarised in **Table 2.1**.

Table 2.1: Supply of homes to come forward 2011-2034

Source of new homes	Net number of dwellings to 2034
Completions 1 April 2011- 31 March 2018	4,364
Commitments as of 30 September 2018 ¹⁸	11,362
New strategic allocations delivering in the plan period ¹⁹	10,375
Market towns outstanding housing requirement (Henley-on-Thames, Thame and Wallingford)	519
Larger villages outstanding housing requirement	499
Windfalls	1,300
Total	28,419

- 2.7 Seven strategic allocations have been included within the Local Plan to deliver 10,375 homes, as summarised in **Table 2.2**.

Table 2.2: Strategic allocations

Site	Net number of units within plan period
Land adjacent Culham Science Centre	1,850
Land at Berinsfield	1,600
Land at Chalgrove Airfield	2,025
Grenoble Road	1,700
Land North of Bayswater Brook	1,100
Northfield	1,800
Land at Wheatley Campus	300
Total	10,375

- 2.8 For employment land, the Local Plan sets a target for the equivalent of at least an additional 37.5 hectares of B-class employment land to be provided over the plan period from 2011-2034.

Policies

- 2.9 Policies in the Local Plan are presented within the following sections:

- Our Spatial Strategy.
- Strategic Policies.
- Delivering new homes.
- Employment and economy.
- Infrastructure.
- Natural and historic environment.
- Built environment.

¹⁸ Sites under construction, with planning permission or resolution to grant planning permission and allocations carried forward from the Local Plan 2011 and Core Strategy

¹⁹ Strategic allocations continue to deliver housing beyond the plan period, and will deliver a total of 14,400 homes.

- Ensuring the vitality of town centres.
- Community and recreational facilities.

2.10 The final section sets out the Monitoring and Review framework for the Local Plan.

2.11 Each policy of the Local Plan is listed and assessed in **Appendix 3**.

Elements of the Local Plan assessed in this HRA

2.12 As the South Oxfordshire Local Plan 2034 covers the period from 2011 to 2034, the quantum of development proposed in the Local Plan includes some completed and committed development²⁰. The policies that enabled those developments to be permitted have already been subject to HRA as part of the Core Strategy, Local Plan 2011 or as part of the HRA for the relevant NDP. The focus of this HRA is therefore the additional development that would be provided for under the new Local Plan policies. The overall quantum of development proposed by the plan also needs to be considered, however; so completed and committed developments have been taken into consideration in terms of their potential to have in-combination effects with the 'new' development quantum.

2.13 For clarity, **Table 2.3** sets out the quantum of development that has been taken into account in the main HRA assessment and that which has been considered only in terms of in-combination effects. The location of the proposed development is shown on **Figure 2.1**.

Table 2.3: Development quantum assessed in this HRA

Type of development	Quantum assessed
<i>Development that would be granted permission under new Local Plan policies (assessed throughout HRA)</i>	
Residential development:	12,693 homes
• New strategic allocations	10,375
• Market towns outstanding housing requirement (Henley-on-Thames, Thame and Wallingford)	519
• Larger Villages outstanding housing requirement	499
• Windfalls	1,300
Gypsy and Traveller sites:	10 pitches
• Gypsy and Traveller pitches (within strategic allocations)	10
• Extensions to / replacements of existing sites	not specified
Employment development:	17.98 ha
• Henley-on-Thames	1 ha
• Thame	1.6ha
• Wallingford	3.1 ha
• Crowmarsh Gifford	0.28 ha
• Culham	2.0 ha
• Chalgrove	5.0 ha
• Berinsfield	5.0ha
Retail development	35,800 sq.m
• Food store (convenience goods)	4,500 sq.m

²⁰ Committed development includes sites under construction, with planning permission, made neighbourhood plan allocations and allocations carried forward from the Local Plan 2011 and Core Strategy.

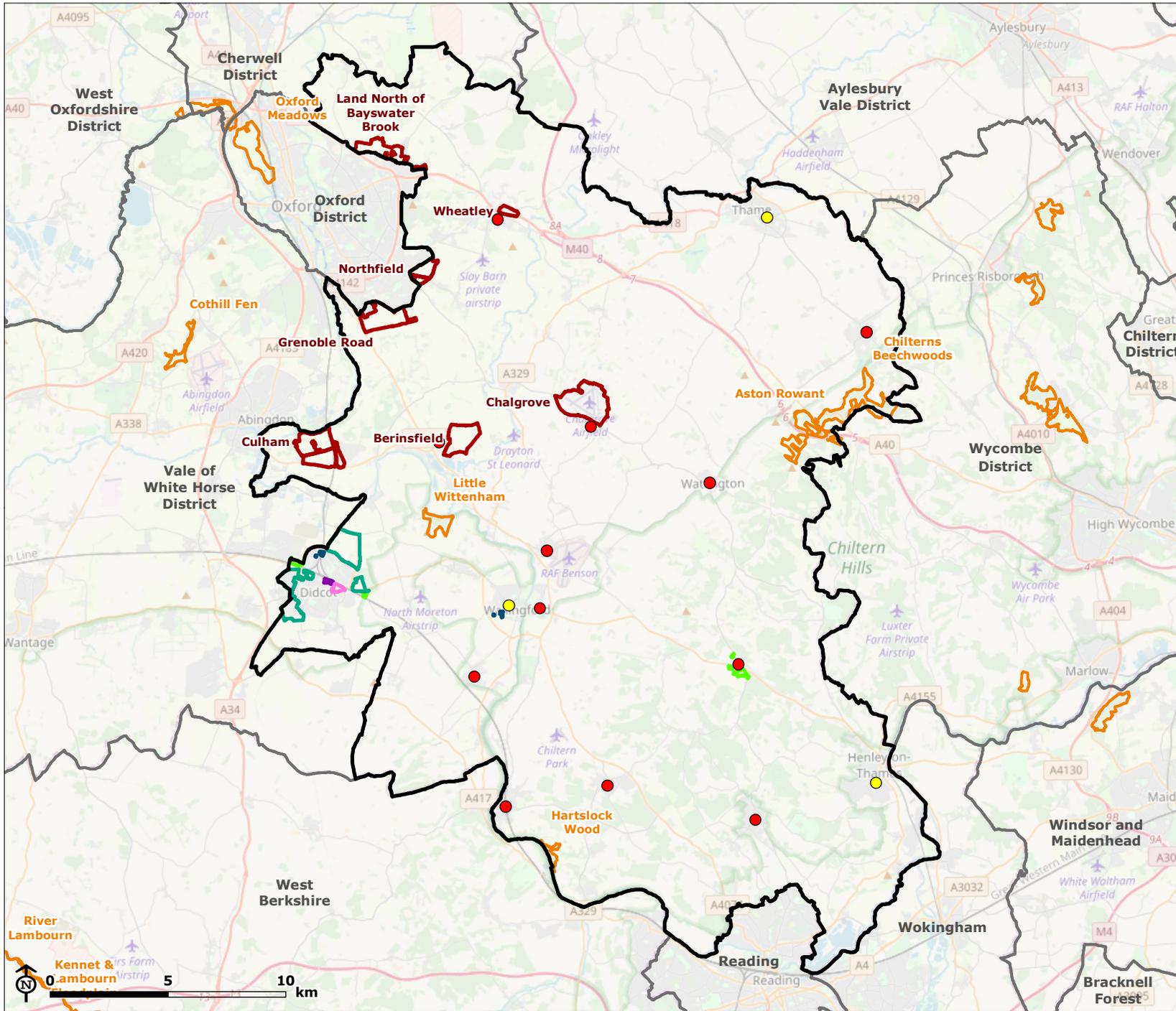
Type of development	Quantum assessed
<ul style="list-style-type: none"> Non-food store (comparison goods) 	25,670 sq.m
<i>Development granted permission under previous policies (assessed for in-combination effects only)</i>	
Residential development:	15,726 homes
<ul style="list-style-type: none"> Completions 2011-2018 	4,364
<ul style="list-style-type: none"> Commitments as of 30 September 2018 	11,362
Employment development:	19.22 ha
<ul style="list-style-type: none"> Didcot (safeguarded sites)²¹ 	2.92 ha
<ul style="list-style-type: none"> Wallingford (safeguarded sites) 	2.25 ha
<ul style="list-style-type: none"> Culham (safeguarded sites) 	5.3 ha
<ul style="list-style-type: none"> Chalgrove 	2.25 ha

²¹ Note that 6.5ha of employment land in Didcot is considered to contribute South Oxfordshire's need, but is provided for by Vale of White Horse District Council's Core Strategy Policy 6 and has therefore been excluded from this table.

South Oxfordshire Local Plan 2034

Figure 2.1: Sites allocated for new development in the Local Plan

-  South Oxfordshire district boundary
-  Neighbouring district boundary
-  Market town
-  Larger Village
-  Committed allocation - housing
-  Committed allocation - mixed use
-  Committed employment allocation
-  Proposed allocation - housing
-  Proposed allocation - mixed use
-  Special Area of Conservation
-  Strategic allocation



Source: OS, Natural England

Map Scale @ A4: 1:230,000



Potential impacts of the Local Plan on European sites

2.14 **Table 2.4** below sets out the range of potential impacts that development of the type to be included in the Local Plan and related activities may have on European sites. This table has been prepared by LUC for use in informing HRA judgements, drawing on our experience of HRA and comments previously provided by Natural England relating to the potential impacts and activities that could affect European sites.

Table 2.4: Potential impacts and activities arising from implementation of the Local Plan that could adversely affect European sites

Broad categories and examples of potential impacts on European sites	Examples of activities responsible for impacts
<p>Physical loss</p> <ul style="list-style-type: none"> Removal (including offsite effects, e.g. foraging habitat) Smothering Habitat degradation 	<p>Development (e.g. housing, employment, infrastructure, tourism)</p> <p>Structural alterations to buildings (bat roosts)</p> <p>Afforestation</p> <p>Tipping</p> <p>Cessation of or inappropriate management for nature conservation</p>
<p>Physical damage</p> <ul style="list-style-type: none"> Direct mortality Sedimentation / silting Prevention of natural processes Habitat degradation Erosion Trampling Fragmentation Severance / barrier effect Edge effects Fire 	<p>Flood defences</p> <p>Dredging</p> <p>Recreation (e.g. motor cycling, cycling, walking, horse riding, water sports, caving)</p> <p>Development (e.g. infrastructure, tourism, adjacent housing etc.)</p> <p>Vandalism</p> <p>Arson</p> <p>Cessation of or inappropriate management for nature conservation</p>
<p>Non-physical disturbance</p> <ul style="list-style-type: none"> Noise Vibration Visual presence Human presence Light pollution 	<p>Development (e.g. housing, industrial)</p> <p>Recreation (e.g. dog walking, water sports)</p> <p>Industrial activity</p> <p>Vehicular traffic</p> <p>Artificial lighting (e.g. street lighting)</p>
<p>Water table/availability</p> <ul style="list-style-type: none"> Drying Flooding / stormwater Water level and stability Water flow (e.g. reduction in velocity of surface water) Barrier effect (on migratory species) 	<p>Water abstraction</p> <p>Drainage interception (e.g. reservoir, dam, infrastructure and other development)</p> <p>Increased discharge (e.g. drainage, runoff)</p>
<p>Toxic contamination</p> <ul style="list-style-type: none"> Water pollution Soil contamination Air pollution 	<p>Oil / chemical spills</p> <p>Tipping</p> <p>Vehicular traffic</p> <p>Industrial waste / emissions</p>
<p>Non-toxic contamination</p> <ul style="list-style-type: none"> Nutrient enrichment (e.g. of soils and water) Algal blooms Changes in salinity Changes in thermal regime Changes in turbidity Air pollution (dust) 	<p>Sewage discharge</p> <p>Water abstraction</p> <p>Industrial activity</p> <p>Flood defences</p> <p>Construction</p>

Broad categories and examples of potential impacts on European sites	Examples of activities responsible for impacts
<p>Biological disturbance</p> <ul style="list-style-type: none"> • Direct mortality • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession 	<p>Development (e.g. housing areas with domestic and public gardens)</p> <p>Predation by domestic pets</p> <p>Introduction of non-native species (e.g. from gardens)</p> <p>Fishing</p> <p>Hunting</p> <p>Changes in management practices (e.g. grazing regimes, access controls, cutting / clearing)</p>

3 HRA Screening Methodology

- 3.1 HRA Screening of the Local Plan has been undertaken in line with current available guidance and seeks to meet the requirements of the Habitats Regulations. The tasks that have been undertaken during the screening stage of the HRA are described in detail below.

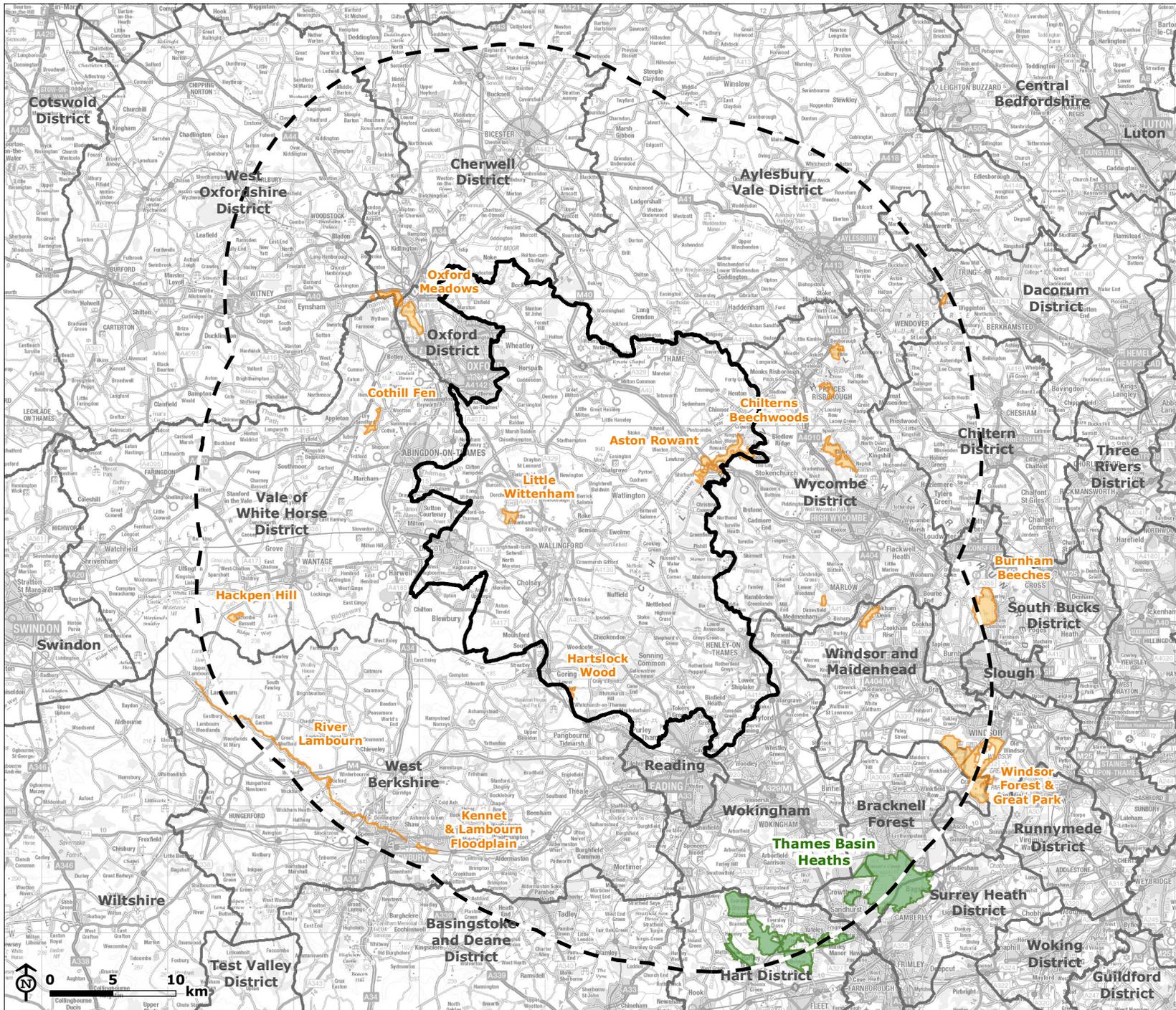
European sites which may be affected by the Local Plan

- 3.2 The HRA of the Core Strategy took into account the six European sites that lie within 17 km of the four main towns in South Oxfordshire (Didcot, Thame, Wallingford and Henley-on-Thames). This buffer area was identified as appropriate at the time because the main growth areas in South Oxfordshire were concentrated around the four main towns. While smaller allocations would be made at the larger villages, it was understood at the time that these would be made through a separate site allocations document. As such, detailed consideration of these smaller site allocations would only be possible through the HRA of the site allocations document, once site allocations were known. However, the production of the site allocations document has now been superseded by the South Oxfordshire Local Plan 2034. The 17km buffer distance, which was subject to consultation with Natural England, reflected the average travel to work distance in the District and recognised the fact that the effects of development within South Oxfordshire may be transmitted to European sites outside of the District boundary.
- 3.3 The same buffer distance has been used during this current stage of HRA work and all of the 12 European sites within 17 km of the District boundary have been included in the assessment. The buffer area of 17 km around the whole District is larger (and therefore more precautionary) than that used during the HRA of the Core Strategy and is considered appropriate for ensuring that all European sites that could potentially be significantly affected by development are identified and included in the assessment.
- 3.4 The following European sites fall within 17 km of South Oxfordshire District and have been included in the HRA:
- Aston Rowant SAC.
 - Burnham Beeches SAC.
 - Chilterns Beechwoods SAC.
 - Cothill Fen SAC.
 - Hackpen Hills SAC.
 - Hartslock Wood SAC.
 - Kennet and Lambourn Floodplain SAC.
 - Little Wittenham SAC.
 - Oxford Meadows SAC.
 - River Lambourn SAC.
 - Thames Basin Heaths SPA.
 - Windsor Forest and Great Park SAC.
- 3.5 Detailed information about the location, qualifying features, pressures and threats for each of European sites included in the assessment is presented in **Appendix 1**. The locations of the European sites are mapped in **Figure 3.1**.

**South Oxfordshire
Local Plan 2034**

Figure 3.1: European sites within 17km of South Oxfordshire District

-  South Oxfordshire district boundary
-  South Oxfordshire 17 km buffer
-  Neighbouring district boundary
-  Special Protection Area
-  Special Area of Conservation



Source: OS, Natural England

Map Scale @ A4: 1:430,000



Assessment of 'likely significant effects' of the Local Plan

- 3.6 Regulation 105 of the Conservation of Habitats and Species Regulations 2017²² (the 'Habitats Regulations'), requires an assessment of the 'likely significant effects' of a land use plan. Likely significant effects have been considered for each Local Plan policy and site allocation with respect to:
- Physical loss of/damage to habitat.
 - Non-physical disturbance e.g. noise/vibration or light pollution.
 - Air pollution.
 - Increased recreation pressure.
 - Water quantity.
 - Water quality.
- 3.7 These are the same effects that were considered in the HRA of the Publication Version of the Local Plan (October 2017), and there is no reason why these should be altered for the purposes of this assessment. This is because the Local Plan Final Publication Version 2nd proposes the same type of development (i.e. housing and employment development), therefore the sources of any potential effects and the pathways by which these may affect European sites have not changed.
- 3.8 The detailed screening matrix can be found in **Appendix 3** of this report and the findings are discussed in **Chapter 4**.
- 3.9 This approach allows for consideration to be given to the cumulative impacts of the policies or site allocations as well as simply focussing on each individually.
- 3.10 A risk-based approach involving the application of the precautionary principle has been adopted in the assessment, such that a conclusion of 'no significant effect' has only been reached where it is considered unlikely, based on current knowledge and the information available, that a Local Plan policy or site allocation would have a significant effect on the integrity of a European site.
- 3.11 A 'traffic light' approach has been used in the screening matrix to record the likely impacts of the policies and site allocations on European sites and their qualifying habitats and species, using the colour categories shown below.

Red	There are likely to be significant effects (Appropriate Assessment required).
Amber	There may be significant effects, but this is currently uncertain (Appropriate Assessment required).
Green	There are unlikely to be significant effects (Appropriate Assessment not required).

Interpretation of 'likely significant effect'

- 3.12 Relevant case law helps to interpret when effects should be considered as a likely significant effect, when carrying out HRA of a land use plan.
- 3.13 In the Waddenzee case²³, the European Court of Justice ruled on the interpretation of Article 6(3) of the Habitats Directive (translated into Reg. 102 in the Habitats Regulations), including that:
- An effect should be considered 'likely', "if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site" (para 44).

²² SI No. 2017/2012

²³ ECJ Case C-127/02 "Waddenzee" Jan 2004.

- An effect should be considered 'significant', "if it undermines the conservation objectives" (para 48).
- Where a plan or project has an effect on a site "but is not likely to undermine its conservation objectives, it cannot be considered likely to have a significant effect on the site concerned" (para 47).

3.14 A relevant opinion delivered to the Court of Justice of the European Union²⁴ commented that:

"The requirement that an effect in question be 'significant' exists in order to lay down a de minimis threshold. Plans or projects that have no appreciable effect on the site are thereby excluded. If all plans or 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."

3.15 This opinion (the 'Sweetman' case) therefore allows for the authorisation of plans and projects whose possible effects, alone or in combination, can be considered 'trivial' or *de minimis*; referring to such cases as those "that have no appreciable effect on the site". In practice such effects could be screened out as having no likely significant effect – they would be 'insignificant'.

Mitigation at the screening stage

3.16 A recent judgment from the Court of Justice of the European Union 'People over Wind, Peter Sweetman v Coillte Teoranta' ruled that Article 6(3) of the Habitats Directive should be interpreted as meaning that mitigation measures should be assessed as part of an Appropriate Assessment, and should not be taken into account at the screening stage. The precise wording of the ruling is as follows:

"Article 6(3)must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of measures intended to avoid or reduce the harmful effects of the plan or project on that site."

3.17 Potential effects identified could be mitigated through the implementation of policies within the Local Plan itself. These include policies relating to the provision of improved sustainable transport links which could help to mitigate potential increases in air pollution associated with increased vehicle traffic, and the provision of green infrastructure within new developments which may help to relieve increases in visitor pressure at European sites.

3.18 However, in line with the 'People over Wind' judgment, we have not taken into account potential mitigation included in the South Oxfordshire Local Plan 2034 Final Publication Version 2nd in the screening assessment. Potential mitigation included in the plan itself is considered only within the Appropriate Assessment of the plan (see **Chapter 5**), thereby ensuring full compliance with the judgment.

²⁴ Advocate General's Opinion to CJEU in Case C-258/11 Sweetman and others v An Bord Pleanala 22nd Nov 2012.

4 HRA Screening Assessment

- 4.1 The screening stage of the HRA has taken the approach of screening each Local Plan policy and site allocation individually.
- 4.2 For some types of impacts, screening for likely significant effects has been determined on a proximity basis, using GIS data to determine the proximity of potential development locations to the European sites that are the subject of the assessment. However, there are many uncertainties associated with using set distances as there are very few standards available as a guide to how far impacts will travel. Therefore, during the screening stage a number of assumptions have been applied in relation to assessing the likely significant effects on European sites that may result from the Local Plan, as explained below. These assumptions draw from the information gathered during the screening of earlier HRAs, as well as the conclusions of that work.

Physical loss of or damage to habitat

- 4.3 Any development resulting from the Local Plan will be located within South Oxfordshire District. Therefore loss of habitat from within the boundaries of a European site can be ruled out in relation to those sites that lie entirely outside of South Oxfordshire (i.e. Burnham Beeches SAC, Cothill Fen SAC, Hackpen Hill SAC, Kennet and Lambourn Floodplain SAC, Oxford Meadows SAC, River Lambourn SAC, Windsor Forest & Great Park SAC, and Thames Basin Heaths SPA). The potential for loss of habitat from within the boundaries of any European site that lies wholly or partially within the District (Aston Rowant SAC, Chilterns Beechwoods SAC, Hartslock Wood SAC, and Little Wittenham SAC) could only occur if Local Plan proposals would result in development coming forward in those areas. However, in reality the legal protection afforded to European sites means that this is highly unlikely. The Local Plan does not allocate any sites falling within the boundaries of any European site.
- 4.4 Loss of habitat from outside of the boundaries of a European site could also affect the integrity of that site if it occurs in an area used by the qualifying species of the site (e.g. for off-site breeding, foraging or roosting).
- 4.5 Several of the European sites included in the HRA have mobile species amongst their qualifying features that could travel outside of the site to make use of other areas of habitat. The European sites that have mobile species amongst their qualifying features are:
- Chilterns Beechwoods SAC: stag beetle.
 - Little Wittenham SAC: great crested newt.
 - River Lambourn SAC: brook lamprey and bullhead.
 - Kennet and Lambourn Floodplain SAC: Desmoulins's whorl snail.
 - Windsor Forest and Great Park SAC: violet click beetle.
 - Thames Basin Heaths SPA: Dartford warbler, nightjar and woodlark.
- 4.6 Where stag beetle is a qualifying feature of a site, the individuals may travel outside of the SAC boundary, although it is unlikely that they will travel far – it is generally only the male stag beetle that flies during the summer months, and the female beetle rarely flies.²⁵ The preferred habitat for stag beetles is old, established woodland, and the larvae feed on rotting tree matter.¹⁶ As the beetle larvae take years to develop, they can be vulnerable to tree clearance and the 'tidying up' of wood in parks and especially gardens.²⁶ Research²⁷ suggests that 2 km may be an appropriate buffer inside which sites could be functionally connected, as this is the distance that males travel to females during the breeding season. Chilterns Beechwoods SAC is a composite of nine SSSIs.

²⁵ <https://www.royalparks.org.uk/parks/richmond-park/richmond-park-attractions/wildlife/stag-beetles>

²⁶ <http://www.arkive.org/stag-beetle/lucanus-cervus/>

²⁷ <http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7998.2006.00282.x/abstract>

Bisham Woods SSSI, which is the part of the Chiltern Beechwoods SAC that supports the qualifying stag beetle population, is greater than 2 km from the District boundary. Therefore potential loss of or damage to off-site habitats associated with Chilterns Beechwoods SAC can be screened out of further assessment.

- 4.7 Great crested newts will travel away from their breeding ponds, during the terrestrial phase of their lifecycle, but not large distances. 500 metres²⁸ is considered an appropriate buffer distance inside which great crested newts might be found, from their breeding location. The site listing for Little Wittenham SAC²⁹ states that great crested newts have been found to range several hundred metres into the site's woodland blocks. Research has found that great crested newts at Little Wittenham SAC migrate within woodland and do not over-winter in the arable farmland³⁰. All of the woodland within 500 metres of the ponds at Little Wittenham SAC is within the SAC boundary. Therefore potential loss of or damage to off-site habitats associated with Little Wittenham SAC can be screened out of further assessment.
- 4.8 The River Lambourn SAC (15 km outside the District), Kennet and Lambourn Floodplain SAC (15 km outside the District), and Windsor Forest and Great Park SAC (13 km outside the District) have mobile qualifying features that are limited in range and are sufficient distance from potential development in South Oxfordshire that potential impacts on off-site habitats can be ruled out. Therefore, potential loss of or damage to off-site habitats associated with the River Lambourn SAC, Kennet and Lambourn Floodplain SAC, and Windsor Forest & Great Park SAC can be screened out of further assessment.
- 4.9 Thames Basin Heaths SPA is located approximately 13 km outside of the District. This is considered to be far enough that effects on its qualifying bird species can be ruled out in relation to the loss of or damage to off-site habitat used for breeding, foraging or roosting, particularly during breeding seasons. In coming to this judgement, we have relied on the Thames Basin Heaths SPA Delivery Framework³¹. This document has been endorsed by the Thames Basin Heaths Joint Strategic Partnership Board, the body established to agree arrangements for the long term protection of the SPA. The Framework advises that avoidance measures are necessary in relation to all residential development within a 'Zone of Influence' from 400 m to 5 km from the perimeter of the SPA and that applications for large scale development (over 50 houses) between 5 km and 7 km from the edge of the SPA should be assessed on a case by case basis. There is a presumption against development within 400 m of the SPA unless an Appropriate Assessment demonstrates that the development will not have an adverse effect on the integrity of the SPA. As the site is 13 km from the District boundary, potential loss of or damage to off-site habitats associated with Thames Basin Heaths SPA can be screened out of further assessment.
- 4.10 **The potential for likely significant effects arising from physical loss of or damage to European site habitats (on-site or off-site) can therefore be screened out for all sites.**

Non-physical disturbance: noise, vibration and light pollution

- 4.11 Noise and vibration effects (e.g. during the construction of new housing development) are most likely to disturb bird species and are thus a key consideration with respect to European sites where birds are the qualifying features, although such effects may also impact upon some mammals and fish species.
- 4.12 Using a precautionary approach, we have assumed that the effects of noise, vibration and light are most likely to be significant if development takes place within 500 metres of a European site with qualifying features sensitive to these disturbances, or known off-site breeding, foraging or roosting areas.
- 4.13 Artificial lighting at night (e.g. from street lamps, flood lighting and security lights) is most likely to affect nocturnal species e.g. bats, and therefore have an adverse effect on the integrity of European sites where nocturnal species are a qualifying feature. None of the European sites within 17 km of South Oxfordshire have bats as a qualifying feature. Although nightjar, which is a

²⁸ <https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects>

²⁹ <http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030184>

³⁰ http://etheses.dur.ac.uk/6683/1/6683_3987.PDF

³¹ http://www.waverley.gov.uk/downloads/file/3503/thames_basin_heaths_spa_delivery_framework_2009_-_thames_basin_heaths_joint_strategic_partnership_board

qualifying species of the Thames Basin Heaths SAC, is nocturnal the site is c.13 km outside the District. Stag beetles, which are a qualifying feature of Chilterns Beechwoods SAC can be nocturnal. Adult male stag beetles fly around dusk during May-August³², but although they can be attracted by light it is not known to be a significant factor in stag beetle mortality. As noted above, the most commonly referred to threat to stag beetles is tree clearance and the 'tidying up' of wood in parks and especially gardens. Potential impacts due to lighting can therefore be screened out of further assessment.

- 4.14 Noise and vibration only have the potential to affect European sites that are within or immediately adjacent to the District boundary. Hartslock Wood SAC and Aston Rowant SAC are both designated for their habitats and are not therefore sensitive to noise and vibration. The qualifying species of Little Wittenham SAC (great crested newts) and Chilterns Beechwoods SAC (stag beetle) are not considered to be sensitive to noise and vibration.
- 4.15 **Therefore, the potential for likely significant effects in relation to noise, vibration and light pollution can be screened out for all sites.**

Air pollution

- 4.16 Air pollution is most likely to affect European sites where plant, soil and water habitats are the qualifying features, but some qualifying animal species may also be affected, either directly or indirectly, by any deterioration in habitat as a result of air pollution. Deposition of pollutants to the ground and vegetation can alter the characteristics of the soil, affecting the pH and nitrogen (N) availability that can then affect plant health, productivity and species composition.
- 4.17 In terms of vehicle traffic, nitrogen oxides (NO_x, i.e. NO and NO₂) are considered to be the key pollutants. Deposition of nitrogen compounds may lead to both soil and freshwater acidification, and NO_x can cause eutrophication of soils and water.
- 4.18 Based on the Highways Agency Design for Road and Bridges (DMRB) Manual Volume 11, Section 3, Part 1³³ (which was produced to provide advice regarding the design, assessment and operation of trunk roads (including motorways)), it is assumed that air pollution from roads is unlikely to be significant beyond 200 metres from the road itself. Where increases in traffic volumes are forecast, this 200 metres buffer needs to be applied to the relevant roads in order to make a judgement about the likely geographical extent of air pollution impacts.
- 4.19 The DMRB Guidance for the assessment of local air quality in relation to highways developments provides criteria that should be applied at the screening stage of an assessment of a plan or project, to ascertain whether there are likely to be significant impacts associated with routes or corridors. Based on the DMRB guidance, affected roads which should be assessed are those where:
- Daily traffic flows will change by 1,000 AADT (Annual Average Daily Traffic) or more; or
 - Heavy duty vehicle (HDV) flows will change by 200 AADT or more; or
 - Daily average speed will change by 10 km/hr or more; or
 - Peak hour speed will change by 20 km/hr or more; or
 - Road alignment will change by 5 metres or more.
- 4.20 Recent case law, known as the Wealden judgement³⁴, has revised the method by which Natural England expects to see in-combination air pollution effects assessed. The implication of the judgment is that, where the road traffic effects of other plans or projects are known or can be reasonably estimated (including those of adopted plans or consented projects), then these should be included in road traffic modelling by the local authority whose local plan or project is being assessed. The screening criteria of 1,000 AADT should then be applied to the traffic flows of the plans in combination.

³² <http://www.ypte.org.uk/animal/beetle-stag-/53>

³³ <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf>

³⁴ Wealden District Council v. (1) Secretary of State for Communities and Local Government; (2) Lewes District Council; (3) South Downs National Park Authority and Natural England

- 4.21 It is assumed that only those roads forming part of the primary road network (motorways and 'A' roads) might be likely to experience any significant increases in vehicle traffic as a result of development (i.e. greater than 1,000 AADT). As such, where a site is not within 200 metres of a motorway or 'A' road, likely significant effects from traffic-related air pollution is ruled out.
- 4.22 The European sites around South Oxfordshire that are within 200 metres of strategic roads are:
- Aston Rowant SAC (M40).
 - Burnham Beeches SAC (A355).
 - Chilterns Beechwoods SAC (A404, A4010).
 - Kennet and Lambourn Floodplain SAC (A4, A34).
 - Oxford Meadows SAC (A34, A40).
 - River Lambourn SAC (M4, A4, A339, A34, A338).
 - Windsor Forest and Great Park SAC (A332, A329).
- 4.23 The Site Improvement Plans for Kennet and Lambourn Floodplain SAC, Oxford Meadows SAC and River Lambourn SAC do not identify air pollution as a threat or pressure. While Site Improvement Plans provide an indication of the current threats and pressures at a site, and do not predict future changes, they do provide information on the aspects of the site's ecology that are likely to be the most sensitive to development.
- 4.24 The Kennet and Lambourn Floodplain SAC, Oxford Meadows SAC and River Lambourn SAC are all sites at which physical changes to the aquatic environment, invasive aquatic species or changes to land management are the main threats or pressures, despite the sites being situated close to major settlements (Oxford and Newbury) and the roads that serve them. These sites are therefore not considered to be particularly sensitive to air pollution.
- 4.25 Following consultation on the earlier HRA work undertaken on the South Oxfordshire Local Plan, Natural England challenged the screening-out of air pollution effects at Oxford Meadows SAC based on the Site Improvement Plan. Further consideration of the sensitivity of the site in the HRA of the South Oxfordshire Local Plan indicated that it should be possible to screen out the site on the basis of its low sensitivity to aerial N deposition (see **Box 3.1** and **Appendix 4**). In addition, subsequent information on traffic flows close to the site suggest that traffic is likely to decrease within proximity to Oxford Meadows SAC (see **Chapter 5**).

Box 3.1: Oxford Meadows SAC – sensitivity to air pollution

Oxford Meadows SAC lies entirely within the floodplain of the River Thames (predominately Flood Zone 3), and as such it is subject to regular inundation during flooding events. Floodplain grassland communities such as these have very different nutrient cycles from terrestrial communities, as flooding events can cause both the flushing of nutrients from the soil surface as flood water pass over them, and the accumulation of nutrients as sediments in the floodwater precipitate and accumulate on the soil surface during more prolonged flooding events. These sediment particles are vectors for the transfer of nutrients, particularly from chemical fertilisers washed out of agricultural fields and into the river. These sediments therefore have a strong influence of soil nutrient levels in floodplain ecosystems.

Terrestrial ecosystems are not subject to such inputs; therefore aerial nitrogen deposition (e.g. from vehicle emissions) has a relatively much stronger influence than in floodplain ecosystems, particularly as aerial nitrogen deposition is allowed to gradually accumulate in the soils over time. This is reflected in the majority of Site Improvement Plans for floodplain SACs, which tend to identify diffuse water pollution rather than aerial deposition as a threat to site integrity, even where critical loads for nitrogen have already been exceeded.

Nutrient enrichment is also generally dependent on the levels of three key nutrients; nitrogen (N), phosphorous (P) and potassium (K). Terrestrial habitats tend to be nitrogen limited (i.e. nitrogen levels have the strongest influence on plant productivity). Therefore, any accumulations of nitrogen over time can trigger the eutrophication of sensitive habitats. Aquatic ecosystems on the other hand tend to be phosphorous limited, and in these systems background levels of nitrogen have a relatively limited influence upon plant growth and the risk of eutrophication compared with the influence of phosphorus levels.

Floodplain meadows are also naturally relatively rich in nutrients as a result of the regular inundation of sediment laden floodwater. In floodplain ecosystems, the grassland communities present tend to have a competitive advantage over other more vigorous plant species which would otherwise normally dominate in such a nutrient-rich environment, due to their ability to survive the high moisture content of the soils and anaerobic conditions created by regular inundation. These communities therefore tend to be primarily defined by their hydrological regime rather than nutrient levels, and as such they are less sensitive to background nutrient levels than terrestrial grasslands, provided appropriate hydrological conditions are maintained.

At Oxford Meadows SAC it is understood that the hydrological regime is controlled artificially via a number of ditches and channels, and the Site Improvement Plan has identified actions to ensure that appropriate hydrological conditions will be maintained.

Oxford Meadows is therefore not considered to be particularly sensitive to aerial nitrogen deposition from increases in vehicle emissions.

- 4.26 SODC commissioned Atkins to model the effects of the Local Plan on traffic flows within the District. This includes calculations of changes in AADT, which can be used to screen whether the Local Plan could give rise to significant effects on air pollution, as described in **paragraph 4.19**. No traffic data were available for the roads adjacent to Burnham Beeches SAC, Chilterns Beechwoods SAC and Windsor Forest & Great Park SAC, as they are located too far outside of the Atkins model network to be reasonably or reliably predicted. Although these locations lie within the initial screening radius of 17 km, the actual distance which would need to be travelled to reach these locations by car from the plan area exceeds this distance for most routes (e.g. Henley on Thames to Burnham Beeches is 17 km as the crow flies, however the quickest route by car is 32km³⁵). It can therefore reasonably be expected that the contribution of growth within the Local Plan area to traffic flows at these locations would be *de minimis*, and as such they are screened out from any further assessment³⁶.
- 4.27 **Therefore, the potential for likely significant effects in relation to air pollution can be screened out for all sites, except Aston Rowant SAC.**

Impacts of recreation

- 4.28 Recreation activities and human presence more generally can have an adverse impact on the integrity of a European site, for example as a result of disturbance of sensitive animal species, trampling of plant species or habitat erosion. Where development is likely to result in an increase in the local population, the potential for an increase in visitor numbers and the associated impacts at sensitive European sites have been considered.
- 4.29 We have assumed that all of the sites within the scope of the HRA have the potential to be vulnerable to recreation impacts such as erosion, trampling or species disturbance to some degree. Those European sites that are closest, most accessible, or most attractive to the residents of the locations where development is proposed are most likely to be affected. The South Oxfordshire Open Space User Survey (2005) reported that 35% of people are prepared to travel for 15 minutes and 45% of people are prepared to travel by car to access natural and semi-natural greenspace³⁷. Visitor surveys³⁸ at Little Wittenham SAC also identified that the majority

³⁵ Google maps <https://www.google.co.uk/maps/dir/Henley-on-Thames/Farnham+Common/@51.5570679,-0.8280697,12z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1s0x48768542ad0cb2ab:0x50b007c5953c9c7d!2m2!1d-0.902894!2d51.535764!1m5!1m1!1s0x48766451f9eebb71:0x62b6b9d2577b14ab!2m2!1d-0.6115895!2d51.559996!3e0>

³⁶ This approach was agreed with Natural England in relation to the HRA of the Publication version of the Local Plan on 2nd November, 2017

³⁷ <http://www.southoxon.gov.uk/sites/default/files/Standards%20summary%20with%20justification.pdf>

³⁸ Earth Trust (2016) *Statement of Need for Improvements to the Earth Trust Centre*

of the visitors to the site live within 20 minutes driving time (i.e. including Abingdon, which is c.8 km from the site).

- 4.30 It is difficult to convert these statistics into an average travel distance by all travel modes to access natural and semi-natural greenspace. As a benchmark, therefore, we have made reference to the 'Zone of Influence' identified by the Thames Basin Heaths SPA Delivery Framework³⁹. Whilst it is recognised that the other European sites scoped into this HRA have different designated features to Thames Basin Heaths SPA, the SPA Delivery Framework is primarily concerned with avoiding adverse recreational or urbanising effects from residential development and the buffer distances it defines are judged to provide a reasonable proxy for the distance from housing development within which likely significant recreational effects cannot be ruled out. In addition, the Thames Basin Heaths have a strong attraction for recreational activities and support ground nesting birds which are highly susceptible to the effects of recreation. As a result, the use of this site in drawing comparisons for a suitable zone of influence is considered highly precautionary.
- 4.31 As set out above in relation to loss or damage of habitat, the Thames Basin Heaths SPA Delivery Framework advises that there is a presumption against development within 400 metres of the European site (assumed adverse effect on integrity unless site-specific Appropriate Assessment demonstrates otherwise), that avoidance measures are necessary in relation to all residential development within a Zone of Influence from 400 metres to 5 km from the perimeter of the European site and that applications for large scale development (over 50 dwellings) between 5 km and 7 km from the edge of the European site should be assessed on a case by case basis.
- 4.32 The potential for effects depends upon the scale of development proposed and the features for which the site is designated. However, as a conservative estimate, it is assumed that any development within 7 km of a sensitive site could have impacts due to recreation. Where site-specific information indicates that development beyond 7 km could produce recreation impacts, this will be taken into account; for example at Little Wittenham SAC, where development in the eastern fringes of the Vale of White Horse District could be relevant.
- 4.33 Aston Rowant SAC, Chilterns Beechwoods SAC, Hartslock Wood SAC and Little Wittenham SAC all lie wholly or partially within South Oxfordshire District. Cothill Fen SAC is c.4.5km outside the District and Oxford Meadows SAC is c.2km outside the District. The other European sites are greater than 7 km outside the District.
- 4.34 **Table 4.1** shows which of the strategic development allocations lie within 7 km of European sites. This demonstrates that there are no strategic site allocations within 7km of Hartslock Wood SAC, Aston Rowant SAC and Chiltern Beechwoods SAC. These strategic allocations will provide for 81.7% of the additional housing to be delivered through the Local Plan Final Publication Version 2nd, on top of existing commitments and completions. A further 4.1% of housing provided for through the Local Plan Final Publication Version 2nd will be delivered at the market towns of Henley-on-Thames and Thame (both partly within 7km of Chilterns Beechwoods SAC) and Wallingford (within 7km of Little Wittenham SAC). The remainder of housing provided for through the Local Plan will be delivered at larger villages and through windfalls, some of which is expected to be within 7km of European sites.

³⁹ http://www.waverley.gov.uk/downloads/file/3503/thames_basin_heaths_spa_delivery_framework_2009_-_thames_basin_heaths_joint_strategic_partnership_board

Table 4.1: Local Plan strategic site allocations within 7 km of European sites

Potential strategic site allocation	Hartslock Wood SAC	Aston Rowant SAC	Chiltern Beechwoods SAC	Cothill Fen SAC	Little Wittenham SAC	Oxford Meadows SAC
Land adjacent Culham Science Centre				✓	✓	
Land at Berinsfield					✓	
Land at Chalgrove Airfield					✓	
Grenoble Road				✓ ⁴⁰		✓
Land North of Bayswater Brook						✓
Northfield						✓
Land at Wheatley Campus						

- 4.35 Natural England’s Site Improvement Plans record the threats and pressures relevant to each European site. Public access or disturbance are not identified as current threats or pressures at the following sites, despite their lying close to large settlements:
- Aston Rowant SAC: c.7km from Thames.
 - Hartslock Wood SAC: <2km from Goring and Pangbourne.
 - Cothill Fen SAC: c.2.5km from Abingdon.
 - Oxford Meadows SAC: within Oxford.
- 4.36 These sites all lie close to or beyond the South Oxfordshire District boundary. HRAs carried out of the neighbouring authorities’ plans have concluded that their plans will not have a significant effect on these sites due to recreation pressure.
- 4.37 Following consultation on an earlier draft of the HRA report of the South Oxfordshire Local Plan Second Preferred Options (Regulation 18) consultation, Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) provided comments suggesting that potential recreation impacts at Cothill Fen SAC and Aston Rowant SAC should be screened in for further assessment.
- 4.38 Subsequent discussions with Natural England officers, however, provided reassurance that the sites are not particularly sensitive to increases in recreation pressure, for the following reasons:
- Cothill Fen SAC: The site is not generally promoted for public access and is unlikely to attract visitors from a long distance. Development very close to the site could generate visitors (e.g. dog walkers from within c.1 km away), but as the site is very wet, visitors naturally follow the boardwalk paths. The site is mainly considered to be sensitive to changes in groundwater or hydrology, not recreation.
 - Aston Rowant SAC: The site’s qualifying features are considered to be fairly resilient to recreation pressure, with changes to habitat management more likely to be an issue. Access to the site can be effectively managed as there are two relatively small car parks and only two main footpaths - there are no plans to increase parking capacity or change the access management policy.
- 4.39 At Chiltern Beechwoods SAC, public access / disturbance is only identified in relation to the stag beetle population. The portion of the SAC that supports the stag beetle population (Bisham Woods SSSI) is greater than 7km from the District boundary, and therefore is considered unlikely to result in likely significant effects from development within South Oxfordshire, either alone or in-combination with other plans or projects.

⁴⁰ The closest part of the Grenoble Road site to Cothill Fen SAC is approximately 7km away. As such, this site is at the very edge of the 7km area of search, but has been included here in line with the precautionary principle.

- 4.40 Public access or disturbance is, however, identified as a threat to the great crested newt population at Little Wittenham SAC⁴¹.
- 4.41 **Therefore, the potential for likely significant effects in relation to recreation can be screened out for all sites, except Little Wittenham SAC.**

Water quantity and quality

- 4.42 European sites at which aquatic or wetland environments support qualifying features have the potential to be affected by changes in water quantity or quality. The European sites with aquatic or wetland habitats, or those identified as sensitive to changes in water quality or quantity are:
- Cothill Fen SAC: has calcium-rich springwater-fed fens that have been identified as sensitive to water pollution and hydrological changes.
 - River Lambourn SAC and Kennet & Lambourn Floodplain SAC: river habitats that support qualifying invertebrate and fish species; identified as sensitive to water pollution and hydrological changes (including water levels, siltation and flood defences).
 - Little Wittenham SAC: its ponds support great crested newts, but changes to water quality or quantity have not been identified as an issue at this site – this site has therefore been screened out.
 - Oxford Meadows SAC: lowland hay meadows, identified as sensitive to hydrological changes.
 - Thames Basin Heaths SPA: includes wetland heath that has been identified as sensitive to hydrological changes.
- 4.43 The types of development that have the potential to affect water quality / quantity or flow regimes at sensitive European sites are:
- Residential or employment development that would involve a significant increase in demand for water supply and treatment; and
 - Infrastructure development that requires significant excavation in proximity to watercourses or groundwater.
- 4.44 Changes to demand for water supply and disposal impact upon the locations where water is abstracted or treated, whereas excavation impacts upon locations that are hydrologically connected to the development site.
- 4.45 Hydrological connectivity can occur in proximity to a river, where development would be upstream of a European site on the same river, or via groundwater where development has the potential to affect an aquifer that the European site lies over.
- 4.46 The potential for effects relating to water supply and disposal has been considered with reference to the Council's last Water Cycle Study⁴² (WCS). This was published to support the Local Plan Publication Version 1 in October 2017. The housing numbers to be delivered on the proposed allocated sites included in the previous publication version of the plan and in neighbourhood plan areas are the same or lower in the Final Publication Version 2nd Local Plan, therefore assessments with regards to the effects of such sites can be regarded as precautionary. However, the Final Publication Version 2nd Local Plan includes additional proposed strategic site allocations in the vicinity of Oxford. An interim Water Cycle Study (2018)⁴³ was produced to consider the potential impacts of the additional strategic site allocations. The WCS reflects the sites included in the Local Plan, although some of the housing numbers to be delivered at each site are different. In general, the number of houses to be delivered over the plan period at each site is fewer than used to inform the interim WCS, therefore the WCS is considered to be precautionary.
- 4.47 The assessment of the water quality effects of increased pressure on waste water treatment facilities is summarised in **Table 4.2**, reflecting the updated findings of the WCS (2017). This considered potential impacts by settlement.

⁴¹ Site Improvement Plan for Little Wittenham SAC: <http://publications.naturalengland.org.uk/publication/6567758347108352>

⁴² JBA Consulting (2017) South Oxfordshire District Council – Water Cycle Study, Phase 1 & 2 Final Report

⁴³ JBA Consulting (2018) Water Cycle Study, Draft Report

Table 4.2: Summary of Water Cycle Study findings on water quality

Settlement	Discharges to	Predicted impact of development in Local Plan
Benson (& Crowmarsh)	Howbery Ditch	Capacity available to serve the proposed growth.
Berinsfield	Clifton Hampden Ditch	Infrastructure and/or treatment work upgrades required to serve proposed growth, but no significant constraints to the provision of this infrastructure identified.
Chalgrove	Haseley Brook	Infrastructure and/or treatment work upgrades required to serve proposed growth, but no significant constraints to the provision of this infrastructure identified.
Chinnor	Kingsey Cuttle Brook	Capacity available to serve the proposed growth.
Cholsey	Cholsey Brook	Infrastructure and/or treatment work upgrades required to serve proposed growth, but no significant constraints to the provision of this infrastructure identified.
Crowmarsh Gifford	Clifton Hampden Ditch	Capacity available to serve the proposed growth.
Culham	Clifton Hampden Ditch	Infrastructure and/or treatment work upgrades required to serve proposed growth, but no significant constraints to the provision of this infrastructure identified.
Didcot	Moor Ditch	Capacity available to serve the proposed growth.
Goring	River Thames	Capacity available to serve the proposed growth.
Henley-on-Thames	Fawley Court Stream	Capacity available to serve the proposed growth.
Nettlebed	Groundwater	Not assessed (groundwater discharge).
Sonning Common	Groundwater	Not assessed (groundwater discharge).
Thame	Scotsgrove Brook	Capacity available to serve the proposed growth.
Wallingford	Cholsey Brook	Infrastructure and/or treatment work upgrades required to serve proposed growth, but no significant constraints to the provision of this infrastructure identified.
Watlington	Pyrton Stream	Capacity available to serve the proposed growth.
Wheatley	River Thame	Capacity available to serve the proposed growth.
Woodcote	River Thames	Capacity available to serve the proposed growth.

- 4.48 The 2018 interim WCS does not provide equivalent information for the Final Publication Version 2nd Local Plan, as the water quality assessment is not yet complete. It does, however, identify that all three additional strategic sites (Northfield, Grenoble Road and Land north of Bayswater Brook) would be served by Oxford Wastewater Treatment Works (WwTW) and gives commentary from Thames Water regarding the impact of proposed development. It is important to note that

Thames Water made these comments based on the maximum number of dwellings proposed to be provided at these locations at the site assessment stage, whereas the number to be allocated and forecast to be provided within the plan period is lower (therefore the conclusions from Thames Water can be considered precautionary).

- 4.49 The 2018 WCS states that, for Grenoble Road, infrastructure at the WwTW is *“unlikely to be able to support the demand anticipated from this development. Significant infrastructure upgrades are likely to be required to ensure sufficient treatment capacity is available to serve this development”*. For Northfield and Land north of Bayswater Brook⁴⁴, the WCS states that *“Infrastructure at the wastewater treatment works in this area may be unable to support the demand anticipated from this development. Minor infrastructure upgrades maybe required to ensure sufficient treatment capacity is available to serve this development”*.
- 4.50 Oxford WwTW appears to discharge into Littlemore Brook, which then runs into the Thames. The Littlemore Brook joins the River Thames downstream of Oxford Meadows SAC. None of the European sites that are sensitive to changes in water quality or quantity are downstream of those treatment works where water quality has been identified as a significant issue.
- 4.51 The WCS (2017) and interim WCS (2018) concluded that water supply will not be a constraint to development, although infrastructure upgrades may be required to enable development at Oxford, Wallingford, Didcot, Chalgrove Airfield, Chinnor, Culham and Berinsfield.
- 4.52 The European sites fed by groundwater are not at risk from abstraction, as confirmed by the Environment Agency (EA) in response to earlier (2015) HRA work (see **Appendix 4**). The EA stated that only Cothill Fen SAC, River Lambourn SAC, Kennet and Lambourn Floodplain SAC and Little Wittenham SAC are truly water dependant habitats. Of these, the EA stated that only the River Lambourn and Kennet and Lambourn would likely be impacted by abstraction. However: *“Water supply for Kennet and Lambourn Floodplain and River Lambourn is from the chalk of the Kennet catchment. Under CAMS this aquifer has no available resource - so no new source of water will come from this catchment”*.
- 4.53 **Therefore, the potential for likely significant effects in relation to water quality and quantity can be screened out for all sites.**

Identification of other plans and projects which may have ‘in-combination’ effects

- 4.54 Regulation 105 of the Habitats Regulations 2017 requires an Appropriate Assessment where *“a land use plan is likely to have a significant effect on a European site (either alone or in combination with other plans or projects) and is not directly connected with or necessary to the management of the site”*.
- 4.55 The first stage in identifying ‘in-combination’ effects involves identifying which other plans and projects in addition to the South Oxfordshire Local Plan 2034 may affect the European sites that are the focus of this assessment. There are a large number of potentially relevant plans and projects which could be considered – the review focuses on planned spatial growth within the authorities adjacent to or near South Oxfordshire, because these are the plans most likely to give rise to in-combination effects. **Appendix 2** lists the plans that were reviewed, outlining the components of each plan that could have an impact on nearby European sites and considering the findings of the accompanying HRA work (where available).
- 4.56 The purpose of the review of other plans was to identify any components that could have an impact on the European sites within and around South Oxfordshire that could also be significantly affected by the Local Plan, e.g. proposals for development near to these sites which could have implications in terms of increased traffic, water use and recreation pressures and infrastructure development. The potential for the effects of these plans to combine with the effects of the Local Plan has been considered in the next chapter and will continue to be assessed where necessary during further iterations of the HRA (if required).

⁴⁴ The interim WCS presents this site as its two constituent sites: Lower Elsfield / Land at Bayswater and Land at Wick Farm.

- 4.57 HRAs of the following neighbouring local authorities' plans found no significant effects on the integrity of European sites, either alone or in combination with other plans or projects:
- Aylesbury Vale District Council.
 - Cherwell District Council.
 - Oxfordshire County Council (Local Transport Plan and Minerals and Waste Local Plan).
 - Oxford City Council.
 - Reading Borough Council.
 - Vale of White Horse District Council.
 - Wycombe District Council.
 - Wokingham Borough Council.
 - West Berkshire Council.
- 4.58 Whilst West Oxfordshire District Council is not adjacent to South Oxfordshire District, it is recognised as having potential to affect some of the same European sites as the other Oxfordshire Local Plans, particularly the Oxford Meadows SAC. However, the HRA for the West Oxfordshire Local Plan concluded that, given the incorporation of the recommendations within the HRA and subject to development of strategic air quality studies relating to Oxford Meadows SAC, the plan will not lead to likely significant effects on European sites either alone, or in combination with other plans and projects.
- 4.59 It should be noted that some of the above authorities are reviewing their local plans and are therefore in the early stages of updating their HRA work. There is therefore potential for in-combination effects to be identified for those impacts where potential impacts cannot be entirely removed. The potential for in-combination effects will continue to be assessed during further iterations of the relevant HRAs. In particular, this relates to the following:
- Cherwell Local Plan Part 2.
 - Wokingham Borough Council Local Plan Update.
 - West Berkshire Local Plan Review.
- 4.60 In addition, a number of NDPs have been made or are being prepared within South Oxfordshire. Those that have been made and some that have not yet been made but have been supported by voting at referendum have been considered by default in this HRA, as they are considered in the Local Plan housing figures as 'commitments'. In addition, the housing numbers set out in the plan for market towns and villages are expected to be delivered by NDPs, either through NDP reviews or through new NDPs coming forward.

HRA Screening summary

- 4.61 As outlined above, the only potential likely significant effects to arise as a result of the Local Plan are as follows:
- Potential air quality effects at Aston Rowant SAC.
 - Potential recreation effects at Little Wittenham SAC.
- 4.62 As described in **Chapter 2**, each policy of the Local Plan has been screened individually. The full screening matrix used for this assessment can be found in **Appendix 3** and the findings are summarised in **Table 4.3** and the sections below. As stated previously, 'traffic light' approach was used to record the risk of likely significant effects on European sites.
- 4.63 This HRA report has taken the approach of screening each policy and site allocation individually, which is consistent with current guidance. In reality, however, the Local Plan policies will combine to deliver the overall scale of development within the District and the in-combination effects of the policies together have therefore been taken into consideration where relevant.

Table 4.3: Summary of HRA screening findings for each policy: likelihood of air and recreation effects

Policy	Air	Rec.	Policy	Air	Rec.	Policy	Air	Rec.
STRAT1	n/a	n/a	H17	n/a	n/a	ENV3	n/a	n/a
STRAT2			H18	n/a	n/a	ENV4	n/a	n/a
STRAT3	n/a	n/a	H19	n/a	n/a	ENV5	n/a	n/a
STRAT4	n/a	n/a	H20	n/a	n/a	ENV6	n/a	n/a
STRAT5	n/a	n/a	H21	n/a	n/a	ENV7	n/a	n/a
STRAT6	n/a	n/a	H22	n/a	n/a	ENV8	n/a	n/a
STRAT7	n/a		EMP1		n/a	ENV9	n/a	n/a
STRAT8	n/a	n/a	EMP2	n/a	n/a	ENV10	n/a	n/a
STRAT9	n/a		EMP3	n/a	n/a	ENV11	n/a	n/a
STRAT10	n/a		EMP4	n/a	n/a	ENV12	n/a	n/a
STRAT10i	n/a	n/a	EMP5	n/a	n/a	EP1	n/a	n/a
STRAT11	n/a		EMP6	n/a	n/a	EP2	n/a	n/a
STRAT12	n/a		EMP7	n/a	n/a	EP3	n/a	n/a
STRAT13	n/a		EMP8	n/a	n/a	EP4	n/a	n/a
STRAT14	n/a		EMP9	n/a	n/a	EP5	n/a	n/a
HEN1	n/a	n/a	EMP10	n/a	n/a	DES1	n/a	n/a
TH1	n/a	n/a	EMP11	n/a	n/a	DES2	n/a	n/a
WAL1	n/a	n/a	EMP12			DES3	n/a	n/a
H1	n/a	n/a	EMP13			DES4	n/a	n/a
H2	n/a		EMP14			DES5	n/a	n/a
H3	n/a		INF1	n/a	n/a	DES6	n/a	n/a
H4	n/a		TRANS1 a		n/a	DES7	n/a	n/a
H5	n/a		TRANS1 b		n/a	DES8	n/a	n/a
H6	n/a		TRANS2	n/a	n/a	DES9	n/a	n/a
H7	n/a		TRANS3	n/a	n/a	DES10	n/a	n/a
H8	n/a	n/a	TRANS4	n/a	n/a	TC1		n/a
H9	n/a	n/a	TRANS5	n/a	n/a	TC2	n/a	n/a
H10	n/a	n/a	TRANS6	n/a	n/a	TC3	n/a	n/a
H11	n/a	n/a	TRANS7	n/a	n/a	TC4		n/a
H12	n/a	n/a	INF2	n/a	n/a	TC5	n/a	n/a
H13	n/a	n/a	INF3	n/a	n/a	CF1	n/a	n/a
H14	n/a		INF4	n/a	n/a	CF2		n/a
H15	n/a	n/a	ENV1	n/a	n/a	CF3		n/a
H16	n/a		ENV2	n/a	n/a	CF4	n/a	n/a
						CF5	n/a	n/a

*Green = Unlikely significant effects; Orange = Uncertain effects; n/a = impact is not relevant to the policy

Significant effects likely

- 4.64 **None of the policies or site allocations** in the Local Plan are considered **likely** to result in significant effects on the European sites in and around South Oxfordshire.

Significant effects unlikely

- 4.65 Significant effects are considered **unlikely** in relation to **most of the Local Plan policies**, either because the policies will not result in new development or because the scale, nature or location of the development proposed will not have an effect on European sites. In some cases the policies also provide mitigation for the impacts of other policies in the plan (although this has not been taken into account in the screening stage).

- 4.66 The following 71 policies are screened out either because: they will not result directly in development (i.e. they set out criteria for development that will be determined under other more specific policies, which have been (or will be) screened separately for their impacts on European sites); or the development they will result in has been assessed in relation to an overarching policy, e.g. because air pollution is the only relevant impact type and only in-combination effects need to be considered in relation to it.

- STRAT1 – The Overall Strategy
- STRAT3 – Didcot Garden Town
- STRAT4 – Strategic Allocations
- STRAT5 – Residential Density
- STRAT6 – Green Belt
- STRAT8 – Culham Science Centre
- STRAT10i – Berinsfield Local Green Space
- HEN1 – The Strategy for Henley-on-Thames
- TH1 – The Strategy for Thame
- WAL1 – The Strategy for Wallingford
- H1 – Delivering New Homes
- H8 – Housing in Smaller Villages
- H9 – Affordable Housing
- H10 – Exception Sites
- H11 – Housing Mix
- H12 – Self-Build and Custom Housing
- H13 – Specialist Housing for Older People
- H15 – Safeguarding Gypsy, Traveller and Travelling Showpeople Sites
- H17 – Sub-division and Conversion to Multiple Occupation
- H18 – Replacement Dwellings
- H19 – Re-Use of Rural Buildings
- H20 – Rural Workers’ Dwellings
- H21 – Extensions to Dwellings
- H22 – Loss of Existing Residential Accommodation in Town Centres
- EMP2 – Range, Size and Mix of Employment Premises
- EMP3 – Retention of Employment Land
- EMP4 – Employment Land in Didcot
- EMP5 – New Employment Land in Henley-on-Thames
- EMP6 – New Employment Land in Thame
- EMP7 – New Employment Land in Wallingford
- EMP8 – New Employment Land in Crowmarsh Gifford
- EMP9 – New Employment Land at Chalgrove
- EMP11 – Development in the Countryside and Rural Areas
- INF1 – Infrastructure Provision
- TRANS2 – Promoting Sustainable Transport and Accessibility
- TRANS3 – Safeguarding of Land for Strategic Transport Schemes
- TRANS4 – Transport Assessments, Transport Statements and Travel Plans
- TRANS5 – Consideration of Development Proposals
- TRANS6 – Rai
- TRANS7 – Development Generating New Lorry Movements
- INF2 – Electronic Communications
- INF3 – Telecommunications Technology

- INF4 – Water Resources
- ENV1 – Landscape and Countryside
- ENV2 – Biodiversity - Designated Sites, Priority Habitats and Species
- ENV3 – Biodiversity - Non Designated Sites, Habitats and Species
- ENV4 – Watercourses
- ENV5 – Green Infrastructure in New Developments
- ENV6 – Historic Environment
- ENV7 – Listed Buildings
- ENV8 – Conservation Areas
- ENV9 – Archaeology and Scheduled Monuments
- ENV10 – Historic Battlefields, Registered Parks and Gardens, and Historic Landscapes
- ENV11 – Pollution: Impact from Existing and/or Previous Land Uses on Development (Potential Receptors of Pollution)
- ENV12 – Pollution: Impact of Development on Human Health, the Natural Environment and/or Local Amenity (Sources)
- EP1 – Air Quality
- EP2 – Hazardous Substances
- EP3 – Waste Collections and Recycling
- EP4 – Flood Risk
- EP5 – Minerals Safeguarding Areas
- DES1 – Delivering High Quality Development
- DES2 – Enhancing Local Character
- DES3 – Design and Access Statements
- DES4 – Masterplans for Allocated Sites and Major Developments
- DES5 – Outdoor Amenity Space
- DES6 – Residential Amenity
- DES7 – Public Art
- DES8 – Efficient Use of Resources
- DES9 – Promoting Sustainable Design
- DES10 – Renewable Energy
- TC2 – Retail Hierarchy
- TC3 – Comparison good floorspace requirements
- TC5 – Primary Shopping Areas
- CF1 – Safeguarding Community Facilities
- CF4 – Existing Open Space, Sport and Recreation Facilities
- CF5 – Open Space, and Sport and Recreation in New Residential Development

4.67 Several of the policies in the Local Plan will result in development of a type that could increase traffic and therefore have the potential to cause air pollution effects at Aston Rowant SAC, but are of a scale or nature that is unlikely to result in significant effects:

- EMP13 – Caravan and Camping Sites.
- EMP14 – Retention of Visitor Accommodation.
- TC4 – Convenience floorspace provision in the Market Towns.
- CF2 – Provision of Community Facilities and Services.
- CF3 – New Open Space, Sport and Recreation Facilities.

4.68 In addition to these, several policies will result in development or activities of a type that could increase visitor numbers at Little Wittenham SAC and therefore have the potential to cause recreational pressure effects, but are of a scale or in a location that is unlikely to result in significant effects for either air pollution or recreation:

- STRAT11 – Land south of Grenoble Road (screened out due to location).
- STRAT12 – Northfield (screened out due to location).
- STRAT13 – Land north of Bayswater Brook (screened out due to location).
- STRAT14 – Land at Wheatley Campus, Oxford Brookes University (screened out due to location).
- H5 – Land to the West of Priests Close, Nettlebed (screened out due to location).

- H6 – Land at Joyce Grove, Nettlebed (screened out due to location).
- H7 – Land to the South and West of Nettlebed Service Station (screened out due to location).
- H14 – Provision for Gypsies, Travellers and Travelling Showpeople (screened out due to scale).
- H16 – Infill Development (screened out due to scale).
- EMP12 – Tourism (screened out due to scale).
- EMP13 – Caravan and Camping Sites (screened out due to scale).
- EMP14 – Retention of Visitor Accommodation (screened out due to scale).

Significant effects uncertain

- 4.69 For a number of the Local Plan proposals it was concluded that there **may** be a significant effect on one or more European sites, **although this is uncertain**. Therefore, in line with the precautionary approach being applied in the HRA, until significant effects can be ruled out they are identified as likely significant effects.
- 4.70 The following policies were identified as having uncertain effects:
- STRAT2 – South Oxfordshire Housing and Employment Requirements (air pollution and recreation).
 - STRAT7 – Land at Chalgrove Airfield (recreation).
 - STRAT9 – Land Adjacent to Culham Science Centre (recreation).
 - STRAT10 – Land at Berinsfield (recreation).
 - H2 – New Housing in Didcot (recreation).
 - H3 – Housing in the Towns of Henley-on-Thames, Thame and Wallingford (recreation, but only in relation to development at Wallingford).
 - H4 – Housing in Larger Villages (recreation, but only in relation to development at Cholsey).
 - EMP1 – The Amount and Distribution of New B-Class Employment Land (air pollution).
 - EMP12 – Tourism (air pollution).
 - TRANS1a – Supporting Strategic Transport Investment across the Oxford to Cambridge Arc (air pollution).
 - TRANS1b – Supporting Strategic Transport Investment (air pollution).
 - TC1 – Retail and Services Growth (air pollution).

5 Appropriate Assessment

Appropriate Assessment approach

- 5.1 Following the screening stage, if likely significant effects on European sites are unable to be ruled out, the plan-making authority is required under Regulation 105 of the Habitats Regulations 2017 to make an 'Appropriate Assessment' of the implications of the plan for European sites, in view of their conservation objectives. EC Guidance⁴⁵ states that the Appropriate Assessment should consider the impacts of the plan (either alone or in combination with other projects or plans) on the integrity of European sites with respect to their conservation objectives and to their structure and function.
- 5.2 A site's integrity depends on it being able to sustain its 'qualifying features' (i.e. those Annex 1 habitats, Annex II species, and Annex 1 bird populations for which it has been designated) and to ensure their continued viability. A high degree of integrity is considered to exist where the potential to meet a site's conservation objectives is realised and where the site is capable of self-repair and renewal with a minimum of external management support.
- 5.3 An Appropriate Assessment has therefore been undertaken for all of the European sites in and around South Oxfordshire (+17km) where likely significant effects from the Local Plan were identified (or were not able to be ruled out) during the screening stage.
- 5.4 At the screening stage, it was not possible to rule out likely significant effects with respect to:
- Recreation impacts at Little Wittenham SAC.
 - Air pollution impacts at Aston Rowant SAC.
- 5.5 As described in **Chapter 1**, a conclusion needs to be reached as to whether or not the Local Plan would adversely affect the integrity of a European site. As stated in the EC Guidance, assessing the effects on the site(s) integrity involves considering whether the predicted impacts of the Local Plan policies (either alone or in combination) have the potential to:
- Cause delays to the achievement of conservation objectives for the site.
 - Interrupt progress towards the achievement of conservation objectives for the site.
 - Disrupt those factors that help to maintain the favourable conditions of the site.
 - Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site.
 - Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem.
 - Change the dynamics of relationships that define the structure or function of the site (e.g. relationships between soil and water, or animals and plants).
 - Interfere with anticipated natural changes to the site.
 - Reduce the extent of key habitats or the population of key species.
 - Reduce the diversity of the site.
 - Result in disturbance that could affect the population, density or balance between key species.
 - Result in fragmentation.
 - Result in the loss of key features.

⁴⁵ *Assessment of plans and projects significantly affecting European sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* European Commission Environment DG, November 2001.

- 5.6 The conservation objectives for each European site (listed in **Appendix 1**) are generally to maintain the qualifying features in favourable condition. The Site Improvement Plans for each European site provide a high level overview of the issues (both current and predicted) affecting the condition of the European features on the site(s) and outline the priority measures required to improve the condition of the features. These have been drawn on to help to understand what is needed to maintain the integrity of the European sites.
- 5.7 For each European site where an uncertain likely significant effect was identified at the screening stage in relation to the Local Plan, the potential impacts have been set out below and judgements made (based on the information available) regarding whether the impact will have an adverse effect on the integrity of the site. Consideration has been given to the potential for mitigation measures to be implemented that could reduce the likelihood or severity of the potential impacts such that there would not be an adverse effect on the integrity of the site.

In-combination effects with other plans, policies and programmes

- 5.8 As discussed previously, the Local Plan has the potential for in-combination effects arising from the following:
- Already-consented development that has been counted within the overall figures for the supply of housing and employment land (Local Plan policies STRAT2 and EMP1).
 - Development proposed within South Oxfordshire neighbourhood plans, where it exceeds the allocation in the Local Plan.
 - Development proposed by Vale of White Horse District that would result in increased population in Abingdon and therefore visits to Little Wittenham SAC.
 - Development proposed by neighbouring authorities that would result in increases in traffic on the M40 within 200 metres of Aston Rowant SAC.
- 5.9 **Appendix 2** summarises the quantum of development proposed in relevant plans and the findings of any HRA work that has been undertaken.
- 5.10 None of the completed HRAs for neighbouring authorities' plans have identified significant effects either alone or in-combination with other plans. In some cases, however, the HRA work has not been completed (e.g. Oxfordshire County waste site allocations), as these plans are in the process of being prepared and have not yet been finalised.
- 5.11 In-combination effects have been considered in the Appropriate Assessment, below.

Air Pollution Impacts

Policies potentially contributing to air pollution impacts in-combination

- 5.12 The policies that have been assessed as having uncertain potential for air pollution impacts are those that could increase traffic flows on roads that pass within 200 metres of a sensitive European site. **Table 5.1** summarises those policies and the nature and quantum of development associated with them.

Table 5.1: Development with the potential for air pollution effects

Policy	Development that the policy provides for
STRAT2 - South Oxfordshire Housing and Employment Requirements	At least 7,049 homes (in addition to the 15,726 homes already committed/completed) Located at: - Strategic allocations - Market towns - Larger villages
EMP1 - The Amount and Distribution of New B-Class Employment Land	≥17.98ha of B-class employment land (in addition to the 19.22ha already committed/completed) Located at: - Henley-on-Thames (1ha) - Thame (1.6ha) - Wallingford (3.1ha) - Crowmarsh Gifford (0.28ha) - Culham (2ha) - Chalgrove (5ha) - Berinsfield (5ha)
EMP12 - Tourism	Unspecified (small scale)
TRANS1a – Supporting Strategic Transport Investment across the Oxford to Cambridge Arc TRANS1b – Supporting Strategic Transport Investment	Support the development and delivery of a new River Thames road crossing between Culham and Didcot Garden Town; support, in association with major development, the delivery of new or improved roads, such as a bypass or edge road.
TC1 – Retail and Services Growth	25,670 sq.m (net) comparison retail floorspace 4,500 sq.m (net) convenience floorspace

5.13 The total increase in traffic arising from all of these policies (the whole Local Plan) in combination with other plans or projects could increase traffic flows and therefore have an air pollution impact at the M40 passing through Aston Rowant SAC.

5.14 Plans and projects that could have an air pollution impact in combination with the Local Plan include:

- Neighbouring authorities' plans or projects.
- Neighbourhood plans for towns and villages within South Oxfordshire, where the quantum of development exceeds that allocated within the Local Plan.

Traffic modelling

5.15 SODC commissioned Atkins to model the effects of the Local Plan on traffic flows within the District. The model considered changes in traffic within proximity to Aston Rowant SAC.

5.16 The traffic model results are presented in **Table 5.2**, and considered the following scenarios:

- Model verification year (2016).
- 2031 do-minimum (includes committed development and policy commitments from surrounding local authorities).
- 2031 Scenario 5A (includes Local Plan sites, transport schemes in the Didcot area and bypasses at Stadhampton and Chisilhampton).
- 2031 Scenario 5B (includes Scenario 5A plus the A40 bypass near Oxford, improvements to the A4074 Golden Balls junction and access to the Culham site on the A415).

Table 5.2: Estimated traffic flows (total AADT) for modelled scenarios along M40 adjacent to Aston Rowant SAC

Scenario	AADT
Without mitigation / scenario '5a'	
2016 baseline	98,571
2031* future baseline	115,700
2031* with Local Plan	117,100
Change without Local Plan	17,129
Change due to Local Plan	1,400
With mitigation / scenario '5b'	
2016 baseline	98,571
2031* future baseline	115,700
2031* with Local Plan	121,100
Change without Local Plan	17,129
Change due to Local Plan	5,400

**Note that the traffic model has a fixed future year date of 2031. However, it includes all development proposed in the South Oxfordshire Local Plan 2034 Final Publication Version 2nd. The model is also based on the full capacity of proposed sites, which is greater than the development allocated in the Local Plan 2034 Final Publication Version 2nd, which includes only that expected to come forward during the plan period. As such, these figures are still considered precautionary and the model is considered the most relevant and robust tool available.*

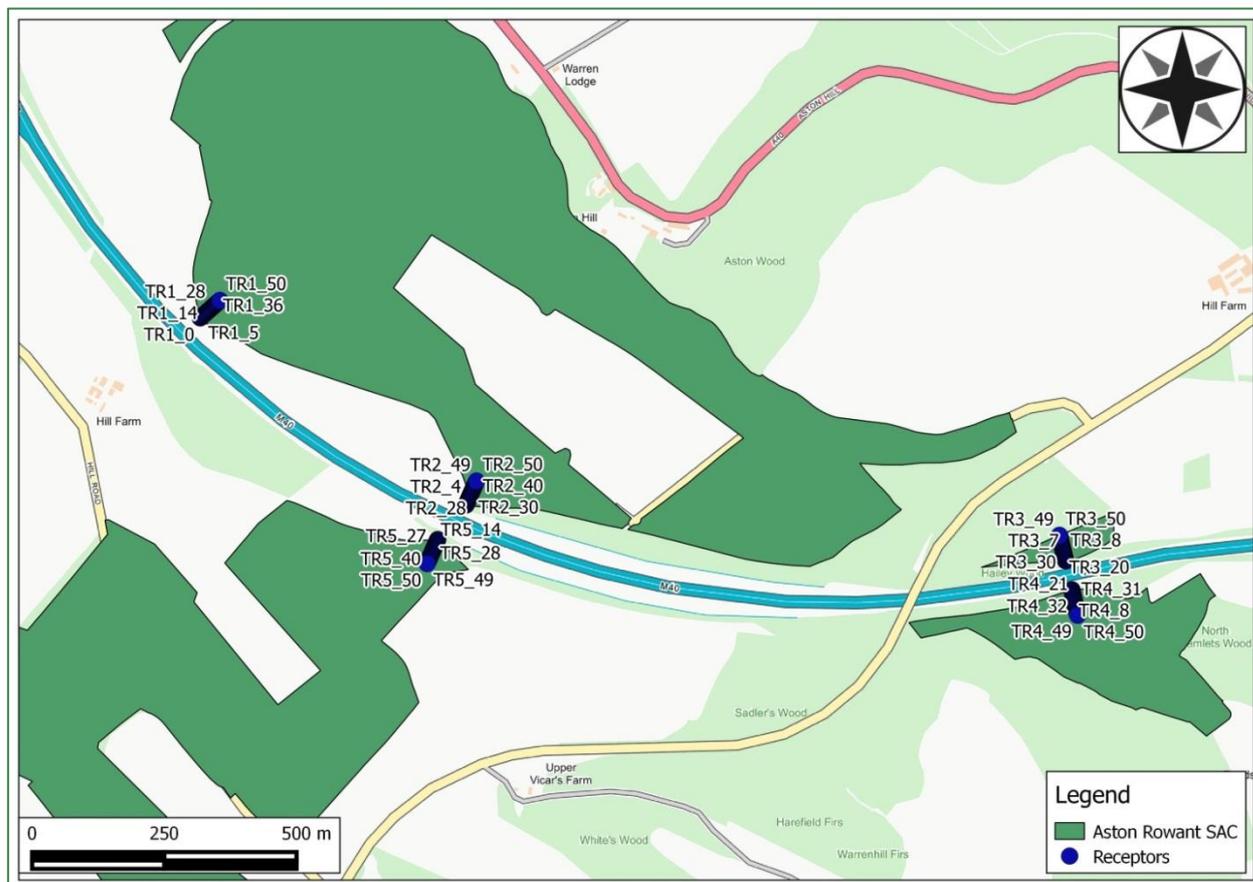
- 5.17 In both scenarios, traffic flows past Aston Rowant SAC are likely to increase by more than 1,000 AADT, therefore air quality modelling and further analysis has been undertaken, as described below.

Air quality model

- 5.18 Concentrations have been modelled along five transects on either side of the M40 based on results of the South Oxfordshire traffic model (as shown in

5.19 **Table 5.2).** The transect locations are shown in **Figure 5.1** below. Concentrations have been predicted at 1m intervals along the five transects, from the SAC boundary closest to the road, up to 20m from the boundary.

Figure 5.1: Aston Rowant SAC and Location of Transect Receptors



5.20 Concentrations of NO_x have been predicted for the following scenarios, with the air quality effects of the Submission Local Plan assessed alone and in-combination with other plans:

- Model verification year (2016).
- 2031 without the Local Plan.
- 2031 with the Local Plan.
- 2031 with the Local Plan + in-combination plans.

5.21 In addition to predictions using emissions data published by Defra, a sensitivity analysis called CURED (Calculator Using Realistic Emissions for Diesels) has been undertaken that assumes higher NO_x emissions from diesel vehicles. The sensitivity analysis provides a worst case assessment of future impacts (see **Appendix 5** for further details on uncertainty).

5.22 Online guidance published by Defra and the Environment Agency has been used in the first instance to screen out impacts that will have an insignificant effect⁴⁶. The guidance explains that regardless of the baseline environmental conditions, a process can be considered as insignificant if the long-term (annual mean) process contribution is less than 1% of the long-term environmental standard.

5.23 It should be recognised that this criterion determines when an impact can be screened out as not significant. It does not imply that there will be damage to a habitat above this threshold, or that impacts will necessarily be significant above this criterion, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology,

⁴⁶ DEFRA and EA (2016) Air Emissions Risk Assessment for your Environmental Permit

such as a detailed dispersion modelling study (as has been carried out for this assessment in any event) in association with a qualified ecologist to consider the likelihood of an adverse effect on the integrity of the habitat. A position statement published by the Institute of Air Quality Management (IAQM)⁴⁷ suggests that only impacts clearly above 1% should be treated as potentially significant, rather than impacts that are about 1%, or slightly higher⁴⁸.

- 5.24 For the purposes of this assessment, where concentrations and/or deposition rates are predicted to increase by 1% or less of the assessment criteria, the potential for significant impacts have been discounted, and no further assessment carried out. However, (when rounded up/down to the nearest whole percent) where concentrations and/or deposition rates are predicted to increase by more than 1% of the assessment criteria, the total concentrations and deposition rates (road contribution + background) have been compared with the relevant critical level/loads. **Critical levels** are defined as 'concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge' and **critical loads** are defined as 'quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'⁴⁹. The APIS website⁵⁰ provides information on critical levels and loads for different habitats and vegetation types.

Nitrogen oxides (NO_x)

- 5.25 Current background levels for NO_x in the local area are well below the Critical Level of 30µg/m³, and are expected to fall further over the Local Plan period, as shown in **Table 5.3**. These are based on a 1x1km grid square analysis carried out by Defra.

Table 5.3: Estimated Annual Mean Background Concentrations in 2016 and 2031 (µg/m³)

Year	NO _x
2016	17.1-20.3
2030	8.7-9.9
2030 – CURED	10.9-12.8
Critical Level	30

*The range of concentrations from across the study area are shown in Table 5.3 above. Predicted background concentrations from the background maps are only available up to 2030; therefore, 2031 concentrations have been assumed to be the same as in 2030.

- 5.26 However in the vicinity of the road itself, the Critical Level is currently being exceeded at all transects (range 34.1 – 77.5µg/m³) due to current levels of traffic related NO_x. By 2031, in the absence of growth the background annual mean NO_x concentrations are predicted to reduce significantly due to improvements in the environmental performance of diesel engines and will fall below the Critical Level across increasing areas of the SAC. However continued exceedances of the Critical Level are predicted under the CURED scenario in some locations at up to 23m inside the SAC boundary.
- 5.27 The effects on annual mean NO_x concentrations due to Scenarios 5A and 5B on each transect are set out in **Table 5.4** below. Under Scenario 5A, assuming Emissions Factor Toolkit (EFT) emissions, there is no exceedance of the annual mean screening criterion, and the impacts would not be significant. Assuming CURED emissions, the annual mean screening criterion is exceeded at Transect 4 only, and up to 1m from the SAC boundary.
- 5.28 Under Scenario 5B, assuming EFT emissions, the annual mean screening criterion is exceeded at Transect 1 up to 15m from the SAC boundary, at Transect 2 up to 25m from the SAC boundary, at Transect 3 up to 28m from the SAC boundary, at Transect 4 up to 24m from the SAC boundary and at Transect 5 up to 2m from the SAC boundary. Assuming CURED emissions, the annual

⁴⁷ The IAQM is the professional body for air quality practitioners.

⁴⁸ IQAM (2016) Position Statement - Effect of Air Quality Impacts on Sensitive Habitats

⁴⁹ http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788050

⁵⁰ <http://www.apis.ac.uk>

mean screening criterion is exceeded up to 50m from the SAC boundary, apart from at Transect 5, where the annual mean screening criterion is exceeded up to 31m from the SAC boundary.

Table 5.4: Predicted Contribution of NO_x at the closest transects due to the Local Plan in 2031

Receptor	Predicted Road Contribution of Annual Mean NO _x (µg/m ³)		% of Screening Criterion a		Maximum distance at which the 1% screening criterion is exceeded under CURED conditions
	EFT	CURED	EFT	CURED	
Scenario 5A in 2031					
TR1_0	0.1	0.2	0	1	0
TR2_0	0.2	0.3	1	1	0
TR3_0	0.2	0.3	1	1	0
TR4_1	0.3	0.5	1	2	1
TR5_0	0.1	0.2	0	1	0
Scenario 5B in 2031					
TR1_50	0.3	0.5	1	2	50
TR2_50	0.3	0.5	1	2	50
TR3_50	0.3	0.5	1	2	50
TR4_50	0.3	0.5	1	2	50
TR5_31	0.3	0.4	1	2	31
Screening Criterion	-		1		

Exceedances of 1% of the assessment criterion are shown in **bold**.

- 5.29 As shown in **Table 11** in **Appendix 5**, the assessment criterion of 30 µg/m³ is predicted to be achieved at all receptors for the do-minimum scenario. The assessment criterion of 30 µg/m³ is predicted to be achieved at most receptors for Scenario 5B, apart from at the SAC boundary on Transect 3, where an annual mean NO_x concentration of 30.8 µg/m³ has been predicted. The maximum increase in annual mean NO_x concentrations due to Scenario 5B is 0.9 µg/m³, which is an increase of 3% as a percentage of the assessment criterion of 30 µg/m³.
- 5.30 The assessment criterion of 30 µg/m³ is predicted to be exceeded for the do-minimum scenario up to 4m from the SAC boundary at Transect 1, up to 14m from the SAC boundary at Transect 2, up to 23m from the SAC boundary at Transect 3 and up to 22m from the SAC boundary at Transect 4. Scenario 5B is predicted to increase the distance of exceedance of the assessment criterion by 2m from the SAC boundary at Transect 1, Transect 2 and Transect 3, and by 3m from the SAC boundary at Transect 4. No exceedances of the assessment criterion are predicted at Transect 5. The maximum increase in annual mean NO_x concentrations due to Scenario 5B is 1.5 µg/m³, which is an increase of 5% as a percentage of the assessment criterion of 30 µg/m³.

Nitrogen deposition

- 5.31 Background nitrogen deposition fluxes have been calculated using data from the APIS website, and are shown in **Table 5.5**. Background deposition fluxes have been estimated from the 2013-15 average data provided by APIS using the methodology in DMRB, Volume 11, Section 3, Part 1 HA207/07 (Highways Agency, 2007). Background deposition fluxes are above the critical loads in 2016 and 2031.

Table 5.5: Estimated Annual Mean Background N Deposition in 2016 and 2031

Year	Nutrient Nitrogen (kg/ha/yr)	Acid Nitrogen (keq/ha/yr)
2016	29.30	2.093
2031	20.14	1.439
Critical Load	10	1.369

- 5.32 Under Scenario 5a the predicted contributions to nutrient and acid nitrogen deposition fluxes at the closest receptors to the M40 on each transect are summarised in **Table 5.6** below and detailed fully in **Table 7** in **Appendix 5**. The predicted contributions are below the screening criteria for both nutrient and acid nitrogen deposition; therefore, the impacts of Scenario 5A on nutrient and acid nitrogen deposition would not be significant.
- 5.33 Under Scenario 5b, assuming EFT emissions, the predicted contributions are below the screening criteria for both nutrient and acid nitrogen deposition. Assuming CURED emissions, the predicted contributions are below the screening criterion for acid nitrogen deposition; however, as shown in **Table 5.6** below, the screening criterion for nutrient nitrogen deposition is exceeded at Transect 2 up to 5m from the SAC boundary, at Transect 3 up to 10m from the SAC boundary and at Transect 4 up to 8m from the SAC boundary.

Table 5.6: Predicted Contribution of Nutrient Nitrogen N at transect locations due to the Local Plan in 2031

Receptor	Predicted Road Contribution of Nutrient Nitrogen N (kg/ha/yr)		% of Screening Criterion a		Maximum distance at which the 1% screening criterion is exceeded under CURED conditions
	EFT	CURED	EFT	CURED	
Scenario 5A in 2031					
TR1_0	0.02	0.03	0	0	0
TR2_0	0.03	0.03	0	0	0
TR3_0	0.03	0.04	0	0	0
TR4_1	0.04	0.06	0	1	1
TR5_0	0.02	0.03	0	0	0
Scenario 5B in 2031					
TR1_0	0.09	0.14	1	1	0
TR2_5	0.10	0.16	1	2	5
TR3_10	0.10	0.15	1	2	10
TR4_8	0.10	0.15	1	2	8
TR5_0	0.07	0.11	1	1	0
Screening Criterion	-		1		

Exceedances of 1% of the assessment criterion are shown in **bold**.

- 5.34 **Table 12** in **Appendix 5** sets out the predicted total nutrient nitrogen deposition at receptors where the screening criterion has been exceeded assuming CURED emissions under Scenario 5B.
- 5.35 Given that background nutrient nitrogen deposition is above the assessment criterion, the assessment criterion of 10 kg/ha/yr is predicted to be exceeded for both do-minimum and Scenario 5B. The maximum increase in nutrient nitrogen deposition due to Scenario 5B is 0.20 kg/ha/yr, representing an increase of 2% as a percentage of the assessment criterion, and extending up to 10m into the SAC.

Mitigating factors

- 5.36 It should be noted that the predicted impacts represent a worst-case scenario with regard to the emissions used. In reality, the introduction of progressively cleaner vehicles into the UK fleet is likely to result in a significant reduction in NO_x emissions from diesel vehicles between 2016 and 2031.
- 5.37 The model has also assumed that the M40 is at grade with the surrounding area, including the Aston Rowant SAC. A significant proportion of the M40 is actually within a cutting as the road passes through the SAC. Modelling the road at grade would likely result in a precautionary assessment of concentrations at parts of the SAC where it lies above a cutting as the distance between the emissions source and the receptor is increased, also, entrainment and recirculation of emissions within the cutting would result in a reduced impact outside the cutting.

- 5.38 The cutting is also heavily vegetated by a dense belt of scrub which would act as a buffer by intercepting and absorbing some NO_x from the air before it reaches the SAC^{51,52,53}, therefore concentrations in the SAC which have been buffered by these belts of scrub are likely to be lower than shown by the model, and the 1% screening threshold is likely to be breached over a much smaller area of the SAC (if at all).

Effects on site integrity

- 5.39 The Critical Level does not discriminate between the role of N deposition and NO_x in the air. It is a precautionary general threshold, not specific to a particular habitat, plant species or impact pathway, below which there is currently a high degree of confidence that adverse effects on vegetation will not arise. For many habitats, increases in NO_x above the standard 30ug/m³ threshold do not necessarily result in an ecological response. For example, a recent study of the effects of atmospheric N on saltmarsh found that it was the level of N deposition relative to the Critical Load which was more important than the concentration of NO_x relative to the Critical Level⁵⁴. Crucially, it is typically the secondary effects of increasing NO_x concentration i.e. the resulting N deposition, which are likely to trigger a significant ecological effect, rather than the direct effects of the increasing NO_x concentrations.

Juniperus communis formations on heaths or calcareous grasslands

- 5.40 Juniper is a dioecious evergreen conifer found on basic and acidic soils in a wide range of habitats, including chalk downland, heather moorland, oceanic heaths, rocky slopes and in *Betula*, *Quercus* and *Pinus* woods.
- 5.41 In the UK, its distribution is restricted to two areas of the country and two broad habitat types. The majority of populations occur on acidic substrates in heathland or acid grassland habitats in northern England and Scotland. In southern England juniper scrub may develop on a range of calcareous grassland types on thin chalk soils, while more closed juniper stands with a rich scrub flora correspond to NVC type W21d *Crataegus monogyna* – *Hedera helix* scrub, *Viburnum lantana* sub-community. Where juniper is not dominant the scrub contains a rich assemblage of other shrubs, mainly of the family Rosaceae.
- 5.42 Juniper is typically found on low nitrogen soils and has been classified as having a relatively low Ellenburg factor (an indicator value of 3 on a scale of 1 to 9). However, it is understood to be relatively tolerant of a wide range of nutrient levels. Fertilizer trials in Scotland by the Forestry Commission⁵⁵ found that on poor to medium upland brown earths at Moray, applications of phosphorus at 60kg/ha had no significant effect on survival or growth of planted junipers. On nutrient deficient peaty podzols at Lochaber, various low applications of N, P and K had no effect on survival of planted junipers but application of N at 150kg/ha significantly improved height growth and root collar diameter growth. The other nutrients by themselves had no effect but K (100kg/ha) with N increased height growth, and P (90kg/ha) with N increased root collar diameter growth. The comparatively small effect of fertilizers points to juniper being well-adapted to nutrient-poor conditions. This is supported by the findings of Grubb et al.⁵⁶ that growth on calcareous soils is limited by available light rather than P and N.
- 5.43 Transects 1 and 2 run through areas of calcareous grassland habitat which potentially support qualifying juniper formations. When the in-combination effects of growth are assessed, the annual mean screening criterion for NO_x is not exceeded under Scenario 5A but is exceeded up to 50m into the SAC for Scenario 5b.

⁵¹ Xu, Y. (2008) Modelling the effects of roadside trees, results and conclusions. Report for the London Borough of Harrow. AEA, Harwell, Oxon

⁵² Air pollution removal by urban trees and shrubs in the United States (2006). David J. Nowak, Daniel E. Crane, Jack C. Stevens. *Urban Forestry & Urban Greening* Vol. 4, pp115–123

⁵³ Freer-Smith, P.H., Beckett, K.P. and Taylor, G. (2005). Deposition velocities to *Sorbus aria*, *Acer campestre*, *Populus deltoides* x *trichocarpa* 'Beaupre', *Pinus nigra* and x *Cupressocyparis leylandii* for coarse, fine and ultra-fine particles in the urban environment. *Environmental Pollution* Vol.133, pp157–167

⁵⁴ Boorman LA and Hazelden J. (2012) Impacts of Additional Aerial Inputs of Nitrogen to Saltmarsh and Transitional Habitats. CCW Science Report No: 995, Countryside Council for Wales, Bangor, Wales

⁵⁵ Broome, A.C. (2003) *Growing juniper; propagation and establishment practices*. Information Note No. 50, Forest Commission, Edinburgh

⁵⁶ Grubb, P.J., Lee, W.G., Kollmann, J. & Wilson, J.B. (1996) Interaction of irradiance and soil nutrient supply on growth of seedlings of ten European tall-shrub species and *Fagus sylvatica*. *Journal of Ecology*, **84**, 827–840

- 5.44 Unsurprisingly, since NO_x is the main source of nitrogen from vehicle exhaust emissions, the results from the NO_x analysis carry over to the nitrogen deposition calculations. However, since most of the emitted NO_x is not deposited at the roadside the change in nitrogen deposition rates is forecast to be lower than the change in NO_x concentrations. Indeed, under Scenario 5B, assuming CURED emissions, the screening criterion for nutrient nitrogen deposition is not exceeded anywhere within the SAC at Transect 1, and is exceeded extending up to only 5m at Transect 2.
- 5.45 As described in **Appendix 5**, the use of CURED emissions provides a conservative upper estimate of the impacts. It is likely that the real in-combination impact will lie somewhere between the EFT and CURED scenarios, suggesting an exceedance of somewhere between 1-2% up to 5m from the SAC boundary at Transect 2. Given the tiny proportion of the SAC that this area represents, and that the IAQM⁵⁷ suggests that only impacts clearly above 1% should be treated as potentially significant, rather than impacts that are about 1%, or slightly higher⁵⁸, together with the current and historic favourable condition of the SAC, the qualifying feature *Juniperus communis formations on heaths or calcareous grasslands* is not predicted to be adversely affected by the Local Plan, either alone or in-combination.

Asperulo-Fagetum Beech Forest

- 5.46 This habitat type occurs on circumneutral to calcareous soils and mostly corresponds to NVC type W12 *Fagus sylvatica – Mercurialis perennis* woodland. In addition, some of the more calcareous stands of NVC type W14 *Fagus sylvatica – Rubus fruticosus* woodland are also included. The main concentrations shown occur in the lowlands of southern Britain, along the Downs, in the Weald and the Chilterns, down the Hampshire Hangers and into the New Forest, and westward through the Cotswolds, Wye Valley and to the coalfields of south-east Wales.
- 5.47 A series of studies on beech woodlands in Switzerland has demonstrated that they are sensitive to N deposition, with a range of significant ecological effects recorded including increased susceptibility to pest and pathogens^{59,60,61,62}, a reduction in root and stem growth⁶³, changes in flowering patterns, seed and litterfall production and decomposition⁶⁴, and lower mycelium density⁶⁵.
- 5.48 Transects 3, 4 and 5 are all within areas of beech woodland. Under Scenario 5A the NO_x screening criterion is exceeded at Transect 4 only, up to a distance of just 1m into the SAC. Under Scenario 5B the NO_x screening criterion is exceeded at Transects 3 and 4 up to 50m and up to 31m at Transect 5.
- 5.49 As described above, since most of the emitted NO_x is not deposited at the roadside the change in nitrogen deposition rates is forecast to be lower than the change in NO_x concentrations. Indeed, under Scenario 5B, assuming CURED emissions, the screening criterion for nutrient nitrogen deposition is exceeded (lying between 1-2%) at Transect 3 at a distance of up to 10m inside the SAC, and at Transect 4 at up to 8m inside the SAC. The screening criterion for nutrient nitrogen is not exceeded at Transect 5.
- 5.50 This could potentially affect an estimated 0.12ha of the SAC. This equates to approximately <0.1% of the SAC potentially affected by increasing N deposition due to the in-combination effects of growth.

⁵⁷ The IAQM is the professional body for air quality practitioners.

⁵⁸ IQAM (2016) Position Statement - Effect of Air Quality Impacts on Sensitive Habitats

⁵⁹ Westling, O. (1991) Nitrate in soil water *Miljöatlas*. pp 1-20

⁶⁰ Flückiger, W. and Braun, S. (1999) Nitrogen and its effects on growth, nutrient status and parasite attacks in beech and Norway Spruce *Water, Air and Soil Pollution* Vol.116, pp99-110

⁶¹ Flückiger, W. and Braun, S. (1998) Nitrogen deposition in Swiss forests and its possible relevance for leaf nutrient status, parasite attacks and soil acidification *Environmental Pollution* Vol.102, pp69-76

⁶² Flückiger, W. and Braun, S. (2004) Wie geht es unserem Wald? Ergebnisse aus Dauerbeobachtungsflächen von 1984 bis 2004 67

⁶³ Flückiger, W. and Braun, S. (2011) Auswirkung erhöhter Stickstoffbelastung auf die Stabilität des Waldes

⁶⁴ Vangelova, E. and Pitman, R. (2011) Impacts of Short Rotation Forestry on Soil Sustainability In McKay, H. (ed.) *Short Rotation Forestry: review of growth and environmental impacts* 212pp

⁶⁵ Braun, S., Thomas, V.F.D., Quiring, R. and Flückiger, W. (2010) Does nitrogen deposition increase forest production? The role of phosphorus *Environmental Pollution* 158 2043-2052

Conservation objectives

- 5.51 The potential effects of increasing N identified by the model on the qualifying features of the SAC have been considered in light of the available scientific evidence and the conservation objectives for Ashton Rowant SAC.
- 5.52 Both of the qualifying features are understood to currently be in favourable condition at the SAC, as recent condition assessments have recorded all units as being in favourable condition⁶⁶. The following objectives have therefore been considered in the context of maintaining, rather than achieving favourable conservation status of the qualifying features.

The extent and distribution of qualifying natural habitats

- 5.53 The potential effects of N deposition on juniper populations and beech forest habitats are relatively subtle, typically relating to the structure, function and supporting processes (see below), however there is no evidence that these effects could result in a change in the extent or distribution of these habitats.

The structure and function (including typical species) of qualifying natural habitats

- 5.54 Research has shown that increasing NO_x concentrations can affect the growth, physiology and biochemistry of plants. At Aston Rowant SAC, the total NO_x concentrations could reach 46.7µg/m³ and total nutrient nitrogen deposition could reach 25 kg/ha/yr when assuming a worst case in-combination scenario and taking background levels of NO_x into account. At these concentrations, effects on growth such as increased biomass, changes in root to shoot ratio, growth of more competitive species, and growth suppression of some species could occur, however physiological and biochemical changes are considered to be unlikely as the evidence indicates that they are triggered at much higher concentrations.
- 5.55 These growth effects would be likely to become noticeable over the long-term, most likely manifesting themselves as changes in species composition and habitat structure. Indeed the M40 has been operational through the SAC since 1974 and the habitats at Aston Rowant would have been exposed to high concentrations of NO_x throughout that period, therefore it is expected that any long-term impacts on the structure and function of the habitats within the site would have been identified through habitat condition monitoring. Condition assessments at the SAC indicate that the unit potentially affected by the elevated NO_x concentrations and nutrient nitrogen deposition (Unit 4) has remained in favourable condition over a period of at least 11 years, which indicates that there has been no significant ecological response to the prolonged exposure to elevated concentrations of NO_x or N deposition, or that any response has been so subtle as to not materially affect the condition targets for the habitats, which Natural England use to establish compliance with the conservation objectives. Given that SAC is still understood to be in favourable condition, and that the overall NO_x concentrations and nutrient nitrogen deposition are expected to continue to fall over time despite the effects of growth on increased traffic flows, it is considered highly unlikely that the structure or function of the qualifying features would not be maintained.

Conclusions on site integrity

- 5.56 In summary, and in light of the above discussion, despite the screening threshold for NO_x and nutrient nitrogen being exceeded, the effect would not be expected to result in any material changes to the qualifying features of the SAC for the following reasons:
- Using 'CURED' vehicle emissions is highly precautionary and no exceedances in screening thresholds were triggered under the EFT emissions. In reality the emissions are likely to be between the EFT and CURED predictions.
 - The proportion of SAC qualifying habitat affected by forecast exceedances in nutrient nitrogen deposition is <0.1% of the total area of SAC and therefore the integrity, in terms of ecological coherence, structure and function would not be affected.
 - Calcareous habitat and particularly juniper scrub have been reported to be resilient to the effects of nutrient nitrogen deposition.

⁶⁶ <https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S1002737&ReportTitle=Aston Rowant SSSI>

- The SAC, including those locations where screening thresholds have regularly been exceeded, have been in favourable condition for over 11 years despite historic exceedances of the critical level. While the effects of changes to growth rates are technically possible, in the long-term it is expected that such effects would result in notable changes to habitat condition. However, no such changes have been recorded within the potentially affected parts of the site during 11 years of condition monitoring.
- The M40 is located within a steep cutting along much of its length in proximity to the SAC, and therefore the actual distance between the M40 and SAC is often considerably greater than is apparent on 2D mapping. In addition, the topography of the steep cutting is likely to reduce the levels of NO_x and nutrient N reaching the SAC.
- The majority of the length of M40 in proximity to the SAC is bordered by an intervening belt of dense scrub and woodland habitat, which is likely to act as a buffer and barrier to the effects of nutrient nitrogen deposition in particular.

5.57 **In light of the above analysis, it is concluded that the ecological effects of the predicted increases in NO_x concentrations and nutrient nitrogen deposition would either be negligible, or that any small effects would be highly unlikely to result in a deterioration in the condition of the qualifying features, and as such it is concluded that the in-combination effects of planned growth would not result in an adverse effect on the integrity of the Aston Rowant SAC.**

Recreation impacts

5.58 The policies identified as having uncertain impacts on Little Wittenham SAC, due to increased visitor numbers, are those that will result in new homes within c.7km of the SAC. Some of the policies provide for housing across the whole District, in which case only a proportion of the new homes they will result in have the potential to be close to Little Wittenham SAC. Where the policies allocate development in a specific location, however, all of the new homes provided for by the policy may be within 7km. **Figure 5.2** shows the strategic allocations, proposed allocations, market towns and larger villages within or in close proximity to 7km of the SAC.

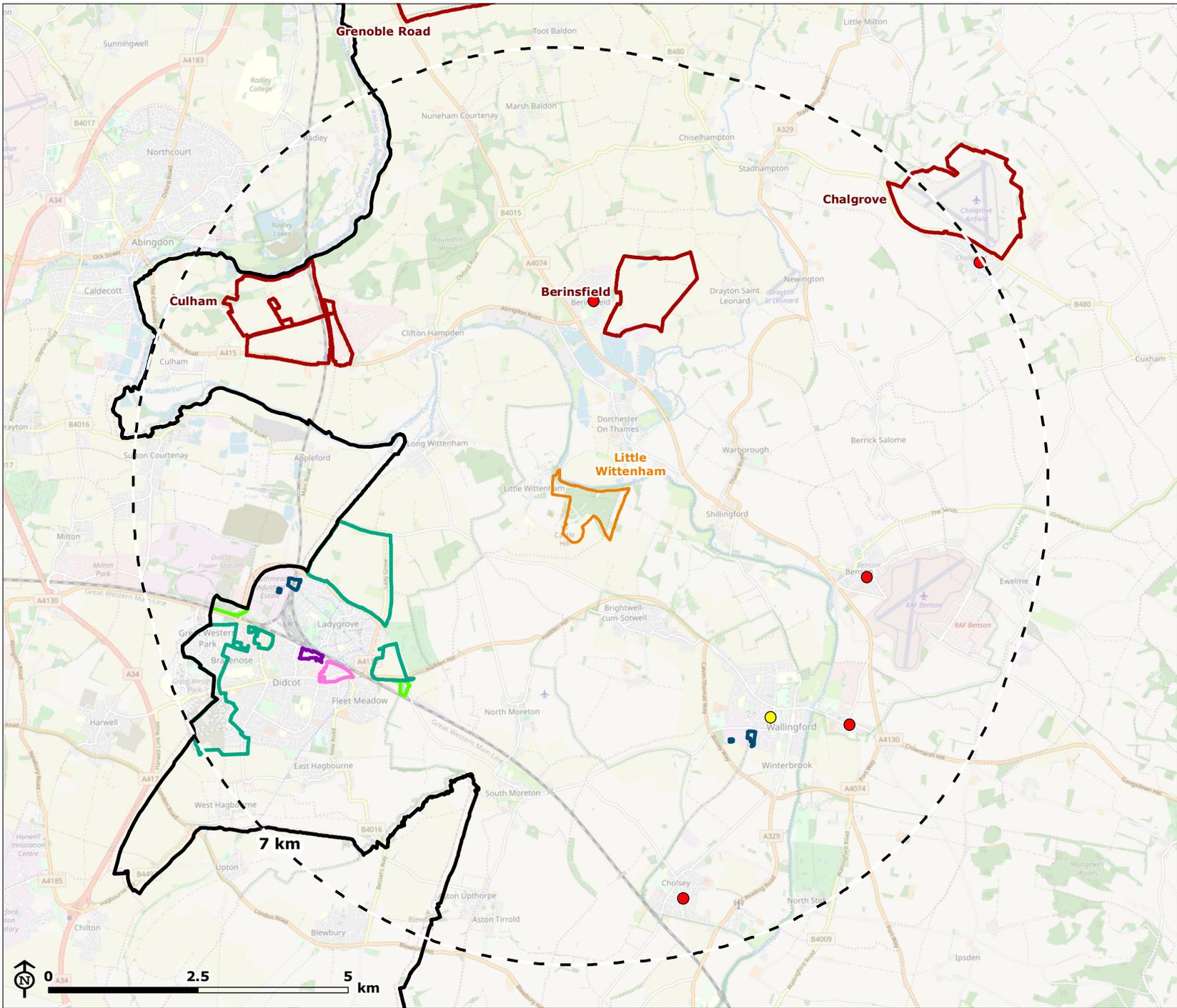
South Oxfordshire Local Plan 2034

Figure 5.2: Development with the potential to increase visitor numbers at Little Wittenham SAC

- South Oxfordshire district boundary
- Market town
- Larger Village
- Special Area of Conservation
- 7km buffer from Little Wittenham SAC
- Committed allocation - housing
- Committed allocation - mixed use
- Committed employment allocation
- Proposed allocation - housing
- Proposed allocation - mixed use
- Strategic allocation

Source: OS, Natural England

Map Scale @ A4: 1:90,000



- 5.59 An estimate of the new homes that are likely to result from the policies identified is summarised in **Table 5.7**.

Table 5.7: New homes within c.7km of Little Wittenham SAC⁶⁷

Policy	Number of new homes policy provides for within plan period	Proportion of these new homes within or near 7km of Little Wittenham SAC
STRAT2 - South Oxfordshire Housing and Employment Requirements	At least 7,049 new homes (in addition to the 15,726 completions / commitments)	As distributed between the sites listed below. c.5,502 new homes (plus a proportion of the completed / committed homes)
STRAT7 - Land at Chalgrove Airfield	2,025 new homes	This site lies on the 7km buffer, therefore the whole allocation has been considered. All
STRAT9 - Land Adjacent to Culham Science Centre	1,850 new homes	All
STRAT10 - Land at Berinsfield	1,600 new homes	All
H4 - Housing in the Larger Villages	499 new homes	Homes in Cholsey only. 27 new homes

- 5.60 South Oxfordshire is expected to have an average household size of 2.18⁶⁸ by the end of the Local Plan period (2034). The new homes resulting from the Local Plan will therefore accommodate an increase in population of c.11,994 within c.7km of Little Wittenham SAC. The current population in the same area (including Chalgrove and Abingdon, which lie at the edge of the 7km zone) is approximately c.63,375⁶⁹, based on 2011 census data. The Local Plan alone therefore seeks to accommodate a population increase of approximately 19% since 2011, within c.7km of Little Wittenham SAC (including Chalgrove).
- 5.61 Little Wittenham SAC currently receives c.150,000 visits each year⁷⁰. An increase of 19%, in line with the estimated population increase, would therefore result in an additional c.28,500 visits per year. The Earth Trust, which manages Little Wittenham SAC as part of a larger area, has undertaken visitor surveys and estimates that visits to the site will increase by 11% by 2020 and 36% by 2030⁴⁵. The increase in population due to the Local Plan alone is estimated to be within the increase planned for by the Earth Trust.
- 5.62 The Earth Trust has submitted a planning application⁷¹ for facilities to accommodate the expected increase in visitors that Natural England has been consulted on and raised no objection to. Natural England stated:

"Little Wittenham Special Area of Conservation is designated for having the best studied population of Great Crested Newts in the UK. The proposals could increase visitor pressure on the SAC; however Great Crested Newts are not particularly sensitive to visitor pressure, and the Earth Trust manage visitors to limit access to the SAC."

⁶⁷ Note that policies H2 and H3 are not included in this table, as the housing allocated through these policies is already committed. The housing allocated in policies H2 and H3 has been taken into account through consideration of in-combination effects.

⁶⁸ <http://www.whitehorsedc.gov.uk/sites/default/files/Oxfordshire%20Population%20Forecasts%20to%202026.pdf>

⁶⁹ Based on 2011 census data for Output Areas population weighted centroids for area within 7km of Little Wittenham SAC, plus Chalgrove.

⁷⁰ Earth Trust (2016) *Statement of Need for Improvements to the Earth Trust Centre*

⁷¹ South Oxfordshire District Council planning application reference P16/S3133/FUL

- 5.63 Recreation impacts from the Local Plan alone (therefore including all of its policies and site allocations alone or in combination with each other) can therefore be screened out of further consideration.
- 5.64 The increase in local population arising from the Local Plan in combination with other plans or projects, however, could result in visitor numbers that exceed those planned for. In addition to new development allocated in the Local Plan, visitor numbers could increase due to:
- Developments completed / committed since 1 April 2011: 6,898 homes at Didcot (South Oxfordshire only), 1,431 at Wallingford, 854 at Benson, 585 at Cholsey, 570 at Crowmarsh Gifford, 7 at Berinsfield and 339 at Chalgrove⁷².
 - Additional development allocated by Neighbourhood Plans (above that already committed or allocated in the Local Plan): 67 at Brightwell-cum-Sotwell, 15 at The Baldons, 29 at Warborough and Shillingford and 52 at Long Wittenham⁷³.
- 5.65 These additional c.10,847 homes would accommodate a population of c.23,646. The current population within the same area (within 7km of Little Wittenham SAC plus Chalgrove) is c. 63,375⁷⁴, therefore the new homes could result in a c.37% increase in population in the vicinity of Little Wittenham SAC, or c.55,500 additional visits per year. The contribution from the Local Plan in combination with completed / committed development and with neighbourhood plans is estimated to be c.56% or c.84,000 additional visitors to the SAC per year. These figures are likely to be overstated, as these calculations are based on visitor numbers in 2016, but take into account development since 2011, therefore some visits will be double-counted. As such, these figures are precautionary.
- 5.66 Additional housing may come forward within 7km of the SAC, through the Vale of White Horse Local Plan Part 1 and Part 2, in the east of the Vale of the White Horse District (which is adjacent to South Oxfordshire District). These areas lie on the very edge of the 7km screening distance and sites allocated for larger numbers of homes (e.g. Valley Park in the Part 1 Local Plan and Dalton Barracks in the Part 2 Local Plan) are on the far side of the larger towns of Didcot and Abingdon, away from Little Wittenham SAC.
- 5.67 The HRA for the Vale of White Horse Local Plan Part 1 discounted recreational pressure as an impact pathway with regards to Little Wittenham SAC due to its distance from the nearest sizeable settlements and the low susceptibility of newts to recreational activity. The HRA of the Vale of White Horse Local Plan Part 2 reached the same conclusion and added that the Earth Trust manages public access to limit access to the SAC, instead directing visitors to Wittenham Clumps and other land in its ownership.
- 5.68 The increase in visitor numbers at Little Wittenham SAC from the Local Plan in combination with other plans or projects could result in disturbance to or damage to the habitats of the site's qualifying species, great crested newts.
- 5.69 Little Wittenham SAC is designated for its great crested newt population, which is supported by two main ponds, although the newts have also been found to travel several hundred metres into the surrounding woodland. The woodland lies entirely within the SAC, in addition to some grassland, and the SAC is part of a larger area managed by the Earth Trust.
- 5.70 The Earth Trust restricts access to the most sensitive areas of the SAC⁷⁵ by maintaining a signed network of paths and a pond viewing area⁷⁶, within the woodland. The Earth Trust's site as a whole, however, experiences a level of visitor numbers that places pressure on the site. Erosion, disturbance (e.g. to nesting birds) and pressure on infrastructure including parking are all an issue for the wider site⁷⁷ and therefore limit the extent to which an increase in visitor numbers could be accommodated in areas of the site away from the SAC.

⁷² These figures are based on South Oxfordshire District Council's most recent monitoring data which covers the period 1 April 2011 to 30 September 2018.

⁷³ The Long Wittenham allocates land for 83-88 dwellings. Some 36 of these already have planning permission, leaving 47-52 to be provided. Following the precautionary principle, the higher figure has been used for the purposes of this HRA.

⁷⁴ Based on 2011 census data for Output Areas population weighted centroids

⁷⁵ http://www.southoxon.gov.uk/sites/default/files/Appropriate%20Assessment_2.pdf

⁷⁶ http://www.earthtrust.org.uk/Libraries/Documents/Little_Wittenham_Nature_Reserve_Walk.sflb.ashx

⁷⁷ Earth Trust (2016) *Statement of Need for Improvements to the Earth Trust Centre*

- 5.71 The Earth Trust's planning application⁷⁸ to SODC for improvements to the visitor centre and parking at the site is aimed at relieving some of the effects of increases in visitor numbers. The work would facilitate access to the site as a whole, however the ecological study submitted with the planning application has concluded the following:
- "There is potential for increased recreational pressure at Little Wittenham SAC due to the proposed development. However, the Earth Trust carefully manages public access to limit access to the Little Wittenham Special Area of Conservation and directs visitors instead to the Wittenham Clumps and other land within its ownership. Great crested newts are not particularly sensitive to recreational pressure. Natural England considered that 100% of the site was in favourable condition in 2010. It is therefore considered that the proposed development will not have a significant effect on the Special Area of Conservation and that an appropriate assessment is not necessary."*
- 5.72 The planning application has been given permission and, as stated previously, Natural England has raised no objection to the proposals.
- 5.73 The increase in local population that would arise as a result of the Local Plan alone is 19% (excluding committed and completed developments), within the 35% increase in visitors planned for by the Earth Trust. However, the Local Plan in combination with other plans could result in visitor pressure that has not yet been planned for: an increase of c.56% or c. 84,000 additional visitors to the SAC per year. As explained above, these figures are likely to be overstated, are based on visitor numbers in 2016, but take into account development since 2011, therefore some visits will be double-counted. As such, they are precautionary.
- 5.74 LUC discussed the potential impact of these additional visits on great crested newts with Natural England's current and former SSSI officers⁷⁹ for the site, in July 2017. They provided the following information:
- The site is already heavily used by the public, however this is not believed to be causing a problem for the great crested newt population.
 - Conditions assessments have concluded that the site is being responsibly managed for newts and the habitats on site are in good condition for the newts.
 - Public access and disturbance are listed as a threat on the site's Site Improvement Plan (relates to the risk of increased numbers of dog walkers regularly letting dogs off the lead and them getting into the ponds, which can introduce invasive species and change the turbidity of the water). The potential measure associated with this threat is to conduct audits to determine the best locations for signed access routes and construct new access routes.
 - The Earth Trust has already started to manage the woodland to make the pond area less accessible to avoid disturbance, although there is not yet any specific management plan agreed with Natural England.
- 5.75 These points are still considered to be valid.
- 5.76 LUC also discussed future management plans with the Earth Trust in September 2017 and December 2018⁸⁰. They confirmed that, although there is officially no public access to the newt ponds and visitors are discouraged from the area, some people do visit the ponds using the paths that the Earth Trust maintains for its own management access. The Earth Trust will continue to discourage access to the ponds and informally monitor the situation (there are no current plans to update previous detailed monitoring of the ponds).
- 5.77 The Earth Trust had a Woodland Management Plan for the site (2012-2017), developed in consultation with Natural England. The plan set out how woodland at the site was to be managed, including woodland within the SAC. The Earth Trust is currently in the process of preparing a new Woodland Management Plan. As part of this process, the Earth Trust is considering how the predicted increase in visitors will impact on the site (including on great crested newts, for which it is designated as a SAC) and what measures will be necessary to avoid

⁷⁸ SODC planning reference P16/S3133/FUL

⁷⁹ Carly Pettett (current SSSI officer) and Alison Muldal (SSSI officer for several years until recently)

⁸⁰ Pers. Comm. with Chris Parker, Head Land Manager for the Earth Trust

and mitigate these impacts. This is likely to include further visitor management measures to encourage visitors away from the ponds (although these have no official public access) and could also include fencing off the ponds and digging additional ponds for newts to boost the robustness of the population.

- 5.78 One of the aims of the Earth Trust's planning application to improve facilities and access for visitors is to alter the points where visitors access the site and the distribution of visitors, to reduce pressure on the more sensitive sites, including the SAC. Wittenham Clumps will continue to be the main draw to the site, and the SAC woodland is close to the Clumps. However, at present, around half of the visitors to Little Wittenham park at a small car park closest to the SAC, so the Earth Trust intends to provide an alternative larger car park, to encourage visitors away from the SAC⁸¹. Improvements are also being made to signed routes, to encourage visitors to use other parts of the site.
- 5.79 It is therefore considered that the great crested newt population is of low sensitivity to recreational pressure and that sufficient measures are in place to manage visitor numbers to Little Wittenham SAC such that they do not have an adverse effect on the site.
- 5.80 The risk that the increase in population will cause significant increases in visitor numbers at Little Wittenham SAC will also be mitigated to an extent by the following Local Plan policies:

Policy ENV5: Green Infrastructure in new developments

Development will be expected to contribute towards the provision of additional Green Infrastructure and protect and enhance existing Green Infrastructure.

Proposals should:

- protect, conserve and enhance the District's green infrastructure;
- provide an appropriate level of green infrastructure where a requirement has been identified for additional provision either within the Green Infrastructure Strategy, the relevant Neighbourhood Development Plan, AONB Management Plan or the Habitats Regulations Assessment;
- avoid the loss, fragmentation, severance or a negative impact on the function of green infrastructure;
- provide appropriate mitigation where there would be an adverse impact on green infrastructure; and
- provide an appropriate replacement where it is necessary for development to take place on areas of green infrastructure.

All green infrastructure provision should be designed to meet the quality standards set out within the Green Infrastructure Strategy or the relevant Neighbourhood Development Plan, or the Didcot Garden Town Masterplan. Consideration should also be given to inclusive access using such guides as the Fieldfare Trust "Countryside for All – A good practice guide to Disabled People's Access in the Countryside" and the South Oxfordshire Design Guide. Where new green infrastructure is provided, applicants should ensure that appropriate arrangements are in place to ensure its ongoing management and maintenance.

- 5.81 SODC has also prepared a joint Green Infrastructure Strategy with Vale of White Horse District Council. The South and Vale Green Infrastructure Strategy⁸² provides additional planning guidance within the two districts on how the green infrastructure network can be safeguarded and improved, to better benefit local communities and biodiversity. The strategy recognises the role that green infrastructure (GI) can play in reducing the effects of recreation at other sites but identifies a current deficit in the provision of accessible natural greenspace, in both districts.
- 5.82 The strategy includes the following planning principles that would contribute towards mitigation of recreation impacts on Little Wittenham SAC:

⁸¹ Explained in the Design and Access Statement submitted with the planning application:

http://www.southoxon.gov.uk/ccm/support/dynamic_serve.jsp?ID=766260233&CODE=9CE0623E0FDB59B07E3EEF81370A5EC3

⁸² Chris Blandford Associates (2017) South and Vale Green Infrastructure Strategy

GI should be embedded into the layout of new development alongside the design of the built environment and grey infrastructure from the start of the masterplanning process.

Development should provide or contribute towards the provision of on- or off-site GI as appropriate in locations with identified deficiencies, including arrangements for on-going management and maintenance of green spaces.

The amount and quality of GI of different types that is required by a development to ensure residents have the opportunity to interact with nature, and encourage recreation, sports and healthier lifestyles, should reflect Natural England's standards for accessible natural greenspace and the standards for open space provision recommended in the Councils' Open Space, Sports and Recreation Studies.

And:

Policy CF5 - Open Space, Sport and Recreation in New Residential Development

New residential development will be required to provide or contribute towards inclusive and accessible open space, and play facilities in line with the most up to date standards set out in the Open Space Strategy, including:

- Amenity greenspace (including parks and gardens)
- Allotments
- Equipped children's play areas

New residential development will be required to provide or contribute towards accessible sport and recreation facilities, including playing pitches, in line with the council's most up to date Leisure Strategy, and Sport England guidance.

The provision of open space, sport, recreation and play facilities, and playing pitches is expected to be delivered on site, unless this is demonstrated not to be feasible.

Provision for the future long-term maintenance and management of the open space and facilities will be sought and must be agreed as part of the planning application.

- 5.83 SODC's Open Space Strategy⁸³ sets the standards for provision for more formal areas of recreational open space close to new developments, as summarised in **Table 5.8**.

⁸³ Nortoft (2017) Sports Facilities, Local Leisure Facilities and Playing Pitch Study. Part 5: Open Spaces Study

Table 5.8: South Oxfordshire Open Space Standards

Open space type	Quantity per 1,000 population	Accessibility	Quality
Parks and Gardens & Amenity Green Space	1.4ha per 1,000 population in the Towns and Larger Villages	710m for Parks and Gardens 480m for Amenity Green Space	Green Flag Standard
Children’s Play and provision for young people	<ul style="list-style-type: none"> 0.25 ha per 1,000 population of Designated Equipped Playing Space 0.3ha per 1,000 population for teenage/MUGA provision 	<ul style="list-style-type: none"> 400m for LEAP 1,000m for NEAP 1,000m for teenage facilities 	<ul style="list-style-type: none"> New LEAPs and NEAPs should meet the Fields In Trust standards as relevant to the individual site New youth provision should reflect current best practice, and also take into account the needs expressed by local young people
Allotments	0.4 ha per 1,000 population	1,000m	Allotments should be secure with gates and fencing providing suitable and accessible areas for growing, and where applicable an adequate water supply and car parking.

5.84 **It is possible to conclude that the increase in visitor numbers arising from the South Oxfordshire Local Plan, either alone or in combination with other plans, would not have an adverse effect on the integrity of Little Wittenham SAC.**

5.85 This conclusion is valid without the need for specific mitigation being provided in the Local Plan, because of the low sensitivity of the great crested newt population to recreational pressure and the measures in place to manage visitor numbers to Little Wittenham SAC. In any event, other policies in the Local Plan are likely to provide alternative green space that will reduce the need or desire for residents of new development delivered by the Local Plan to visit Little Wittenham SAC.

6 Conclusions

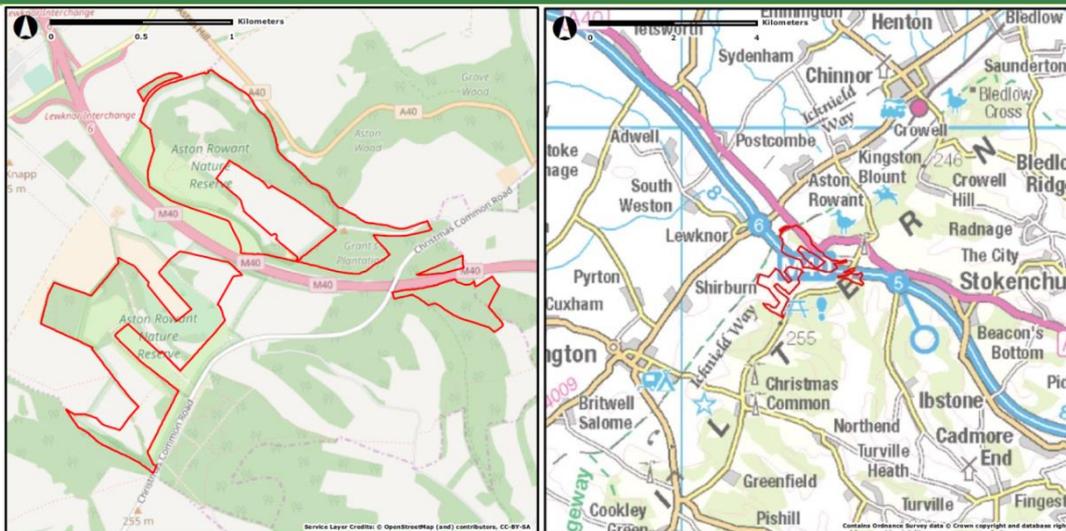
- 6.1 The HRA of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd (January 2019) has been undertaken in accordance with currently available guidance and based on a precautionary approach as required under the Habitats Regulations. The HRA and Appropriate Assessment conclusions are summarised below.
- 6.2 At the screening stage, the HRA concluded that adverse effects on the integrity of European sites around South Oxfordshire from policies and site allocations in the Local Plan will not occur in relation to:
- Physical loss or damage to on- or off-site habitat.
 - Noise/vibration and light pollution.
 - Changes to water quality or quantity.
- 6.3 An Appropriate Assessment of the potential effects of the plan on the Aston Rowant SAC through increased air pollution has been carried out. While the 'worst case' in-combination effects of growth would result in increased NO_x concentrations and N deposition at the periphery of the SAC, levels of nutrient nitrogen deposition exceeding the 1% screening threshold are restricted to the edge of the SAC and are limited to an area comprising less than 0.1% of the total SAC area. When with the mitigating factors outlined above, together with the long-term trends and past monitoring at the SAC, and current favourable condition status, these increases are likely to be negligible in ecological terms and are considered unlikely to have an adverse effect on the qualifying features.
- 6.4 An Appropriate Assessment was carried out to determine whether increases in visitor number due to the Local Plan in combination with other plans or projects would have an adverse effect on the integrity of Little Wittenham SAC. Whilst the increase in visitor numbers likely to result from the Local Plan are within those planned for by the Earth Trust, they are exceeded when taking into account in-combination effects. Following discussions with Natural England and the Earth Trust, the assessment has concluded that there will be no adverse effects on the site's integrity, due to the low sensitivity of the great crested newt population to recreation disturbance, and the responsible management of the site and its habitats by the Earth Trust.
- 6.5 It is therefore concluded that **the Local Plan would not have any adverse effects on the integrity of any European sites, either alone or in combination with other plans and projects.**

LUC
December 2018

Appendix 1

European sites in and around South Oxfordshire

1. Aston Rowant Special Area of Conservation



Site description

Aston Rowant is classified as SAC because it supports one of the largest remaining populations of juniper in lowland Britain. It is selected as an example of juniper formations on the chalk in the south east of England. At this site juniper is present as part of a mixed scrub community but also occurs as isolated bushes in chalk grassland. In common with most lowland populations of juniper, successful reproduction and survival of new generations of bushes is extremely rare and conservation is currently dependent upon significant levels of management intervention. The low level of reproductive success is the main threat to the feature at this site. Aston Rowant also supports *Asperulo-Fagetum* beech forests although this is not a primary reason for classification as SAC.

Qualifying Features

H5130	Juniper on heaths or calcareous grassland
H9130	Beech forests on neutral to rich soils
Site status*	100% in favourable condition

Special Area of Conservation objectives⁸⁴

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats; 2. the structure and function (including typical species) of qualifying natural habitats; and 3. the supporting processes on which qualifying natural habitats rely.

Site Improvement Plan⁸⁵: pressures, threats and related development

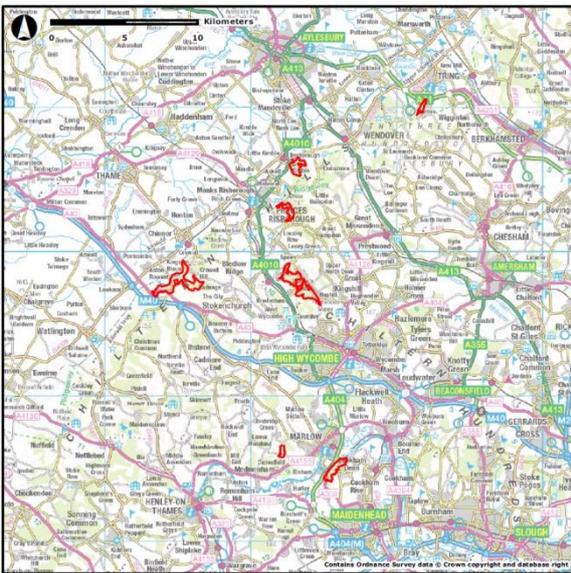
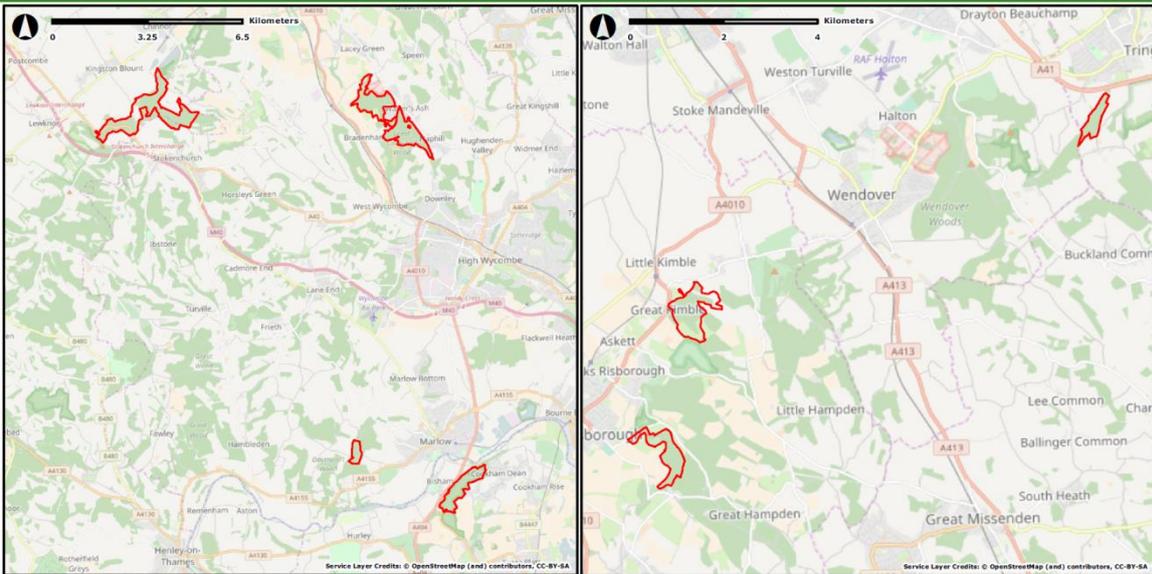
The main pressures and threats to this site include an unsustainable on-site population, changes in species distribution, disease of juniper as well as the impacts of air pollution and the risks of atmospheric nitrogen deposition upon juniper. Additionally, conflicting conservation objectives threaten juniper and deer threaten beech. With regard to the types of development that may be brought forward in the Local Plan, air pollution could impact the site.

*Site status is an assessment by Natural England of the status of the SSSIs within the SAC

⁸⁴ Natural England - European Site Conservation Objectives for Aston Rowant SAC (UK0030082)
<http://publications.naturalengland.org.uk/publication/5596085330378752?category=6528471664689152>

⁸⁵ Natural England - Site Improvement Plan: Aston Rowant (SIP007)
<http://publications.naturalengland.org.uk/publication/4960794580090880?category=6149691318206464>

2. Chilterns Beechwoods Special Area of Conservation



Site description

The Chilterns Beechwoods SAC comprises nine separate sites scattered across the Chilterns. There are three features of interest: semi-natural grasslands and scrubland on chalk; *Asperulo-Fagetum* beech woodland (for which this is considered to be one of the best areas in the UK and lies in the centre of the habitat's UK range); and Stag beetle *Lucanus cervus*, for which the area is considered to support a significant presence. The rare coralroot *Cardamine bulbifera* is found in these woods.

Qualifying features

H6210	Dry grasslands and scrublands on chalk or limestone
H9130	Beech forests on neutral to rich soils
S1083	Stag beetle
Site status*	83% in favourable condition; 17% in an unfavourable condition, recovering

Special Area of Conservation objectives⁸⁶

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats and habitats of qualifying species; 2. the structure and function (including typical species) of qualifying natural habitats; 3. the structure and function of the habitats of qualifying species; 4. the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;

⁸⁶ Natural England - European Site Conservation Objectives for Chilterns Beechwoods SAC (UK0012724) <http://publications.naturalengland.org.uk/publication/4808896162037760?category=6528471664689152>

2. Chilterns Beechwoods Special Area of Conservation

5. the populations of qualifying species; and
6. the distribution of qualifying species within the site.

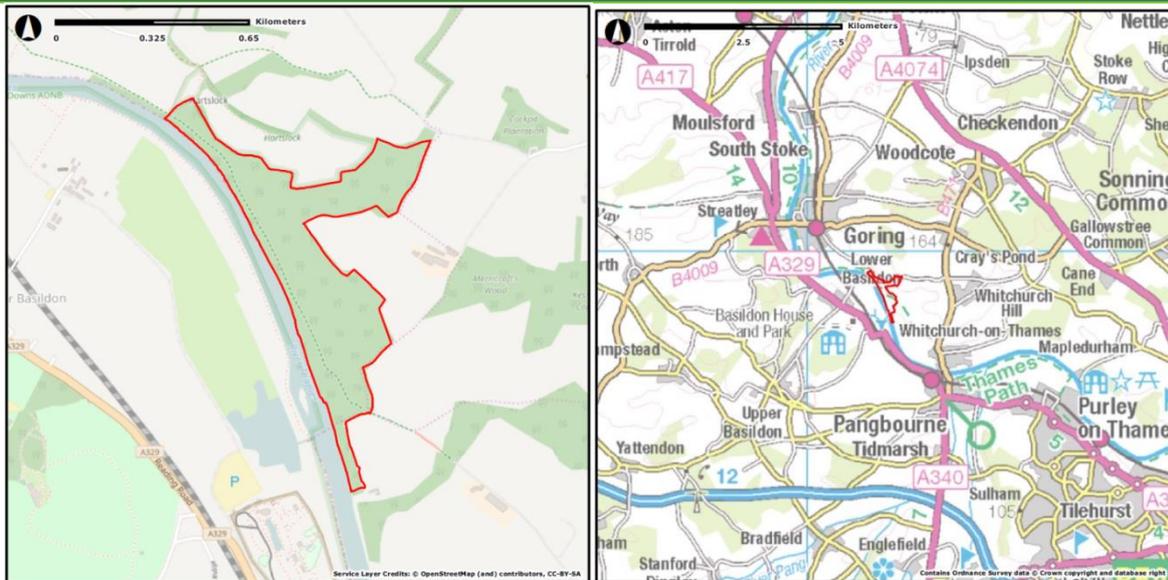
Site Improvement Plan⁸⁷: pressures, threats and related development

The main pressures and threats to this site include the impacts of forestry and woodland management, disease, deer and the invasive species of grey squirrel upon beech. Additionally, the changes in species distribution of stag beetle as well as the impact of public access and disturbance upon stag beetle. Air pollution and the impact of atmospheric nitrogen deposition also threaten the dry grasslands, beech and stag beetle. With regard to the types of development that may be brought forward in the Local Plan, air pollution and visitor disturbance could impact the site.

*Site status is an assessment by Natural England of the status of the Sites of Special Scientific Interest within the SAC

⁸⁷ Natural England - Site Improvement Plan: Chilterns Beechwoods (SIP045)
<http://publications.naturalengland.org.uk/publication/6228755680854016?category=6149691318206464>

3. Hartslock Wood Special Area of Conservation



Site description

This site hosts the priority habitat type "orchid rich sites". The steep slopes of this site on the chalk of the Chilterns comprise a mosaic of chalk grassland, chalk scrub and broadleaved woodland. The chalk grassland mostly consists of a mosaic of shorter-turf NVC type CG2 *Festuca ovina*-*Avenula pratensis* grassland and taller CG3 *Bromus erectus* grassland. The site supports one of only three UK populations of monkey orchid *Orchis simia*, a nationally rare Red Data Book species. The bulk of this site lies on a steep slope above the River Thames. Recent storms and landslips have resulted in a diverse age-structure for the yew population. Open patches show a rich flora including local species such as southern wood-rush *Luzula forsteri*, wood barley *Hordelymus europaeus* and narrow-lipped helleborine *Epipactis leptochila*.

Qualifying features

H6210	Dry grasslands and scrublands on chalk or limestone
H91J0	Yew dominated woodland
Site status*	88% in favourable condition; 12% in an unfavourable condition, recovering

Special Area of Conservation objectives⁸⁸

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of the qualifying natural habitats; 2. the structure and function (including typical species) of the qualifying natural habitats; and 3. the supporting processes on which the qualifying natural habitats rely.

Site Improvement Plan⁸⁹: pressures, threats and related development

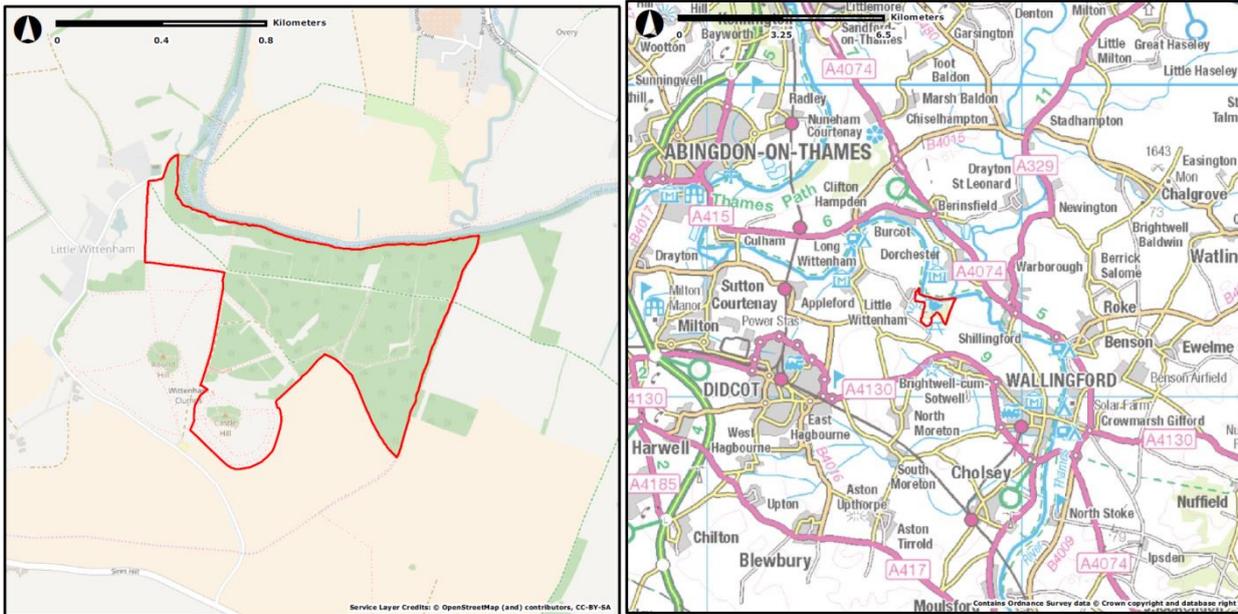
The main threat to this site is air pollution and the risk of atmospheric nitrogen deposition upon the dry grasslands and yew-dominated woodland. With regard to the types of development that may be brought forward in the Local Plan, air pollution could impact the site.

*Site status is an assessment by Natural England of the status of the Site of Special Scientific Interest within the SAC

⁸⁸ Natural England - European Site Conservation Objectives for Hartslock Wood SAC (UK0030164)
<http://publications.naturalengland.org.uk/publication/5307946309255168?category=6528471664689152>

⁸⁹ Natural England - Site Improvement Plan: Hartslock Wood (SIP100)
<http://publications.naturalengland.org.uk/publication/4874314121740288?category=6149691318206464>

4. Little Wittenham Special Area of Conservation



Site description

One of the best-studied great crested newt sites in the UK, Little Wittenham comprises two main ponds set in a predominantly woodland context (broadleaved and conifer woodland is present). There are also areas of grassland, with sheep grazing and arable bordering the woodland to the south and west. The River Thames is just to the north of the site, and a hill fort to the south. Large numbers of great crested newts *Triturus cristatus* have been recorded in the two main ponds, and research has revealed that they range several hundred metres into the woodland blocks.

Qualifying features

S1166	Great crested newt
Site status*	100% in favourable condition

Special Area of Conservation objectives⁹⁰

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of habitats of qualifying species; 2. the structure and function of the habitats of qualifying species; 3. the supporting processes on which the habitats of qualifying species rely; 4. the populations of qualifying species; and 5. the distribution of qualifying species within the site.

Site Improvement Plan⁹¹: pressures, threats and related development

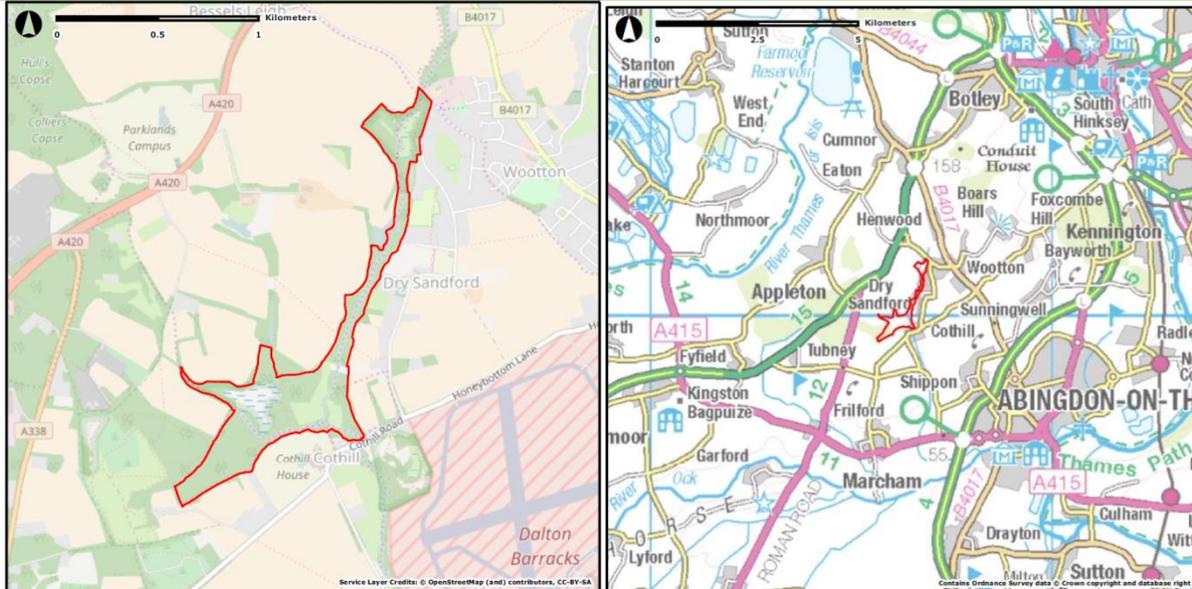
The main pressures and threats to this site include the impacts of public access and disturbance, and invasive fish species upon great crested newt. With regard to the types of development that may be brought forward in the Local Plan, visitor disturbance could impact the site.

*Site status is an assessment by Natural England of the status of the SSSI within the SAC

⁹⁰ Natural England - European Site Conservation Objectives for Little Wittenham SAC (UK0030184)
<http://publications.naturalengland.org.uk/publication/6104670577623040?category=6528471664689152>

⁹¹ Natural England - Site Improvement Plan: Little Wittenham (SIP122)
<http://publications.naturalengland.org.uk/publication/6567758347108352?category=6149691318206464>

5. Cothill Fen Special Area of Conservation



Site description

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants. The habitats consist of calcareous fen, calcareous grassland, woodland and scrub of varying degrees of wetness. The habitat supports over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the nationally rare Southern Damselfly (*Coenagrion mercuriale*).

Qualifying features

H7230	Alkaline Fens; Calcium-rich springwater-fed fens
H91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ; Alder woodland on floodplains
Site status*	65% in favourable condition; 35% in an unfavourable condition, recovering

Special Area of Conservation objectives⁹²

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats; 2. the structure and function (including typical species) of qualifying natural habitats; and 3. the supporting processes on which qualifying natural habitats rely.

Site Improvement Plan⁹³: pressures, threats and related development

The main pressures and threats to this site include the impacts of water pollution and hydrological changes, as well as air pollution and the impact of atmospheric nitrogen deposition upon the calcium-rich spring water-fed fens.

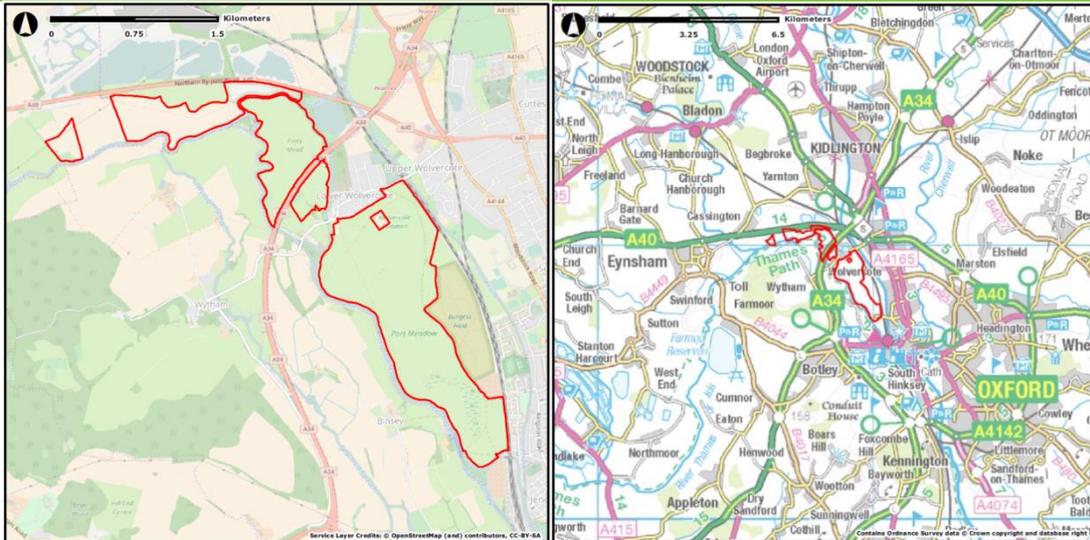
With regard to the types of development that may be brought forward in the Local Plan, air pollution, and water quality and quantity could impact the site.

*Site status is an assessment by Natural England of the status of the Site of Special Scientific Interest within the SAC

⁹² Natural England - European Site Conservation Objectives for Cothill Fen SAC (UK0012889)
<http://publications.naturalengland.org.uk/publication/5691343946907648?category=6528471664689152>

⁹³ Natural England - Site Improvement Plan: Cothill Fen (SIP047)
<http://publications.naturalengland.org.uk/publication/6482436405854208?category=6149691318206464>

6. Oxford Meadows Special Area of Conservation



Site description

Oxford Meadows is one of two SACs that represent lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) in the Thames Valley. It includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries, and so exhibits good conservation of structure and function. The site is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort *Apium repens*.

Qualifying features

H6510	Lowland hay meadows
S1614	<i>Apium repens</i> ; Creeping marshwort
Site status*	99% in favourable condition; 1 % in an unfavourable conditions, recovering

Special Area of Conservation objectives⁹⁴

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats and habitats of qualifying species; 2. the structure and function (including typical species) of qualifying natural habitats; 3. the structure and function of the habitats of qualifying species; 4. the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; 5. the populations of qualifying species; and, 6. the distribution of qualifying species within the site.

Site Improvement Plan⁹⁵: pressures, threats and related development

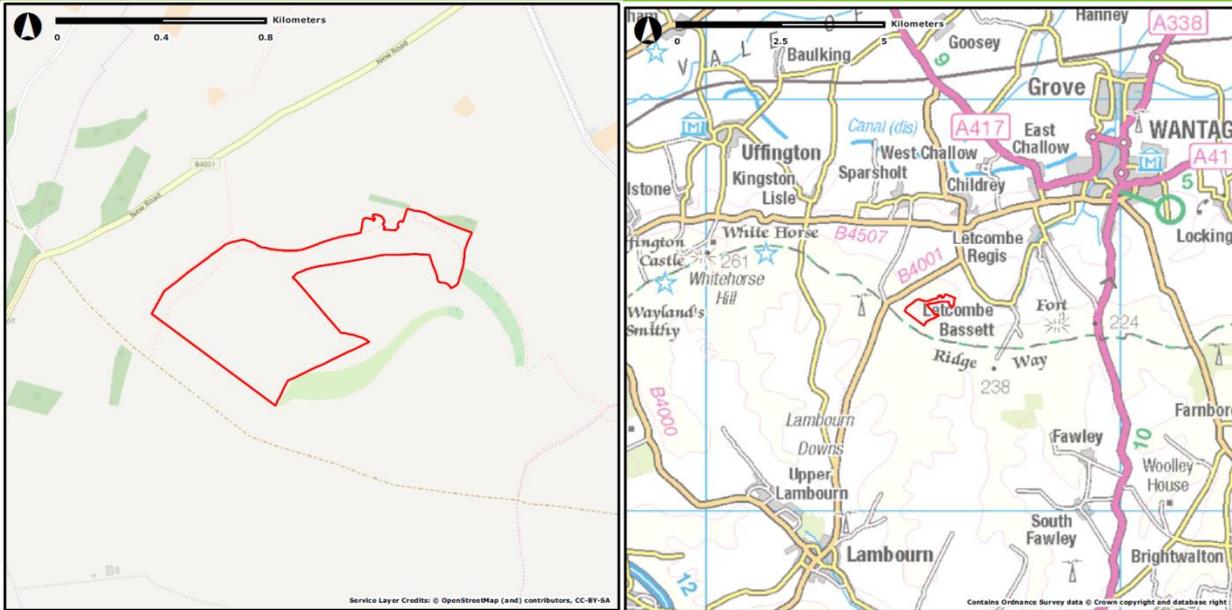
The main pressures and threats to this site include the impacts of hydrological changes and the invasive species of *Crassula* upon creeping marshwort. With regard to the types of development that may be brought forward in the Local Plan, water quantity changes could impact the site.

*Site status is an assessment by Natural England of the status of the SSSIs within the SAC

⁹⁴ Natural England - European Site Conservation Objectives for Oxford Meadows SAC (UK0012845)
<http://publications.naturalengland.org.uk/publication/5815888603250688?category=6528471664689152>

⁹⁵ Natural England - Site Improvement Plan: Oxford Meadows (SIP163)
<http://publications.naturalengland.org.uk/publication/4942743310696448?category=6149691318206464>

7. Hackpen Hill Special Area of Conservation



Site description

Hackpen Hill SAC is an extensive area of unimproved chalk grassland in the North Wessex Downs, and is considered to be one of the most important areas in the UK for the rare early gentian.

The site has a variety of aspect and gradients, with the grassland dominated by red fescue and upright brome. The herb flora includes a significant population of early gentian, as well as autumn gentian, fragrant orchid, frog orchid, horseshoe vetch, common rock-rose and dwarf thistle.

Qualifying features

H6210	Semi-natural dry grasslands and scrubland facies: on calcareous substrates; dry grassland and scrublands on chalk or limestone
S1654	Early gentian
Site status*	100% in favourable condition

Special Area of Conservation objectives⁹⁶

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats and habitats of qualifying species; 2. the structure and function (including typical species) of qualifying natural habitats; 3. the structure and function of the habitats of qualifying species; 4. the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; 5. the populations of qualifying species; and, 6. the distribution of qualifying species within the site.

Site Improvement Plan⁹⁷: pressures, threats and related development

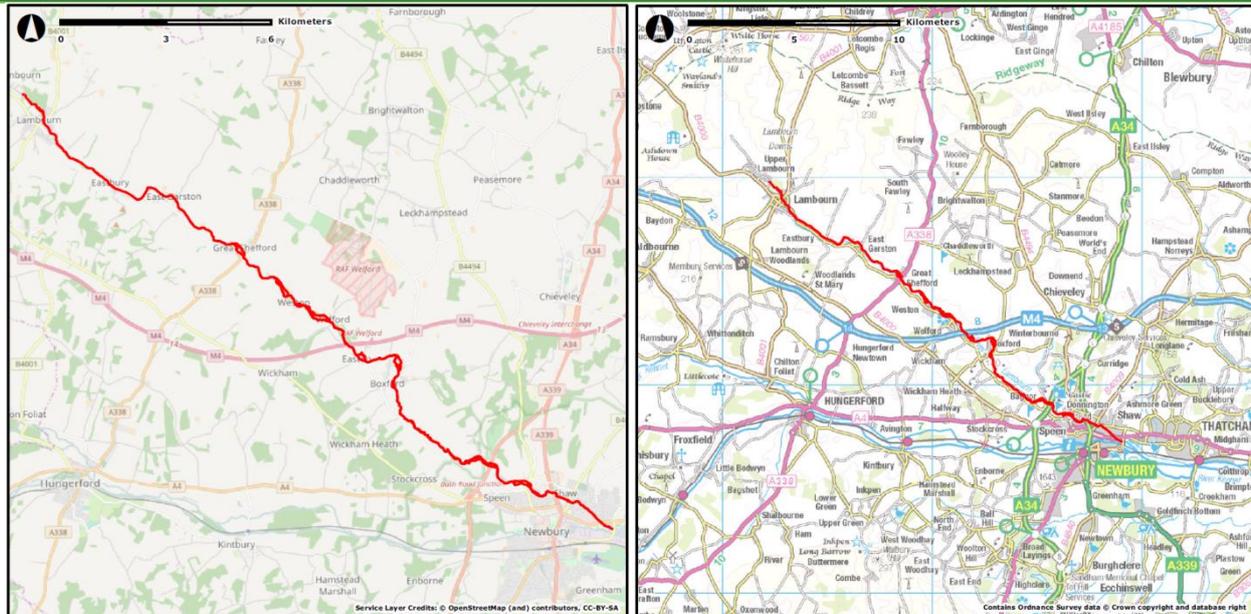
There are no pressures and threats identified currently affecting this site.

*Site status is an assessment by Natural England of the status of the Site of Special Scientific Interest within the SAC

⁹⁶ Natural England - European Site Conservation Objectives for Hackpen Hill SAC (UK0030162)
<http://publications.naturalengland.org.uk/publication/5182475147935744?category=6528471664689152>

⁹⁷ Natural England - Site Improvement Plan: Hackpen Hill (SIP096)
<http://publications.naturalengland.org.uk/publication/5938642669273088?category=6149691318206464>

8. River Lambourn Special Area of Conservation



Site description

The River Lambourn is an example of a classic chalk stream with a seasonally dry winterbourne section. It is relatively unmodified and has near-natural flow characteristics. The river supports a characteristic range of aquatic plant communities of the *Ranunculus fluitantis* and *Callitriche-Batrachion* types. As well as being classified as SAC for its river type, the Lambourn is also of importance in supporting self-sustaining populations of Bullhead. An additional qualifying feature present is Brook lamprey.

Qualifying features

H3260	Rivers with floating vegetation often dominated by water-crowfoot
S1096	Brook Lamprey
S1163	Bullhead
Site status*	100% unfavourable condition, no change

Special Area of Conservation objectives⁹⁸

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats and habitats of qualifying species; 2. the structure and function (including typical species) of qualifying natural habitats; 3. the structure and function of the habitats of qualifying species; 4. the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; 5. the populations of qualifying species; and, 6. the distribution of qualifying species within the site.

Site Improvement Plan⁹⁹: pressures, threats and related development

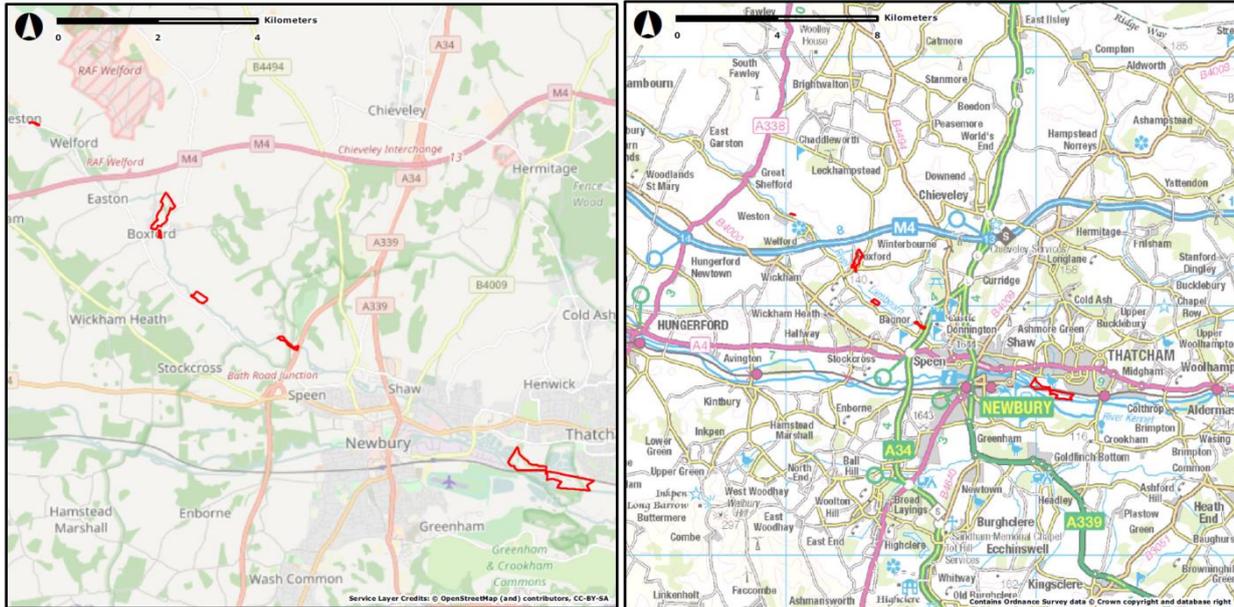
The main pressures and threats to this site include the impacts of siltation and water pollution, the invasive species of crayfish, hydrological changes, inland flood defence works and inappropriate cutting and mowing upon the following features; rivers with floating vegetation often dominated by water-crowfoot, Brook lamprey, and Bullhead. With regard to the types of development that may be brought forward in the Local Plan, water quality and quantity could impact the site.

*Site status is an assessment by Natural England of the status of the Site of Special Scientific Interest within the SAC

⁹⁸ Natural England - European Site Conservation Objectives for River Lambourn SAC (UK0030257) <http://publications.naturalengland.org.uk/publication/5757637085888512?category=6528471664689152>

⁹⁹ Natural England - Site Improvement Plan: River Lambourn and Kennet-Lambourn Floodplain (SIP112) <http://publications.naturalengland.org.uk/publication/4738329056641024?category=6149691318206464>

9. Kennet and Lambourn Floodplain Special Area of Conservation



Site description

The Kennet and Lambourn Floodplain SAC consists of a cluster of sites in the Kennet and Lambourn river valleys. These areas represent locations where the terrestrial snail *Vertigo moulinsiana* is particularly abundant.

Qualifying features

S1016	Desmoulin's whorl snail
Site status*	38% in favourable condition; 59% in unfavourable condition, recovering; 1% in unfavourable condition, no change; 2% in unfavourable condition, declining

Special Area of Conservation objectives¹⁰⁰

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of the habitats of qualifying species; 2. the structure and function of the habitats of qualifying species; 3. the supporting processes on which the habitats of qualifying species rely; 4. the populations of qualifying species; and, 5. the distribution of qualifying species within the site.

Site Improvement Plan¹⁰¹: pressures, threats and related development

The main pressures and threats to this site include the impacts hydrological changes caused by the decline of *Vertigo moulinsiana*, water pollution caused by molluscicides, changing land management and inappropriate water levels, upon Desmoulin's whorl snail. Also, the impacts of water pollution and hydrological changes upon these features as well as Desmoulin's whorl snail.

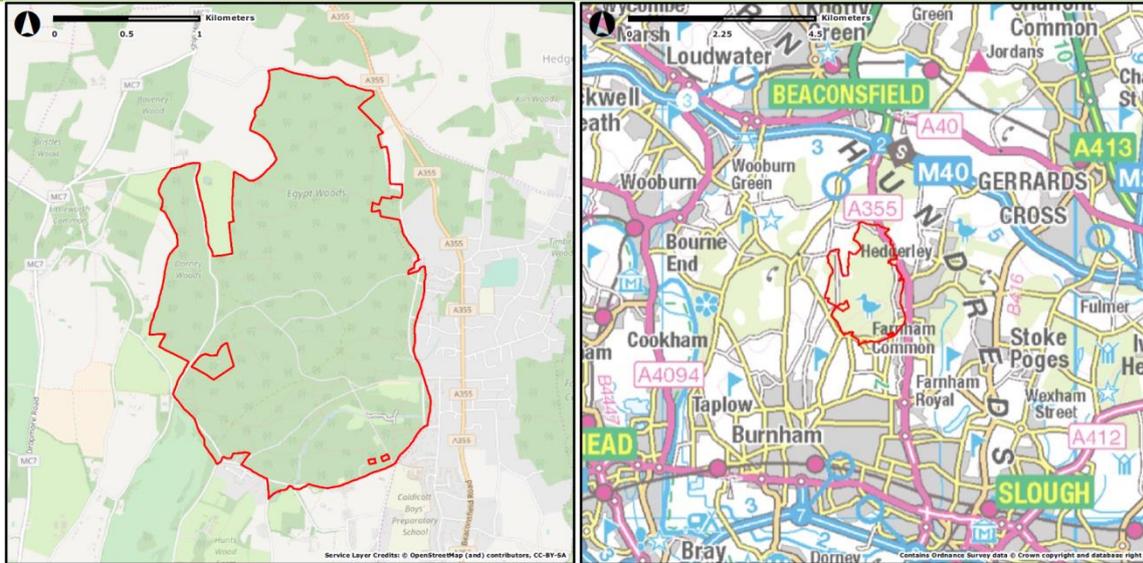
With regard to the types of development that may be brought forward in the Local Plan, water quality and quantity could impact the site.

*Site status is an assessment by Natural England of the status of the SSSIs within the SAC

¹⁰⁰ Natural England - European Site Conservation Objectives for Kennet & Lambourn Floodplain SAC (UK0030044) <http://publications.naturalengland.org.uk/publication/6261183967395840?category=6528471664689152>

¹⁰¹ Natural England - Site Improvement Plan: River Lambourn and Kennet-Lambourn Floodplain (SIP112) <http://publications.naturalengland.org.uk/publication/4738329056641024?category=6149691318206464>

10. Burnham Beeches Special Area of Conservation



Site description

Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech *Fagus sylvatica* and oak *Quercus spp.* high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK. It also retains nationally important epiphytic communities, including the moss *Zygodon forsteri*.

Qualifying features

H9120	Beech forests on acid soils
Site status*	63% in favourable condition; 37% in unfavourable condition, recovering

Special Area of Conservation objectives¹⁰²

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats; 2. the structure and function (including typical species) of qualifying natural habitats; and 3. the supporting processes on which qualifying natural habitats rely.

Site Improvement Plan¹⁰³: pressures, threats and related development

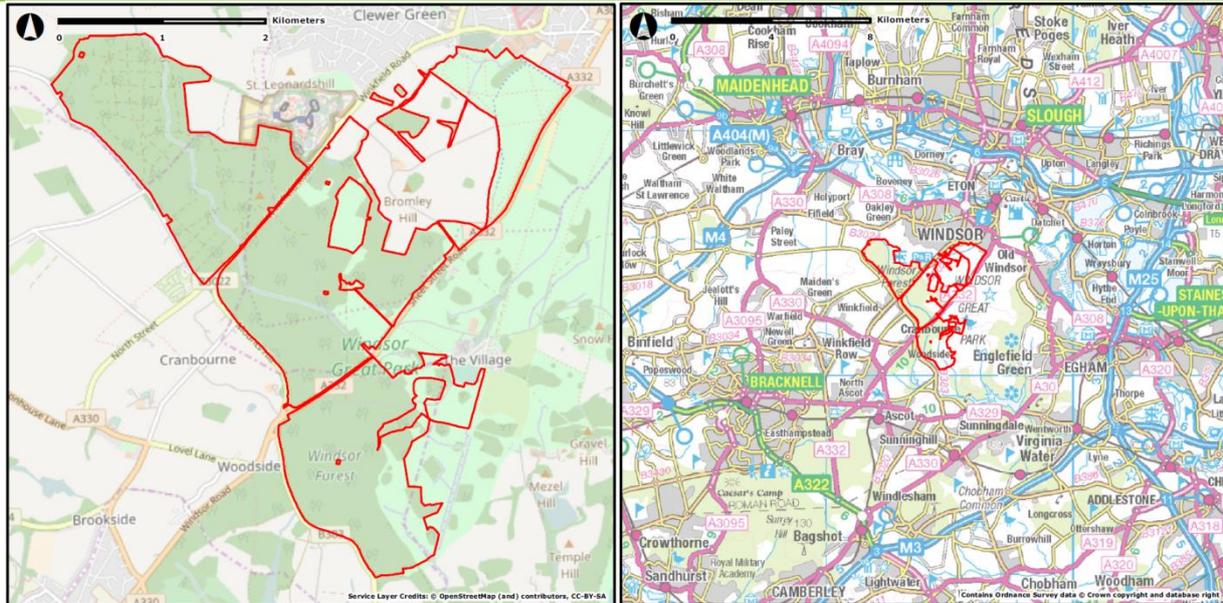
The main pressures and threats to this site include the impacts of air pollution and the risk of atmospheric nitrogen deposition, public access and disturbance, habitat fragmentation, deer, species decline and invasive species upon Beech. With regard to the types of development that may be brought forward in the Local Plan, air pollution, visitor disturbance and direct habitat loss could impact the site.

*Site status is an assessment by Natural England of the status of the SSSI within the SAC

¹⁰² Natural England - European Site Conservation Objectives for Burnham Beeches SAC (UK0030034)
<http://publications.naturalengland.org.uk/publication/6014456282742784?category=6528471664689152>

¹⁰³ Natural England - Site Improvement Plan: Burnham Beeches (SIP032)
<http://publications.naturalengland.org.uk/publication/5689860228644864?category=6149691318206464>

11. Windsor Forest and Great Park Special Area of Conservation



Site description

Windsor represents old acidophilous oak woods (H9190) in the south-eastern part of its UK range. It has the largest number of veteran oaks *Quercus spp.* in Britain (and possibly in Europe), a consequence of its long continuity of management. Windsor Forest is listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (oak spp, beech, and other species of tree). It is of importance for its range and diversity of saproxylic invertebrates, including many rare species (e.g. the beetle *Lacon querceus*). The SAC is thought to support the largest of the known populations in the UK of European important Violet click beetle *Limonicus violaceus*. It is also recognised as having rich fungal assemblages. Atlantic acidophilous beech forest habitat (H9120) is present at the site and supports many of the important invertebrate and fungi assemblage.

Qualifying features

H9120	Beech forests on acid soils
H9190	Dry oak-dominated woodland
S1079	Violet click beetle
Site status*	52% in favourable condition; 48% in unfavourable condition, recovering

Special Area of Conservation objectives¹⁰⁴

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of qualifying natural habitats and habitats of qualifying species; 2. the structure and function (including typical species) of qualifying natural habitats; 3. the structure and function of the habitats of qualifying species; 4. the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; 5. the populations of qualifying species; and, 6. the distribution of qualifying species within the site.

Site Improvement Plan¹⁰⁵: pressures, threats and related development

The main pressures and threats to this site include the impacts of forestry and woodland management upon dry oak-dominated woodland, as well as beech and violet click beetle. In addition, the impact of disease upon dry oak-dominated woodland, the impact of air pollution and the impact of atmospheric nitrogen deposition upon beech and dry oak-dominated woodland, and the impact of invasive pest and plant species upon dry oak-dominated woodland and violet click beetle. With regard to the types of development that may be brought forward in the Local Plan, air

¹⁰⁴ Natural England - European Site Conservation Objectives for Windsor Forest & Great Park SAC (UK0012586) <http://publications.naturalengland.org.uk/publication/5175000009015296?category=6528471664689152>

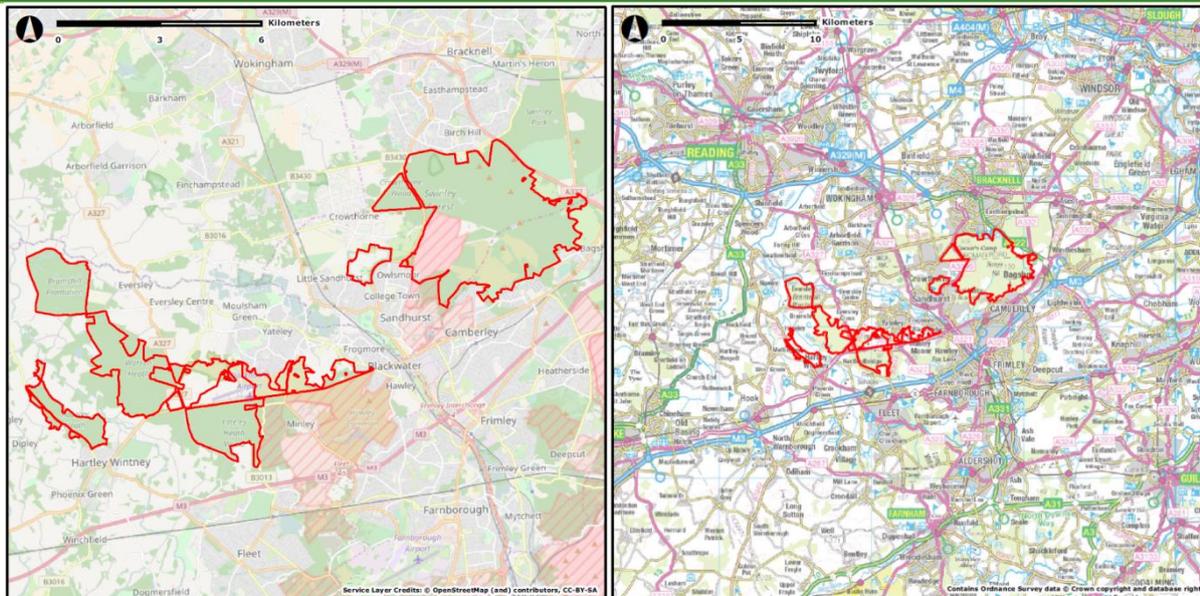
¹⁰⁵ Natural England - Site Improvement Plan: Windsor Forest and Great Park (SIP263) <http://publications.naturalengland.org.uk/publication/6221375450644480?category=6149691318206464>

11. Windsor Forest and Great Park Special Area of Conservation

pollution could impact the site.

*Site status is an assessment by Natural England of the status of the Sites of Special Scientific Interest within the SAC

12. Thames Basin Heath Special Protection Area



Site description

Thames Basin Heaths SPA forms part of an extensive complex of lowland heathlands in southern England that support important breeding bird populations. It is located across the counties of Surrey, Hampshire and Berkshire and within the Thames Basin Heaths National Character Area (NCA) which stretches westwards from Weybridge in Surrey to the countryside around Newbury in Berkshire. The SPA consists of areas of agriculturally-unimproved heathland, scrub and woodland which were once almost continuous but are now fragmented by roads, urban development and farmland. It supports important breeding populations of a number of birds which are strongly associated with heathland habitat, especially the ground nesting birds Nightjar and Woodlark, and also the Dartford Warbler which often nests close to the ground amongst dense heather and gorse. The geology of the area consists of sand and gravel sediments which give rise to sandy or peaty acidic soils. These support dry heath vegetation in well-draining areas and wet heath vegetation in low-lying shallow slopes and bogs.

Qualifying features

A224	European nightjar (breeding)
A246	Woodlark (breeding)
A302	Dartford warbler (breeding)
Site status*	47% in favourable condition; 52% in unfavourable condition, recovering; <1% in unfavourable condition; no change; 1% in unfavourable condition, declining

Special Protection Area objectives¹⁰⁶

1	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.
2	Subject to natural change, maintain or restore: <ol style="list-style-type: none"> 1. the extent and distribution of the habitats of the qualifying features; 2. the structure and function of the habitats of the qualifying features; 3. the supporting processes on which the habitats of the qualifying features rely; 4. the population of each of the qualifying features; and, 5. the distribution of the qualifying features within the site.

Site Improvement Plan¹⁰⁷: pressures, threats and related development

The main pressures and threats to this site include the impacts of public access and disturbance, as well as unknowns regarding feature location, extent and condition, upon European nightjar, Woodlark, and Dartford Warbler. In addition, impacts of forestry and woodland management and inappropriate scrub control upon European nightjar, Woodlark, Dartford Warbler. Impacts of undergrazing, military operations, habitat fragmentation, wildfire and arson, as well as air pollution and the impact of atmospheric nitrogen deposition, upon

¹⁰⁶ Natural England - European Site Conservation Objectives for Thames Basin Heaths SPA (UK9012141) <http://publications.naturalengland.org.uk/publication/4952859267301376?category=6528471664689152>

¹⁰⁷ Natural England - Site Improvement Plan: Thames Basin (SIP237) <http://publications.naturalengland.org.uk/publication/6249258780983296?category=6149691318206464>

12. Thames Basin Heath Special Protection Area

European nightjar, Woodlark, Dartford Warbler.

With regard to the types of development that may be brought forward in the Local Plan, air pollution, visitor disturbance, direct habitat loss and water quantity changes could impact the site.

*Site status is an assessment by Natural England of the status of the Sites of Special Scientific Interest within the SAC

Appendix 2

Plans and projects with the potential for in-combination effects

Local Plans and Strategies

Oxfordshire County Council Local Transport Plan 2015-2031 ('Connecting Oxfordshire')

Status

Adopted in September 2015 and then updated in 2016.

Proposed development

Provides transport infrastructure to serve the estimated increase of 85,000 new jobs and 100,000 new homes in the county by 2031, while also reducing emissions to air and protecting and enhancing the environment. The proposals include:

- Enhanced road capacity at: the A34 and Oxford to Cambridge expressway; the A40; Oxford City ring road; the A420 corridor; local routes in Science Vale, Bicester, Banbury, Witney & Carterton; and cross-boundary links.
- Measures to reduce car use e.g. prioritising sustainable modes of transport, better integrated public transport.
- Managing freight: promoting freight by rail and working to improve strategic roads.
- Managing the demand for parking.
- Improving accessibility and safety.
- Requiring developments to mitigate adverse effects on transport, make provision for sustainable transport, and agree local routing where appropriate to protect environmentally sensitive locations from traffic.

HRA

The 2015 HRA of the Local Transport Plan concluded that there would be no likely significant effects from the plan's proposals, subject to design and mitigation. The work did identify the potential need for project-level HRA of future projects, in relation to Oxford Meadows SAC, Cothill Fen SAC, and Little Wittenham SAC; however, air pollution effects at these sites were screened out on the basis of distance from roads, and the proposals will not increase recreation pressure at Little Wittenham SAC.

Therefore, there are no likely in-combination effects of the Oxfordshire County Council Local Transport Plan 2015-2031 with the South Oxfordshire Local Plan.

Oxfordshire County Council Minerals and Waste Local Plan Part 1: Core Strategy and emerging Part 2: Site Allocations

Status

Part 1: Core Strategy adopted in September 2017.

Plan Part 2: Site Allocations in preparation. A draft of this document has not yet been published.

Proposals

The Core Strategy sets out policies to meet the county's requirements for minerals supply and waste disposal.

The Core Strategy also identifies strategic areas for development but specific sites will be identified through the Site Allocations DPD.

Policy M4 states that locations for minerals working will need to avoid locations likely to have an adverse effect on sites of international nature conservation importance, and:

'In the case of locations within the Eynsham / Cassington / Yarnton part of the Thames, Lower Windrush and Lower Evenlode Valleys area, it must be demonstrated that there will be no change in water levels in the Oxford Meadows Special Area of Conservation and the proposal must not involve the working of land to the north or north east of the River Evenlode; in the case of locations within the Corallian Ridge area, it must be demonstrated that there will be no change in water levels in the Cothill Fen Special Area of Conservation.'

HRA

The August 2015 HRA Screening Report concluded the Core Strategy would not have likely significant effects

on European sites either alone or in-combination with other plans. An earlier version of the HRA (2011) had identified the possibility of hydrological effects from minerals extraction on Oxford Meadows SAC and Cothill Fen SAC, but additional studies concluded that minerals extraction could take place, if additional safeguards were put in place, without a likely effect on the SACs.

It is assumed that the Site Allocations DPD will be in line with the Core Strategy and therefore that the HRA conclusions will be similar, however that work has not yet been undertaken by Oxfordshire County Council.

There are no likely in-combination effects of the Oxfordshire Minerals and Waste Local Plan Core Strategy with the South Oxfordshire Local Plan.

Oxford City Council Core Strategy 2026 and the Sites and Housing Plan 2011-2026

Status

Core Strategy adopted in March 2011.

Sites and Housing Plan adopted in February 2013.

Replaced many policies within the Local Plan 2001-2016, including those relating to employment land and housing provision.

Core Strategy, Sites and Housing Plan and saved policies of the Local Plan 2001-2016 will be replaced by the Local Plan 2036 once adopted.

Housing Provision

Provision of 8,000 additional dwellings over the plan period from 2006-2026.

The Core Strategy includes strategic allocations for residential and employment at West End, Northern Gateway and for residential only at Barton Park.

The Sites and Housing Plan lists the housing site allocations, and indicates approximately half of the 2,258 allocated dwellings will be at the Cowley/Blackbird Leys site.

Employment Land Provision

Provision of employment land for 11,000-14,000 jobs over the plan period via the granting of planning permission for developments that seek to achieve 'managed economic growth', whereby proposals show they maintain, strengthen, modernise or diversify Oxford's economy.

The Sites and Housing Plan highlights that some key employment sites are to be protected, unless viable alternatives are found.

HRA

The April 2011 HRA for the adopted Core Strategy concluded that there would be no significant effects on European sites. An Appropriate Assessment was carried out to assess the effects of recreation pressure, air pollution and changes to water quantity and quality on Oxford Meadows SAC; this concluded no adverse effects on integrity. Potential in-combination effects with SODC Local Plan, in relation to recreational pressure at Little Wittenham SAC were ruled out on the basis of the HRA of SODC's draft growth options.

The February 2012 HRA for the draft Sites and Housing Plan determined that, providing all of the mitigation measures recommended were carried out, the Sites and Housing Plan was not likely to have any adverse impact on European sites, either alone, or in combination with other plans or projects.

Therefore, there are no likely in-combination effects of the Oxford City Council Core Strategy 2026 and the Sites and Housing Plan 2011-2026 with the South Oxfordshire Local Plan.

Oxford City Council Local Plan 2036 Proposed Submission Draft (November 2018)

Status

Preferred Options Document consulted on from June to August 2017.

Consultation on Draft Plan is taking place from November – December 2018.

Housing Provision

Provision of 8,620 additional dwellings is to be delivered by 2036. In recognition of significant constraints and limitations including, but not limited to, the availability of land/sites within the city, Oxford City Council has set a capacity-based housing target. Since Oxford is unable to meet its housing need, the local plans for other Oxfordshire districts are delivering 13,100 dwellings to meet Oxford's unmet need.

Employment Land Provision

The Employment Land Assessment (2018) forecast that between 2016 and 2036 there is a need for 135,004m² of additional employment floorspace (113,535m² of B1A/B/C and 21,470m² of B2/B8). **HRA**

A screening report was prepared in October 2017 by Oxford City Council that found that an Appropriate Assessment was required to assess the potential impacts of the Local Plan on the Oxford Meadows SAC; alone and in combination with other plans or projects. The September 2018 HRA concluded that the policies of the Local Plan can be implemented without having an adverse effect on the integrity of the SAC.

Therefore, there are no likely in-combination effects of the Oxford City Council Local Plan 2036 Proposed Submission Draft with the South Oxfordshire Local Plan.

Vale of White Horse Local Plan 2031 Part 1: Strategic Sites and Policies and Draft Local Plan 2013 Part 2: Detailed Policies and Additional Sites

Status

Part 1 Adopted in December 2016.

Part 2 was submitted for examination in February 2018.

This replaces the majority of the Local Plan 2011. The remaining 'saved' policies from the Local Plan 2011 will be replaced by the Local Plan 2031 Part 2 once adopted. This will set out strategic policies and locations for strategic housing for the agreed quantum of Oxford's unmet housing need to be addressed within the Vale of White Horse District.

Housing Provision

The Local Plan Part 1 makes provision of at least 20,560 homes over the plan period between 2011 and 2031.

12,495 of these are to be delivered through strategic allocations, the majority of which are to be provided within the South East Vale Sub-Area, predominantly at Grove Airfield and Valley Park where each site has been allocated 2,550 dwellings, and at Crab Hill where 1,500 dwellings have been allocated.

The Draft Local Plan Part 2 makes provision for at least 22,760 homes over the plan period between 2011 and 2031. The additional 2,200 homes (in comparison to that provided for in Part 1) are to address a proportion of the unmet housing need for Oxford City.

12,495 of these are to be delivered through Part 1 strategic allocations and 3,420 of these are to be delivered through Part 2 allocations.

Employment Land Provision

The Local Plan Part 1 makes provision for 218 hectares of strategic employment land which is anticipated to deliver approximately 23,000 jobs over the plan period between 2011 and 2031. 93 hectares of this land will be at the Harwell Campus Enterprise Zone.

HRA

The February 2015 HRA of the draft Local Plan 2031 Part 1 concluded that no strategic housing sites would lead to likely significant effects, either alone or in combination. The July 2016 addendum to the HRA concluded that modifications made to the Local Plan since the previous HRA was undertaken did not impact the findings of the previous HRA.

The February 2018 HRA for the draft Local Plan 2031 Part 2 concluded that, given the incorporation of the recommendations within the HRA and subject to development of strategic air quality studies relating to Oxford Meadows SAC, the plan will not lead to likely significant effects on European sites either alone, or in

combination with other plans and projects.

Therefore, there are no likely in-combination effects of the Vale of White Horse Local Plan 2031 Part 1: Strategic Sites and Policies and Draft Local Plan 2013 Part 2: Detailed Policies and Additional Sites with the South Oxfordshire Local Plan.

Cherwell District Council Local Plan 2011-2031

Status

Part 1 was adopted in July 2015 (and Policy Bicester 13 was re-adopted in December 2016). This sets out the strategic planning policy framework and strategic site allocations for the District to 2031.

Part 1 is now also in the process of a partial review which focuses specifically on how to accommodate additional housing and associated supporting infrastructure within Cherwell in order to help meet Oxford's unmet housing need. The Local Plan Partial Review was submitted for examination in March 2018.

Part 2 is also in the process of being prepared and contains non-strategic site allocations and development management policies. The Part 2 Issues Consultation Document was published for consultation in January 2016.

Until Part 2 is adopted, there are saved policies within the adopted Local Plan 1996, adopted in November 1996, which are still in use. However, the plan period extended until 2001, therefore the policies are expired.

Housing Provision

Part 1 provides for 22,840 additional dwellings over the plan period from 2011-2031.

Part 1 review is informed by the Oxfordshire Growth Board which has agreed the appointment of Cherwell to make provision for an additional 4,400 homes over the plan period from 2011-2031 to help meet Oxford's unmet housing needs.

Part 2 will contain non-strategic site allocations and development management policies.

Employment Land Provision

Part 1 provides for 200 hectares of employment sites providing approximately 20,500 jobs, and provides for the retention of existing employment sites.

HRA

The October 2014 HRA for the Submission Cherwell Local Plan incorporating proposed modifications (October 2014) (Local Plan Part 1) determined that it would not lead to likely significant effects, either alone or in combination, on the qualifying features of any European sites.

The June 2017 HRA of the Local Plan Part 1 Partial Review: Options and Additional sites determined that the plan may lead to likely significant effects on the qualifying features of Oxford Meadows SAC and that an HRA Screening will therefore need to be undertaken for the Proposed Submission Partial Review Plan, which will contain details of strategic site allocations to meet Oxford's unmet need.

Subsequently, the June 2017 HRA of the Part 1 Partial Review: Oxford's unmet housing needs Proposed Submission Plan determined that the plan will not lead to likely significant effects, either alone or in combination, on the qualifying features of Oxford Meadows SAC.

The February 2018 HRA Update was produced to accompany the focussed changes and minor modifications to the Part 1 Review Submission Plan. The update did not change the previous HRA findings.

Therefore, there are no likely in-combination effects of the Cherwell District Council Local Plan Part 1 and the submitted Part 1 (Review) 2011-2031 with the South Oxfordshire Local Plan.

An HRA for the emerging Part 2 Local Plan has not yet been published.

Therefore, it is not yet possible to rule out in-combination effects of the emerging Cherwell District Council Local Plan Part 2 with the South Oxfordshire Local Plan.

West Oxfordshire Local Plan 2031

Status

The Local Plan was adopted in September 2018..

Housing Provision

The plan provides for at least 15,950 new homes over the plan period up to 2031, including 2,750 to help meet Oxford City's unmet need. A significant proportion of this growth will be provided at the main towns of Witney, Carterton, Chipping Norton and Burford, as well as a new settlement near Eynsham. The plan also allocates housing in Eynsham, Woodstock and other rural service centres.

Employment Land Provision

The plan identified the following levels of employment land provision:

- 18ha to the West of Witney.
- 6ha in the Carterton Sub-Area.
- 5ha as part of the Land East of Chipping Norton Strategic Development Area.
- 40ha at Oxfordshire Cotswolds Garden Village.
- At least 5ha within existing commitments with 2ha at Lakeside Standlake.

HRA

The June 2018 HRA of the West Oxfordshire Local Plan concluded that, given the incorporation of the recommendations within the HRA and subject to development of strategic air quality studies relating to Oxford Meadows SAC, the plan will not lead to likely significant effects on European sites either alone, or in combination with other plans and projects.

Therefore, there are no likely in-combination effects of the West Oxfordshire Local Plan with the South Oxfordshire Local Plan.

Vale of Aylesbury Proposed Submission Local Plan 2013 - 2033 and the Aylesbury Vale District Local Plan 2004

Status

Local Plan 2013 - 2033 was submitted for examination in February 2018.

Local Plan 2004 was adopted in January 2004 and in 2007 a selection of these policies were saved. However, the plan period extended until 2011, therefore the policies are expired. The Local Plan 2016 will replace this once adopted.

Housing Provision

The Proposed Submission Local Plan 2013 - 2033 makes provision for 27,400 homes, including 8,000 homes to assist providing Oxford's unmet housing need.

Strategic growth to be focussed on Aylesbury, and development at Buckingham, Winslow, Wendover and Haddenham supported by growth at other larger, medium and smaller villages. The strategy also allocates growth at a new settlement and on sites adjacent to Milton Keynes.

Employment Land Provision

The Proposed Submission Local Plan 2013 - 2033 makes provision for 27 hectares of employment land.

Strategic growth to be focussed on Aylesbury, and development at Buckingham, Winslow, Wendover and Haddenham supported by growth at other larger, medium and smaller villages. The strategy also allocates growth at a new settlement and on sites adjacent to Milton Keynes.

HRA

The April 2017 HRA of the Vale of Aylesbury Local Plan concluded that the plan is not likely to have significant effects on European sites, either alone or in-combination.

The August 2017 HRA Addendum looked at the impact on designated sites of the potential development at RAF Halton in the VALP Proposed Submission and deletion of previously identified option of green belt release site at Wendover. The addendum did not change the previous HRA findings

Therefore, there are no likely in-combination effects of the Vale of Aylesbury Local Plan 2016 with the South Oxfordshire Local Plan.

Wycombe submitted Local Plan, Core Strategy 2008 and Local Plan 2004

Status

The Local Plan was submitted for examination in March 2018. This reviews the Core Strategy 2008 and will replace the Local Plan 2004. The new Local Plan will be adopted by Wycombe District Council following the inspector's recommendations in 2019.

The Princes Risborough Town Plan was originally being prepared as a stand along plan, but this is now incorporated into the new Local Plan as a single plan.

The Core Strategy was adopted in 2008 and covers the plan period from 2006-2026.

The Local Plan 2004 was adopted in January 2004 and in 2007 a selection of these policies were saved. However, the plan period extended until 2011, therefore the policies are expired. The new Local Plan will replace this once adopted.

Housing Provision

The submitted Local Plan makes provision for 10,925 homes over the plan period from 2013-2033. The majority of homes are to be provided at the urban area of High Wycombe. 2,050 homes are also proposed at Princes Risborough and the plan notes that the expansion of Princes Risborough is expected to continue beyond the end of the plan period in 2033 adding approximately a further 600 homes to this total.

Core Strategy makes provision for a total of 7,240 houses over the plan period from 2006-2026 and notes that the Site Allocations DPD will identify and allocate sufficient land for this.

Employment Land Provision

The submitted Local Plan makes provision for employment land via safeguarding existing employment areas, supporting High Wycombe as a location for high quality offices, facilitating rural enterprise and diversification, and allocating 21ha of additional employment sites on the edge of High Wycombe, at Stokenchurch, and at Princes Risborough.

Core Strategy makes provision of employment land primarily through the regeneration and intensification of existing business areas, as well as through new sites for business.

HRA

The July 2018 HRA Report concluded that the Local Plan is unlikely to have significant effects, either individually or in combination with other plans or projects, on the integrity of European sites.

Therefore, there are no likely in-combination effects of the submitted Wycombe Local Plan with the South Oxfordshire Local Plan.

Wokingham Borough Core Strategy 2010, Managing Development Delivery Local Plan 2014 and emerging Local Plan Update

Status

Core strategy adopted in 2010.

Managing Development Delivery Local Plan adopted in 2014.

Both or parts of both will be superseded by the Local Plan Update. The Preferred Options are currently in preparation.

Housing Provision

Core Strategy makes provision for at least 13,232 houses over the plan period from 2006-2026, including those at allocated sites.

The Managing Development Delivery Local Plan highlights that the Core Strategy requires the provision of at least 13,230 dwellings over the plan period from 2006-2026 and identifies allocated sites.

The 2016 Issues and Options consultation document for the Local Plan Update highlights that the emerging Local Plan will need to help address the Objectively Addressed Housing Need in Wokingham of 856 new homes per annum between 2013-2036.

Employment Land Provision

Core Strategy makes provision for employment development at 9 Core Employment Areas. Some limited additional employment development may also be identified in the Managing Development Delivery Plan, within Strategic Development Locations and at retail centres.

The Managing Development Delivery Local Plan highlights that Core Employment Areas are defined in the Core Strategy and identifies allocated sites.

The 2016 Issues and Options consultation document for the Local Plan Update highlights that the emerging Local Plan will need to help address the need for employment land. It does not identify how much employment land may be required.

HRA

The Core Strategy advises that an Appropriate Assessment was undertaken and identified the potential significant impacts upon Thursley, Ash, Pirbright & Chobham SPA and Windsor Forest & Great Park SAC, but concluded that likely significant effects could be avoided.

Therefore, there are no likely in-combination effects of the Wokingham Borough Core Strategy 2010 and Managing Development Delivery Local Plan 2014 with the South Oxfordshire Local Plan.

An HRA scoping document for the emerging Local Plan was produced in August 2016. It notes that an HRA screening report will accompany the Preferred Options Local Plan document once published.

Therefore, it is not yet possible to rule out in-combination effects of the emerging Wokingham Borough Council Local Plan Update with the South Oxfordshire Local Plan.

Reading Borough Local Development Framework: Core Strategy (2008), Sites and Detailed Policies Document (2012) and Submission Draft Local Plan (2018)

Status

Core Strategy adopted in January 2008 and alteration adopted in January 2015.

Sites and Detailed Policies Document adopted in October 2012 and alteration adopted in January 2015.

The Reading Borough Local Development Framework (the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document) will be replaced by the New Local Plan. The Submission Draft Local Plan was submitted for examination in March 2018.

Housing Provision

The Submission Draft Local Plan makes provision for an additional 15,433 homes from 2013-2036. The plan also states that the Council will continue to work with neighbouring authorities within the Western Berkshire Housing Market Area to ensure that the shortfall of 644 dwellings that cannot be provided within Reading will be met over the plan period.

Core Strategy makes provision for a total of 10,930 dwellings over the plan period from 2006-2026.

Reading Central Area Action Plan makes provision for housing allocations at opportunity sites within the Reading Central Area of the Borough.

The Sites and Detailed Policies Document makes provision for housing site allocations.

Employment Land Provision

The Submission Draft Local Plan makes provision for a net increase of 53,000-112,000m² of office floorspace and 148,000 m² of industrial and/or warehouse space from 2013-2036.

Core Strategy seeks additional employment provision, particularly offices, in the centre and along the A33 corridor, whilst at the same time allows for the release of areas no longer required for employment use,

including some parts of the central area.

Sites and Detailed Policies Document makes provision for employment site allocations.

HRA

The November 2017 Sustainability Appraisal of the Proposed Submission Local Plan incorporates the HRA and concludes that all of the policy options are unlikely to have significant effects on European sites.

Therefore, there are no likely in-combination effects of the Reading Borough new Local Plan with the South Oxfordshire Local Plan.

West Berkshire Council Core Strategy (2006-2026); Housing Site Allocations DPD (2017), Local Plan 1991-2006 (Saved Policies 2007) and emerging Local Plan Review to 2036

Status

Core Strategy adopted in July 2012.

Housing Site Allocations DPD adopted May 2017.

Local Plan 1991-2006 saved policies in 2007.

West Berkshire Local Plan Review to 2036 Scoping Report consulted on from February – March 2018. This will replace the Core Strategy, Housing Site Allocations DPD and Local Plan 1991-2006 (Saved Policies 2007).

Housing Provision

Core Strategy makes provision for at least 10,500 additional dwellings over the plan period from 2006-2026.

Delivery includes housing in settlement boundaries and within broad locations and strategic sites, including those at and south of Newbury.

The Scoping Reports of the Local Plan Review states that the new Local Plan will establish a new housing requirement which will look forward to 2036. It does not identify the amount of housing to be proposed by the plan.

Employment Land Provision

Core Strategy makes provision for managing the growth of employment floorspace including through Protected Employment Areas.

Protected Employment Areas are located predominantly within Newbury, Thatcham and along the M4 and A4 corridors.

The Scoping Reports of the Local Plan Review states that the new Local Plan will assess the future levels of need for new employment land. It does not identify the amount of employment land to be proposed by the plan.

HRA

The 2016 HRA concluded that the Core Strategy, either alone or in combination with other plans and projects, will not affect the integrity of any of the European sites within the District or within 5km of the District boundary.

Therefore, there are no likely in-combination effects of the West Berkshire Council Core Strategy with the South Oxfordshire Local Plan.

An HRA has yet to be published for the emerging Local Plan.

Therefore, it is not yet possible to rule out in-combination effects of the emerging West Berkshire Local Plan Review with the South Oxfordshire Local Plan.

Neighbourhood Plans

Benson Neighbourhood Plan 2018

Status

The Benson Neighbourhood Plan was voted to be adopted in June 2018 following local referendum. The District Council has resolved to make the Neighbourhood Plan as part of the Council's development plan.

Housing Provision

Provision of 565 houses over the plan period of 2018-2033. The housing sites are located to the north of the village.

Employment Land Provision

Provision of retail, financial and professional, café and restaurant, and business developments via change of use from residential and commercial use in the village centre.

HRA

The July 2018 HRA screening report for the Benson Neighbourhood Plan identified the potential for in-combination effects of air pollution with the Local Plan on the Aston Rowant SAC. However, it concluded that the in-combination effects would not lead to any adverse effects, on the SAC on the basis of the Appropriate Assessment of the Local Plan. Whilst this related to the Appropriate Assessment for the previous version of the Local Plan, all development coming forward at Benson, including that allocated through the neighbourhood plan, has been considered in this HRA.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Brightwell-cum-Sotwell Neighbourhood Plan 2016-32

Status

The Brightwell-cum-Sotwell Neighbourhood Plan was made part of the Council's development plan by South Oxfordshire District Council in October 2017 following local referendum in September 2017.

Housing Provision

Provision of 67 new homes over the plan period of 2016-2032.

Employment Land Provision

The strategy permits infill employment development within the village boundary but does not make provision for additional employment or retail land on the edges of the village.

HRA

The March 2017 HRA concludes that the Brightwell-cum-Sotwell Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Chalgrove Draft Neighbourhood Plan 2018-2033: Suggested Revisions

Status

The draft Chalgrove Neighbourhood Plan was submitted for independent examination following public consultation, which ended in March 2018. Following comments from the examiner, the parish council has proposed some changes to the neighbourhood plan. Consultation on these changes ran from July – August 2018 and the referendum to adopt the plan took place on 22nd November 2018 and the plan was voted to be adopted, giving it full legal effect.

Housing Provision

Provision of 320 homes over the plan period from 2018 – 2033. The housing sites are located to the northwest and southeast of the village.

Employment Land Provision

The plan does not allocate sites for employment, but does state that the parish council will encourage business uses at an appropriate scale improve the mix and range of opportunities in the Neighbourhood Plan area. However, the plan notes this should not be at the expense of retail and essential service use in the village centre.

HRA

The August 2018 HRA Screening Report concludes that the Chalgrove Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Chalgrove Neighbourhood Plan with the South Oxfordshire Local Plan.

Chinnor Neighbourhood Plan 2017

Status

The Chinnor Neighbourhood Plan was made part of the Council's development plan by South Oxfordshire District Council in October 2017 following local referendum in September 2017.

Housing Provision

The Chinnor Neighbourhood Plan does not make any housing site allocations.

Employment Land Provision

Promote and develop employment via the protection of existing retail facilities, protection and enhancement of existing employment facilities, and enhancement of tourism facilities.

HRA

The June 2016 HRA Screening Report concluded that the Chinnor Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Cholsey Neighbourhood Plan 2018

Status

The plan has been submitted for examination and included a public hearing that was held in September 2018.

Housing Provision

Provision of approximately 189 homes over the plan period from 2017-2033. The three allocated housing sites are to the northeast and southeast of the village.

Employment Land Provision

Support employment via the safeguarding of employment land.

HRA

The August 2018 HRA concluded that the Cholsey Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Cholsey Neighbourhood Plan with the South Oxfordshire Local Plan.

East Hagbourne Neighbourhood Development Plan 2018 to 2033

Status

The plan has been submitted to South Oxfordshire District Council and is currently undergoing examination.

Housing Provision

Provision of 74 dwellings at Western Village Plotlands, which have already been granted planning permission.

Employment Land Provision

The plan does not allocate sites for employment nor does it directly support employment development.

HRA

The November 2018 HRA Screening Assessment concluded that the East Hagbourne NDP will not give rise to likely significant effects on European sites, either alone or in-combination with other plans or projects.

Therefore, there are no likely in-combination effects of the East Hagbourne Neighbourhood Development Plan with the South Oxfordshire Local Plan.

Dorchester-on-Thames Neighbourhood Development Plan 2017 - 2033

Status

The Dorchester-on-Thames Neighbourhood Development Plan was made part of the Council's development plan by South Oxfordshire District Council in April 2018 following local referendum in March 2018.

Housing Provision

Provision of additional homes through a limited number of small developments, providing affordable housing, smaller dwellings, and dwellings suitable for older people, in order to meet the identified needs of local residents and allow the village to maintain a balanced community.

Employment Land Provision

Support business and employment via support for development proposals for enhancing retail facilities, facilitating home working, and creating employment opportunities, including appropriate rural diversification.

HRA

The June 2017 Screening Assessment concluded that the Dorchester-on-Thames Neighbourhood Development Plan is unlikely to have significant effects on European sites.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Goring Draft Neighbourhood Plan 2018

Status

The Draft Plan is undergoing independent examination and has included a public hearing that took place in July 2018.

Housing Provision

Provision of 94 dwellings on allocated sites, as well as some infill development, over the plan period from 2018-2033. The housing sites are to the north east and southwest of the village and in the centre of the village.

Employment Land Provision

The employment site in the centre of the village is to be retained until it is demonstrated to be no longer economically viable. It is then allocated to be developed for housing.

To enhance the local economy, the village centre is to be protected, supported and enhanced as an essential component of the sustainability of Goring.

HRA

The July 2018 HRA Screening Report concluded that the Goring Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Goring Neighbourhood Plan with the South Oxfordshire Local Plan.

Joint Henley and Harpsden Neighbourhood Development Plan 2012-2027

Status

Made part of the Council's development plan by South Oxfordshire District Council in April 2016. Note that this plan is in the early stages of being reviewed.

Housing Provision

Provision for around 500 homes over the plan period 2012-2027. The housing sites are located at various locations across the parishes.

Employment Land Provision

Ensure a sustainable economy within the area via the re-provision, redistribution and intensification of employment land. Allocates existing low density employment sites for mixed use development, including employment, and allocates an additional employment site at an existing garden centre site. Sites allocated to west of built area and within the centre and south of the parishes.

HRA

The May 2015 Sustainability Appraisal states that the HRA Appropriate Assessment concluded that the Joint Henley and Harpsden Neighbourhood Development Plan is unlikely to have significant effects on European sites.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Little Milton Draft Neighbourhood Plan 2018-2033

Status

The draft Little Milton Neighbourhood Plan was submitted for independent examination following public consultation, which ended in June 2018. The referendum took place on 22nd November 2018 and was voted to be adopted, giving the plan full legal effect.

Housing Provision

The Neighbourhood Plan does not allocate sites for housing, but states that new homes will be delivered by suitable infill development or on suitable sites adjacent to the current built-up area.

Employment Land Provision

Provision of employment development via the alteration or expansion of existing premises, the change of use of existing premises, well-designed new development which is located outside the built-up area of the village, or proposals which promote the sustainable development and diversification of agricultural and other land-based rural businesses. Such development must have no significant adverse impacts on the local area.

HRA

The December 2016 HRA screening report concludes that the Little Milton Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Little Milton Neighbourhood Plan with the South Oxfordshire Local Plan.

Reviewed Long Wittenham Neighbourhood Development Plan 2018-2033

Status

The plan is currently undergoing examination and if made, will replace the current plan. The Long Wittenham Neighbourhood Development Plan was made part of the Council's development plan by South Oxfordshire District Council in October 2017 following local referendum in September 2017.

Housing Provision

The made Neighbourhood Plan does not allocate sites for housing, but states that new homes could potentially be delivered through minor development such as conversions, infill or plot subdivision. The revised Neighbourhood Plan, currently undergoing examination, seeks to allocate three housing sites to provide 83-88 new homes. (It should be noted that one of the three proposed site allocations already has planning permission for 36 new homes, granted at appeal. This is the same number proposed in the emerging allocation.)

Employment Land Provision

A key objective for the villages is to improve the amenities through a community hub, including community facilities such as a café, community shop or market.

HRA

The March 2017 HRA screening report concludes that the Long Wittenham Neighbourhood Development Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Long Wittenham Neighbourhood Development Plan with the South Oxfordshire Local Plan.

Pyrton Draft Neighbourhood Plan 2018-2033

Status

The Draft Pyrton Neighbourhood Plan underwent examination, which ended in November 2018. The Examiner recommended that, subject to modifications, the draft NDP should proceed to referendum.

Housing Provision

The emerging Neighbourhood Plan allocates approximately 15 new homes. (The site in question already has planning permission for 15-20 homes.)

Employment Land Provision

The plan does not make provision for employment development.

HRA

The August 2018 HRA screening report concludes that the Pyrton Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

Therefore, there are no likely in-combination effects of the Pyrton Neighbourhood Plan with the South Oxfordshire Local Plan.

Sonning Common Neighbourhood Plan 2012-2027

Status

Made part of the Council's development plan by South Oxfordshire District Council in October 2016.

The plan is currently under review however, at this early stage in the plan making process, no draft plan documents have yet been produced.

Housing Provision

The adopted Sonning Common Neighbourhood Plan makes allocations for up to 195 new homes.

Employment Land Provision

Protect the existing employment site on the southwest of the village and provide and expansion of this site.

HRA

The September 2014 HRA states that the Sonning Common Neighbourhood Development Plan will have potential significant effects on European sites and, therefore, requires an Appropriate Assessment. It states that the District Council intend to address this by updating the Appropriate Assessment for the Submission Core Strategy to include the effects of allocations made to larger villages.

The Appropriate Assessment for the Core Strategy was produced in December 2010, and therefore does not consider the Sonning Neighbourhood Plan. However, the January 2018 HRA of the emerging South Oxfordshire Local Plan considers the housing allocations at larger villages and the Neighbourhood Plan does not propose development that exceeds that proposed within the Local Plan. It can therefore be concluded that the Sonning Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Thame Neighbourhood Plan 2013

Status

Made part of the Council's development plan by South Oxfordshire District Council in July 2013. Note that this plan is in the early stages of being reviewed.

Housing Provision

Provision of 775 homes over the plan period up to 2027. The housing sites are located to the west and south of the town, and within the eastern part of the village.

Employment Land Provision

Provision of 3ha of employment land on the eastern part of the town.

The level of development allocated in the Thame Neighbourhood Plan reflects Policy CSTHA1 of the Core Strategy, and therefore relied on the HRA of the Core Strategy. This concluded that the Core Strategy would not result in any adverse impacts on any European sites.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

The Baldons Draft Neighbourhood Development Plan 2018

Status

Draft plan has undergone examination and the examiner's report was published in June 2018. The plan went to referendum in October 2018 and was voted to be adopted, giving the plan full legal effect. The plan was made by the council on 11 October 2018.

Housing Provision

Provision of 15 houses during the plan period from 2011-2033. The housing sites are located sporadically around the perimeter of Mash Baldon, Toot Baldon and Little Baldon.

Employment Land Provision

Employment facilities will be enhanced via the support for planning proposals that generate new employment opportunities, support existing ones or provide opportunities for home working and that are within the built-up areas of the villages.

HRA

The June 2016 HRA screening report concludes that The Baldons Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as this is considered in the Local Plan as commitments.

Warborough and Shillingford Draft Neighbourhood Plan 2011-2033

Status

Draft plan has undergone examination and the examiner's report was published in June 2018. The plan went to referendum in October 2018 and was voted to be adopted, giving the plan full legal effect. The plan was made by the council on 11 October 2018.

Housing Provision

Provision for around 29 dwellings at Six Acre Field in the east of Warborough, as well as some infill development.

Employment Land Provision

Employment facilities will be enhanced via the support for development of new employment facilities within the built-up area of the village.

HRA

The June 2018 HRA screening report concludes that the Warborough and Shillingford Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as this is considered in the Local Plan as commitments.

Watlington Neighbourhood Development Plan: Our Community, Our Plan 2018

Status

The Watlington Neighbourhood Development Plan was made in August 2018.

Housing Provision

Provision of up to 260 dwellings over the plan period from 2017-2033. Housing sites are located to the northwest of the town and staff accommodation for the Nursing Home is allocated in the east of the town.

Employment Land Provision

Provision of new small-scale workshops and accommodation for small and medium sized businesses, including start-ups, appropriate to the location within Watlington. Staff accommodation for the Nursing Home is allocated in the east of the town, which is recognised to develop and support employment opportunities associated with the nursing home.

HRA

The July 2018 HRA screening report for the Watlington Neighbourhood Plan was carried out concurrently with the Local Plan HRA. While it identified the potential for in-combination effects of air pollution with the Local Plan on the Aston Rowant SAC, it concluded that the in-combination effects would not lead to any adverse effects, on the SAC on the basis of the January 2018 Appropriate Assessment of the Publication version of the Local Plan.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as this is considered in the Local Plan as commitments.

Woodcote Neighbourhood Plan 2013-2027

Status

Made part of the Council's development plan by South Oxfordshire District Council in May 2014.

A review of the plan is currently underway and a new plan is being prepared however, at this early stage in the plan making process, no draft plan documents have yet been produced.

Housing Provision

Provision of a minimum of 73 new homes and a maximum of 76 new homes over the plan period from 2013-2027. The housing sites are located to the northeast, south and west of the village.

Employment Land Provision

Support employment via the support for non-residential development of the Old Coal Yard.

HRA

The January 2018 HRA of the emerging South Oxfordshire Local Plan considers the housing allocations at larger villages and the Neighbourhood Plan does not propose development that exceeds that proposed within the Local Plan. It can therefore be concluded that the Woodcote Neighbourhood Plan is unlikely to have significant effects on European sites either alone or in combination with other plans and policies.

This HRA has considered potential effects of all development allocated through made Neighbourhood Plans in combination with the Local Plan, as these are considered in the Local Plan as commitments.

Appendix 3

Screening Matrix for the Final Publication Version 2nd Local Plan

The screening matrix below shows which types of impacts on European sites could potentially result from each of the policies and sites allocated in the Local Plan. Where a site is not expected to have a particular type of impact, the relevant cell is shaded green. Where a site could potentially have a certain type of impact, this is shown in orange. The final column sets out the screening conclusions and the nature of potential significant effects if they were to arise.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
Policies				
STRAT1: The Overall Strategy	None – this policy describes the overall strategy for development within the District but will not itself result in new development; the principles set out in this strategic policy are covered by other more specific development policies.	n/a	n/a	No
STRAT2: South Oxfordshire Housing and Employment Requirements (at least 22,775 homes and 37.5 hectares of employment development)	Residential development Employment development Increase in vehicle traffic Increase in recreation pressure	Air pollution Disturbance from recreation	Air pollution: Aston Rowant SAC Recreation: Little Wittenham SAC	Uncertain: air pollution and recreation The screening of this policy considers the overall number of new homes in the District. The effect of those homes in specific locations is assessed in relation to specific allocations, below. STRAT2 provides for a total of 22,775 new homes over the plan period with 15,726 homes having already been completed or committed and 7,049 homes to be delivered. The provision of new homes in the District is likely to relate to an increase in population and therefore result in an increase in traffic flows on roads throughout the District. Where those roads pass within 200m of sensitive European sites, the increase in traffic could have air pollution impacts. This policy could have an air pollution effect alone or in combination with other policies or plans. This is considered further in the Appropriate Assessment. Development is proposed within c.7km of Little Wittenham SAC and therefore the plan has the potential to increase visitor numbers at the site and cause disturbance from recreation. Whilst not all of the new homes proposed in this policy lie within 7km, there are a number of large settlements, larger villages and strategic allocations, including Chalgrove, Berinsfield and Culham. Appropriate Assessment is required to

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
				consider the impacts further.
STRAT3: Didcot Garden Town	None – this policy sets out the design principles for the garden town but will not itself result in new development	n/a	n/a	No
STRAT4: Strategic Development	None – this policy sets out the principles for development within strategic areas but will not itself result in new development. The strategic allocations are assessed individually, below.	n/a	n/a	No
STRAT5: Residential Density	None – this policy describes the minimum net densities based on their location in the District but will not result in new development.	n/a	n/a	No
STRAT6: Green Belt	None – this policy describes the protection or alteration of Green Belt in relation to development, but will not itself result in new development.	n/a	n/a	No
STRAT7: Land at Chalgrove Airfield	Residential development Employment development Retail development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, Gypsy & Traveller pitches in relation to H14, retail in relation to TC1, and employment land in relation	Little Wittenham SAC	Uncertain: recreation Chalgrove Airfield lies c.6.5km from Little Wittenham SAC. The increase in population at this location could therefore potentially contribute an increase in visitors to the SAC.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
		to EMP1.)		
STRAT8: Culham Science Centre (in-combination with STRAT7, there will be a net increase of 7.3 ha employment land)	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
STRAT9: Land adjacent to Culham Science Centre (this policy makes provision for 1,850 new homes, 7.3 ha employment land in-combination with STRAT8, a maximum of 500 sqm retail space and 3 pitches for Gypsies and Travellers)	Residential development Employment development Retail development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, Gypsy & Traveller pitches in relation to H14, retail in relation to TC1, and employment land in relation to EMP1.)	Little Wittenham SAC	Uncertain: recreation Culham Science Centre lies c.4km from Little Wittenham SAC. The increase in population at this location could therefore contribute an increase in visitors to the SAC.
STRAT10: Land at Berinsfield (this policy makes provision for 1,600 new homes, 5 ha employment land and a maximum of 500 sqm retail space)	Residential development Employment development Retail development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, retail in relation to TC1, and employment land in relation	Little Wittenham SAC	Uncertain: recreation Berinsfield lies c.2.5km from Little Wittenham SAC. The increase in population at this location could therefore contribute an increase in visitors to the SAC.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
		to EMP1.)		
STRAT10i: Berinsfield Local Green Space	None - this allocates land as the centre of Berinsfield as Local Green Space and will not result in new development.	n/a	n/a	No
STRAT11: Land south of Grenoble Road (This policy makes provision for 1,700 new homes and 9.7 ha employment land)	Residential development Employment development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, and employment land in relation to EMP1.)	Little Wittenham SAC	Unlikely: recreation Land south of Grenoble Road lies greater than 8km away from Little Wittenham SAC and is therefore not likely to contribute a significant increase in visitors to the site.
STRAT12 Northfield (This policy makes provision for 1,800 new homes and a maximum of 500 sqm of retail space)	Residential development Retail development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, and retail in relation to TC1)	Little Wittenham SAC	Unlikely: recreation Northfield lies c.9.5km away from Little Wittenham SAC and is therefore not likely to contribute a significant increase in visitors to the site.
STRAT13: Land north of Bayswater Brook (This policy makes provision 1,100 new homes and a maximum of 500sqm of retail space)	Residential development Retail development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2, and retail in relation	Little Wittenham SAC	Unlikely: recreation Land north of Bayswater lies c.24.5km away from Little Wittenham SAC and is therefore not likely to contribute a significant increase in visitors to the site.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
		to TC1)		
STRAT14: Land at Wheatley Campus, Oxford Brookes University (This policy makes provision for 300 new homes)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2)	Little Wittenham SAC	Unlikely: recreation Wheatley Campus lies greater than 13km away from Little Wittenham SAC and is therefore not likely to contribute a significant increase in visitors to the site.
HEN1: The Strategy for Henley-on-Thames	None – this policy describes the principles for development in Henley-on-Thames but will not itself result in new development	n/a	n/a	No
TH1: The Strategy for Thame	None – this policy describes the principles for development in Thame but will not itself result in new development	n/a	n/a	No
WAL1: The Strategy for Wallingford	None – this policy describes the principles for development in Wallingford but will not itself result in new development	n/a	n/a	No
H1: Delivering new homes	None – this policy describes the circumstances in which new housing will be permitted outside of allocated sites, but will not itself result in new development	n/a	n/a	No
H2: New Housing in Didcot (this policy makes provision for 6,500 new homes, including the following locations and indicative dwelling numbers): - Ladygrove East (642)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed	Little Wittenham SAC	Uncertain: recreation All sites allocated in this policy have already been completed or committed, therefore they are not considered to constitute new housing as a result of the Local Plan, but should be considered in terms of in-combination effects. The increase in population at this location could therefore potentially contribute an

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
<ul style="list-style-type: none"> - Didcot North-east (2,030) - Great Western Park (2,587) - Vauxhall Barracks (300) - Orchard Centre Phase II (300) - Didcot A (270) - Didcot Gateway (300) - Hadden Hill (74) 		in relation to STRAT2.)		increase in visitors to the SAC, however the number of additional visitors would be low. This policy is unlikely to have a significant recreational pressure effect alone; however it could have an effect in combination with other policies or plans.
<p>H3: Housing in the towns of Henley-on-Thames, Thame and Wallingford (this policy makes provision for 3,873 new homes, including the following locations and indicative dwelling numbers):</p> <ul style="list-style-type: none"> - Henley-on-Thames (1,285) - Thames (1,518) - Land at Wallingford Green (555). 	<p>Residential development</p> <p>Increase in vehicle traffic</p> <p>Increase in recreational pressure</p>	<p>Disturbance from recreation</p> <p>(The in-combination air pollution impact of homes has been assessed in relation to STRAT2.)</p>	Little Wittenham SAC	<p>Uncertain: recreation (Wallingford only)</p> <p>Wallingford lies c.5km from Little Wittenham SAC. The increase in population at this location could therefore potentially contribute an increase in visitors to the SAC. The allocation at Wallingford Green has been brought forward from the Core Strategy and therefore is not considered to constitute new housing as a result of the Local Plan, but should be considered in terms of in-combination effects.</p> <p>Unlikely: recreation (Thame & Henley-on-Thames)</p> <p>Thame lies c.18km and Henley-on-Thames c.20km away from Little Wittenham SAC. Development at these locations is unlikely to significantly increase visitor numbers at Little Wittenham SAC.</p>
<p>H4: Housing in the Larger Villages</p> <p>(This policy makes the provision for 499 new homes through the Neighbourhood Development plan and site allocations at the larger villages are as follows:</p> <ul style="list-style-type: none"> - Cholsey (27) - Goring-on-Thames (233) - Nettlebed (55)* - Sonning Common (1108) - Woodcote (131)) <p>*Nettlebed allocations are</p>	<p>Residential development</p> <p>Increase in vehicle traffic</p> <p>Increase in recreational pressure</p>	<p>Disturbance from recreation</p> <p>(The in-combination air pollution impact of homes has been assessed in relation to STRAT2.)</p>	Little Wittenham SAC	<p>Uncertain: recreation (Cholsey)</p> <p>Cholsey lies <7km from Little Wittenham SAC and could therefore potentially contribute an increase in visitors to the SAC. However, the number of proposed homes at this location is small and unlikely to contribute significant recreational pressure from each site alone. These sites do have the potential for recreational effects in combination with other policies (e.g. H3).</p> <p>Unlikely: recreation (Goring-on-Thames, Sonning Common and Woodcote)</p> <p>The other larger villages are situated >7km from Little Wittenham SAC. Development at these locations is unlikely to significantly increase visitor numbers at Little Wittenham SAC.</p>

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
considered separately below.				
H5: Land to the west of Priests Close, Nettlebed (This policy makes provision for 11 new homes)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2.)	Little Wittenham SAC	Unlikely: recreation Nettlebed lies greater than 13km away from Little Wittenham SAC and this allocation is for a small number of homes. They are therefore not likely to contribute a significant increase in visitors to the site.
H6: Joyce Grove, Nettlebed (This policy makes provision for 20 new homes)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2.)	Little Wittenham SAC	Unlikely: recreation Nettlebed lies greater than 13km away from Little Wittenham SAC and this allocation is for a small number of homes. They are therefore not likely to contribute a significant increase in visitors to the site.
H7: Land to the South and West of Nettlebed Service Station (This policy makes provision for 15 new homes)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2.)	Little Wittenham SAC	Unlikely: recreation Nettlebed lies greater than 13km away from Little Wittenham SAC and this allocation is for a small number of homes. They are therefore not likely to contribute a significant increase in visitors to the site.
H8: Housing in Smaller Villages (This policy has no defined requirement for additional housing)	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed in relation to STRAT2)	Little Wittenham SAC	Unlikely: recreation The location of proposed housing in smaller villages is not specified in the Local Plan; however if new homes were developed close to Little Wittenham SAC, these could contribute to an increase in visitors to the site, either alone or in combination with other policies. However, the policy does not directly allocate housing and suggests that housing in smaller villages would come through Neighbourhood Plans, which would be subject to HRA screening in their own right.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
H9: Affordable Housing; H10: Exception Sites; H11: Housing Mix; H12: Self-Build and Custom Housing; and H13: Specialist Housing for Older People	None – these policies set out the requirements for specific types of housing but will not themselves result in new development	n/a	n/a	No
H14: Provision for Gypsies, Travellers and Travelling Showpeople (This policy makes provision for the following allocations: Gypsy & Traveller pitches: - Didcot North-east (4) - Culham Science Centre (3) - Land at Chalgrove Airfield (3))	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation	Little Wittenham SAC	Unlikely: recreation and physical loss/damage to habitat The allocated plots and pitches permitted by policy H14 are at sites for residential development assessed under policies STRAT7-9 and H2. The small number of additional residents at these sites provided for by policy H14 will not contribute significant recreation effects on European sites. Policies H14 and H15 do allow for some development outside of these allocations, as extensions to existing sites, or where there has been a need to close an existing site. However, the identified need for 10 pitches is met by the allocated sites and the existing sites are small (16 pitches at Sandford-on-Thames and Wheatley, and 5 pitches at Benson). Any additional development is likely to be very small scale and unlikely to result in significant effects on European sites.
H15: Safeguarding Gypsies, Traveller and Travelling Show people Sites	None – this policies protect against the loss of sites used by Gypsies, Travellers and Travelling Showpeople.	n/a	n/a	No
H16: Infill Development	Residential development Increase in vehicle traffic Increase in recreational pressure	Disturbance from recreation (The in-combination air pollution impact of homes has been assessed	Little Wittenham SAC	Unlikely: recreation The scale of development that would result from this policy will be small and will not contribute to significant recreation or air pollution effects on European sites.

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
		in relation to STRAT2 and STRAT3.)		
H17: Sub-division and Conversion to Multiple Occupation; H18: Replacement Dwellings; H19: Re-use of Rural Buildings; H20: Rural Workers' Dwellings; and H21: Extensions to dwellings	None – these policies sets out principles for development to existing dwellings and will not result in new development.	n/a	n/a	No
H22: Loss of Existing Residential Accommodation in Town Centres	None – this policy restricts the loss of existing residential development and will not result in new development	n/a	n/a	No
EMP1: The amount and distribution of new B-class employment land This policy makes provision for at least 37.2 hectares, to include the following- Already committed: - Didcot (9.42ha) - Wallingford (2.25ha) - Culham (5.3ha) - Chalgrove (2.25ha) Not yet committed: - Henley-on-Thames (1ha) - Thame (1.6ha) - Wallingford (3.1ha) - Crowmarsh Gifford (0.28ha) - Culham (2ha) - Chalgrove (5ha) - Berinsfield (5ha)	Employment development Increase in vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Uncertain: air pollution This policy makes provision for at least 37.2 ha of employment space, of which 19.22 ha is already committed. The sites in combination and the overall quantum of employment development have the potential to increase traffic on roads close to sensitive sites. This policy could therefore have an air pollution impact in combination with other policies (e.g. STRAT2) or plans.
EMP2: Range, Size and Mix of Employment Premises	None – this policy sets principles for the type of employment space but will not result in new	n/a	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
	development			
EMP3: Retention of Employment Land	None – this policy describes the circumstances in which change of use of existing employment land will be permitted. It will not result in new development	n/a	n/a	No
EMP4: Employment Land in Didcot	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
EMP5: New Employment Land in Henley-on-Thames	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
EMP6: New Employment Land at Thame	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
EMP7: New Employment Land in Wallingford	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
		of employment land has been assessed in relation to EMP1.)		
EMP8: New Employment Land at Crowmarsh Gifford	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
EMP9: New Employment Land at Chalgrove	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No
EMP10: Community Employment Plans	None – this policy sets requirements for developments to produce Community Employment Plans (CEPs) and will not result in new development.	n/a	n/a	No
EMP11: Development in the Countryside and Rural Areas	Employment development Increase in vehicle traffic	None (The in-combination air pollution impact of employment land has been assessed in relation to EMP1.)	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
EMP12: Tourism	Tourism development Increase in vehicle traffic Increase in recreational pressure	Air pollution Disturbance from recreation	Air pollution: Aston Rowant SAC Recreation: Little Wittenham SAC	Uncertain: air pollution The scale of development that will come forward as a result of this development is likely to be small in scale. However this policy could contribute additional traffic to roads and therefore have an air pollution impact on sensitive sites, in combination with other policies (e.g. EMP1) or plans. Unlikely: recreation and physical damage / loss of habitat Although this policy may result in an increase in tourist visitors to the District, it is likely to also provide a wider choice of attractions. Overall, this policy is unlikely to significantly increase visitor numbers at Little Wittenham SAC.
EMP13: Caravan and Camping Sites	Tourism development Increase in vehicle traffic Increase in recreational pressure	Air pollution Disturbance from recreation	Air pollution: Aston Rowant SAC Recreation: Little Wittenham SAC	Unlikely: air pollution, recreation and physical damage / loss of habitat The scale of development that will come forward as a result of this development is likely to be small in scale. The temporary increases in population that the policy will result in are unlikely to generate significant increases in traffic, or visitors to Little Wittenham SAC.
EMP14: Retention of Visitor Accommodation	Tourism development Increase in vehicle traffic Increase in recreational pressure	Air pollution Disturbance from recreation	Air pollution: Aston Rowant SAC Recreation: Little Wittenham SAC	Unlikely: air pollution and recreation The scale of development that will come forward as a result of this development is likely to be small in scale. The temporary increases in population that the policy will result in are unlikely to generate significant increases in traffic, or visitors to Little Wittenham SAC.
INF1: Infrastructure Provision	None – this policy requires new development to be served by appropriate infrastructure and services, but will not itself increase traffic or visitor numbers .	n/a	n/a	No
TRANS1a: Supporting Strategic Transport Investment across the Oxford to Cambridge Arc TRANS1b: Supporting Strategic	Transport development Changes to vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Uncertain: air pollution The highways improvements identified by SODC that would be implemented via this policy will change the flow of traffic on the road network and could therefore have a significant effect on air pollution close to

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
Transport Investment				European sites in combination with other policies. Some of the strategic transport development that this policy relates to is covered by the Oxfordshire Local Transport Plan ¹⁰⁸ , which is subject to its own HRA. The Local Transport Plan may have significant effects in combination with policies within this Local Plan. This has been considered in the Appropriate Assessment and in Appendix 2 .
TRANS2: Promoting Sustainable Transport and Accessibility	None – this policy encourages sustainable transport and will not result in development that would increase vehicle traffic or visitor numbers	n/a	n/a	No
TRANS3: Safeguarding of Land for Strategic Transport Schemes	None – this policy safeguards land for some of the development that would come forward under STRAT1, but will not itself result in new development	n/a	n/a	No
TRANS4: Transport Assessments, Transport Statements and Travel Plans	None – this policy sets out the requirements for transport assessment and will not result in new development	n/a	n/a	No
TRANS5: Consideration of Development Proposals	None – this policy requires all development to make provision for access but will not result in new development	n/a	n/a	No
TRANS6: Rail	None – this policy encourages sustainable transport and will not result in development that would increase vehicle traffic or visitor numbers	n/a	n/a	No

¹⁰⁸ <https://www.oxfordshire.gov.uk/cms/content/ltp4-policy-and-overall-strategy>

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
TRANS7: Development Generating New Lorry Movements	None – this policy sets out principles for development that would result in significant increases in lorry movements but will not itself result in new development	n/a	n/a	No
INF2: Electronic Communications	None – this policy requires new development to be served by communications infrastructure, but will not itself increase traffic or visitor numbers	n/a	n/a	No
INF3: Telecommunications Technology	None – this policy will result in infrastructure development but will not increase traffic or visitor numbers	None	n/a	No
INF4: Water and Waste Resources	None – this policy requires developments to put in place adequate water supply and treatment but will not itself result in new development	n/a	n/a	No
ENV1: Landscape and Countryside	None – this policy sets out principles to protect landscape and countryside from inappropriate development, and will not result in new development	n/a	n/a	No
ENV2: Biodiversity - Designated Sites, Priority Habitats and Species	None – this policy sets out principles to protect biodiversity from inappropriate development, and will not result in new development	n/a	n/a	No
ENV3: Biodiversity – Non designated sites, habitats and species	None – this policy protects non-designated sites, habitats and species and will not result in new development	n/a	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
ENV4: Watercourses	None – this policy protects watercourses and will not result in new development	n/a	n/a	No
ENV5: Green Infrastructure in new developments	None – this policy requires developments to contribute to the provision of new green infrastructure but will not increase traffic or visitor numbers	n/a	n/a	No
ENV6: Historic Environment ENV7: Listed Buildings; ENV8: Conservation Areas; ENV9: Archaeology and Scheduled Monuments; and ENV10: Historic Battlefields, Registered Parks and Gardens and Historic Landscapes	None – these policies provides protection for heritage assets and will not result in new development	n/a	n/a	No
ENV11: Pollution - Impact from Existing and/or Previous Land Uses on New Development and the Natural Environment (Potential Receptors of Pollution)	None – this policy protects the occupants of new development and the natural environment from pollution and will not result in new development	n/a	n/a	No
ENV12: Pollution - Impact of Development on Human Health, the Natural Environment and/or Local Amenity (Potential Sources of Pollution)	None – this policy protects the environment, human health and amenity from pollution and will not result in new development	n/a	n/a	No
EP1: Air Quality	None – this policy protects public health from poor air quality and will not result in new development	n/a	n/a	No
EP2: Hazardous substances	None – this policy limits development associated with hazardous waste and will not result in new development	n/a	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
EP3: Waste Collection and Recycling	None - this policy outlines requirements for waste and recycling facilitates at new developments, but will not result in new development.	n/a	n/a	No
EP4: Flood Risk	None - this policy directs development away from areas likely to flood and sets principles for the design of new development to minimise flood risk, but will not result in new development.	n/a	n/a	No
EP5: Minerals Safeguarding Areas	None – this policy directs non-mineral development away from safeguarded minerals areas, but will not itself result in new development	n/a	n/a	No
DES1: Delivering High Quality Development; DES2: Enhancing Local Character; DES3: Design and Access Statements; DES4: Masterplans for allocated sites and major development; DES5: Outdoor Amenity Space; DES6: Residential Amenity DES7: Public Art	None – these policies set principles for the design of new development and the design process, but will not themselves result in new development	n/a	n/a	No
DES8: Efficient use of resources	None – this policy relates to the design of development and will not result in new development	n/a	n/a	No
DES9: Promoting sustainable design	None – this policy relates to the design of development and will not result in new	n/a	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
	development			
DES10: Renewable Energy	None – this policy enables energy infrastructure development but will not increase traffic or visitor numbers	n/a	n/a	No
TC1: Retail and Services Growth (25,670 sq m (net) comparison retail floorspace. Also makes provision for 4,500 sq m convenience floorspace, which is considered under TC4 below.)	Retail development Changes to vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Uncertain: air pollution The increase in retail development within the District may alter the travel patterns of the population it serves. If the development results in an increase in traffic on roads close to sensitive European sites, it could have an air pollution impact on those sites in combination with other policies (e.g. STRAT2) or plans.
TC2: Retail Hierarchy	None – this policy sets out the principles for locating retail development within settlements, but will not itself result in new development	n/a	n/a	No
TC3: Comparison goods floorspace requirements	None – this policy sets out the principles for locating comparison goods floorspace within settlements, but will not itself result in new development	n/a	n/a	No
TC4: Convenience floorspace provision in the Market Towns (Each of Henley-on-Thames, Thame and Wallingford to make provision for a single format food store with at least 1,500 sq m net sales floorspace)	Retail development Changes to vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Unlikely: air pollution This policy provides for convenience retail, which is expected to serve a local population. As such, this policy is not expected to result in traffic movements beyond the areas surrounding the market towns and is unlikely to result in additional traffic through Aston Rowant SAC.
TC5: Primary Shopping Areas	None – this policy sets out requirements for development in Primary Shopping Areas and will not itself result in new development	n/a	n/a	No

	Likely activities (operation) to result as a consequence of the proposal	Likely effects if proposal implemented	European site(s) potentially affected	Could the proposal have likely significant effects on European sites?
CF1: Safeguarding Community Facilities	None – this policy safeguards existing facilities and will not result in new development	n/a	n/a	No
CF2: Provision of Community Facilities and Services	Community and social infrastructure development Increase in vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Unlikely: air pollution The scale of development that would result from this policy is likely to be small and will not contribute to significant air pollution effects on European sites.
CF3: New Open Space, Sport and Recreation Facilities	Community and social infrastructure development Increase in vehicle traffic	Air pollution	Air pollution: Aston Rowant SAC	Unlikely: air pollution The scale of development that would result from this policy is likely to be small and will not contribute to significant air pollution effects on European sites.
CF4: Existing Open Space, Sport and Recreation Facilities	None – this policy safeguards existing facilities and will not result in new development	n/a	n/a	No
CF5: Open Space, and Sport and Recreation in New Residential Development	None – this policy enables green infrastructure to serve new development but will not itself increase traffic or visitor numbers	n/a	n/a	No

Appendix 4

Consultation Responses

Summary of comments relevant to the HRA and the response provided within the HRA report

Date of comment and document consulted on	Comment	HRA response
<p>13 February 2015</p> <p>HRA of the South Oxfordshire Local Plan 2031 (housing distribution and growth scenarios), January 2015</p>	<p>Environment Agency:</p> <p><i>Only a few of the sites identified in the HRA are truly water dependant habitats:</i></p> <p>Fen Lambourn t and Lambourn Floodplain Wittenham</p> <p><i>Water supply/availability is already covered by an existing regulatory regime. However, we have reviewed all licences to ensure that that do not have a significant impact on Habitat Directives sites. Without further detail on any increased water demand, it's impossible for us to specifically confirm that new developments will or will not impact upon the environment.</i></p> <p><i>Of the sites above only the River Lambourn and Kennet and Lambourn would likely be impacted by abstraction. Cothill Fen has a very small, localised catchment and is fed by water moving locally through the sand. Little Wittenham has ponds that are fed by rainwater and potentially spring sources. Other ponds on site are supported by the Thames. No likely abstraction points will impact on these.</i></p> <p><i>Water supply for Kennet and Lambourn Floodplain and River Lambourn is from the chalk of the Kennet catchment. Under CAMS this aquifer has no available resource - so no new source of water will come from this catchment.</i></p> <p><i>All the woodland sites identified are perched on top of the Chilterns with significant unsaturated zones beneath them meaning abstraction can't impact them and discharges can't get to them.</i></p>	<p>This information has been acknowledged in the assumptions used to screen potential water quality and quantity impacts (paragraphs 3.24-3.33 of this report).</p>
<p>17 February 2015</p> <p>HRA of the South Oxfordshire Local Plan 2031 (housing distribution and growth scenarios), January 2015</p>	<p>Natural England:</p> <p><i>The draft HRA as submitted for the South Oxfordshire District Local Plan 2031 is satisfactory.</i></p>	<p>No action required. This HRA has built upon the assumptions and findings of the earlier HRA work.</p>
<p>17 May 2017</p> <p>HRA of the Second Preferred</p>	<p>Natural England:</p> <p><i>We have reviewed the HRA which accompanies the Local Plan Part 2 and we note in section 3.13 of the HRA that impacts on Oxford Meadows from air pollution have</i></p>	<p>Natural England's concerns about nitrogen deposition at Oxford Meadows SAC are on the basis that the Annex 1 habitat type 'Lowland hay meadows' present at Oxford Meadows SAC has been identified as being potentially sensitive to nitrogen deposition.</p>

Date of comment and document consulted on	Comment	HRA response
Options Local Plan 2031	<p><i>been screened out of the assessment. We do not agree with this assumption and advise that air pollution impacts on the Oxford Meadows SAC are screened into the HRA. The assessment should consider both whether increased air pollution resulting from proposals in the South Oxfordshire Local Plan would lead to a likely significant effect alone (through contributing to an increase in traffic within 200m of the SAC of 1000 AADT or over), or if other plans or projects would act in-combination and together they would lead to an increase of more than 1000 AADT within 200m of a SAC.</i></p>	<p>However, Annex 1 habitat type Lowland hay meadows (6510) comprises a relatively broad habitat type, including both floodplain and fully terrestrial grassland sub-communities¹⁰⁹. Therefore, while the overall Annex 1 habitat might potentially be sensitive to aerial nitrogen deposition, it is important to consider the sensitivities of the different sub-communities, particularly those understood to be present at Oxford Meadows SAC.</p> <p>Oxford Meadows SAC lies entirely within the floodplain of the River Thames (predominately Flood Zone 3), and as such it is subject to regular inundation during flooding events. Floodplain grassland communities such as these have very different nutrient cycles from terrestrial communities, as flooding events can cause both the flushing of nutrients from the soil surface as flood water pass over them, and the accumulation of nutrients as sediments in the floodwater precipitate and accumulate on the soil surface during more prolonged flooding events. These sediment particles are vectors for the transfer of nutrients, particularly from chemical fertilisers washed out of agricultural fields and into the river. These sediments therefore have a strong influence of soil nutrient levels in floodplain ecosystems.</p> <p>Terrestrial ecosystems are not subject to such inputs; therefore aerial nitrogen deposition (e.g. from vehicle emissions) has a relatively much stronger influence than in floodplain ecosystems, particularly as aerial nitrogen deposition is allowed to gradually accumulate in the soils over time. This is reflected in the majority of Site Improvement Plans for floodplain SACs, which tend to identify diffuse water pollution rather than aerial deposition as a threat to site integrity, even where critical loads for nitrogen have already been exceeded.</p> <p>Nutrient enrichment is also generally dependant on the levels of three key nutrients; nitrogen (N), phosphorous (P) and potassium (K). Terrestrial habitats tend to be nitrogen limited i.e. nitrogen levels have the strongest influence on plant productivity, therefore any accumulations of nitrogen over time can trigger the eutrophication of sensitive habitats. Aquatic ecosystems on the other hand tend to be phosphorous limited, and in these systems background levels of nitrogen have a relatively limited influence upon plant growth and the risk of eutrophication compared with the influence of phosphorus levels.</p>

¹⁰⁹ European Commission (2013) Interpretation Manual of European Union Habitats

Date of comment and document consulted on	Comment	HRA response
		<p>Floodplain meadows are also naturally relatively rich in nutrients as a result of the regular inundation of sediment laden floodwater. In floodplain ecosystems, the grassland communities present tend to have a competitive advantage over other more vigorous plant species which would otherwise normally dominate in such a nutrient-rich environment, due to their ability to survive the high moisture content of the soils and anaerobic conditions created by regular inundation. These communities therefore tend to be primarily defined by their hydrological regime rather than nutrient levels, and as such they are less sensitive to background nutrient levels than terrestrial grasslands, provided appropriate hydrological conditions are maintained. At Oxford Meadows SAC it is understood that the hydrological regime is controlled artificially via a number of ditches and channels, and the Site Improvement Plan has identified actions to ensure that appropriate hydrological conditions will be maintained.</p> <p>Oxford Meadows is therefore not considered to be particularly sensitive to aerial nitrogen deposition from increases in vehicle emissions.</p> <p>In addition, the contribution of the Local Plan to traffic flows on the A34 and A40 is expected to be negligible (see Table 3.2 and paragraphs 3.45 & 3.46)</p>
<p>17 May 2017</p> <p>HRA of the Second Preferred Options Local Plan 2031</p>	<p>Berks, Bucks & Oxon Wildlife Trust:</p> <p><i>The Habitats Regulation Assessment (HRA) considers potential impacts of the South Oxfordshire Local Plan on Special Areas for Conservation (SAC) including Aston Rowant SAC, Chilterns Beechwoods SAC, Cothill Fen SAC; Hartslock Wood SAC, Little Wittenham SAC and Oxford Meadows SAC.</i></p> <p><i>This assessment is based on the application of a 7km buffer to the site identified as the "Zone of Influence" by the Thames Basin Heaths SPA Delivery Framework. We are not convinced that this 7km buffer is appropriate for this situation and recommend that recreational effects are also screened in with regard to Aston Rowant and Cothill Fen SACs. This is on the basis of increased recreational pressure arising from allocations at Didcot, Culham, Chalgrove, Watlington, Thame and Chinnor as well as major allocations in the neighbouring districts of Aylesbury Vale and Vale of White Horse.</i></p> <p><i>In our experience the Chilterns are a favoured destination for informal recreation from people living some distance away. This seems to be also supported by the findings of the South Oxfordshire Open Space User Survey (2005) and the Little Wittenham SAC visitor surveys as outlined in para 3.16 of the HRA.</i></p>	<p>LUC has discussed this with Natural England (Rebecca Micklem, Lead Advisor) and has been advised that Natural England generally has no concerns about using 7km as an approximate screening distance / general threshold. However, where there are specific evidence or concerns, sites outside this distance should be considered.</p> <p>Since the HRA was prepared, we have received details of the visitor survey data for Little Wittenham. This states that the majority of visits are from people within 20 minutes' drive of the site, or c.8km (7km to the South Oxfordshire border, plus Abingdon). Development in Abingdon has therefore been considered (paragraphs 4.17 & 4.18). This does not alter the HRA screening conclusions.</p> <p>Further discussions with Natural England's SSSI officers for Cothill Fen (Alison Muldal) and Aston Rowant (Graham Steven), has provided reassurance that those sites are not particularly sensitive to increases in recreation pressure, for the following reasons:</p> <p>Cothill Fen SAC: The site is not generally promoted for public access and is unlikely to attract visitors from a long distance. Development very close to the site could generate visitors (e.g. dog walkers from within c.1km away), but as the site is very wet, visitors naturally</p>

Date of comment and document consulted on	Comment	HRA response
	<p><i>We believe that Aston Rowant acts as a particular attraction to visitors because a large part of the SAC is also designated as a National Nature Reserve (NNR). Similarly Cothill Fen SAC contains a number of SSSI, which are managed by BBOWT as nature reserves and which act as an attraction for visitors. We consider it therefore reasonable to assume that residents in South Oxfordshire will travel to nature conservation sites outside the district even if these are more than 7km away. On the basis that potential significant in-combination effects on the SACs cannot be fully ruled out we request that recreational effects on Aston Rowant SAC and Cothill Fen SAC are also assessed.</i></p>	<p>follow the boardwalk paths. The site is mainly considered to be sensitive to changes in groundwater or hydrology, not recreation; and</p> <p>Aston Rowant SAC: The site's qualifying features are considered to be fairly resilient to recreation pressure, with changes to habitat management more likely to be an issue. Access to the site can be effectively managed as there are two relatively small car parks and only two main footpaths; there are no plans to increase parking capacity or change the access management policy.</p> <p>LUC has contacted BBOWT to invite them to provide further comment on the approach taken in this HRA but, at the time of writing, no response has been received.</p>
<p>17 May 2017 HRA of the Second Preferred Options Local Plan 2031</p>	<p>Member of the public:</p> <p><i>An assessment is also noted that 'Upgrades to waste-water treatment' have been deemed necessary, mentioning groundwater (Habitat Assessment, Table 3.1). It is perhaps understandable that such planning does not say when and what, but there have also been previous plans for pumping infrastructure for waste from Huntercombe, Nuffield. Directly adjacent land is part of Nettlebed Parish. This may also be developable, but the status of waste treatment may need clarification.</i></p>	<p>Upgrades to waste water treatment in the District are being planned for as part of South Oxfordshire's Water Cycle Study work.</p>
<p>15 May 2017 HRA of the Second Preferred Options Local Plan 2031</p>	<p>Member of the public:</p> <p><i>The Habitats Regulations Assessment Report identifies the following concerns in relation to the proposed developments: Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site. Reduce the diversity of the site Result in disturbance that could affect the population, density or balance between key species Change the dynamics of relationships that define the structure or function of the site (e.g. relationships between soil and water, or animals and plants) Result in the loss of key features. Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem Reduce the extent of key habitats or the population of key species. The report goes on to say that planning permission will be granted if proposals can demonstrate that they will, protect, conserve and where possible, enhance the Districts green infrastructure.</i></p> <p><i>There are hedgehogs, bats, barn owls, woodpeckers, bees, deer, monk jacks, frogs, house martins, bee orchids and snow drops within and adjacent to the proposed development site. My objection is based as identified in the Habitats Regulations Assessment Report; the area of outstanding natural beauty, at Harwell Science Park, will be destroyed by constructing 1000 houses. Habitats and protected species will be destroyed. There are protected species which are seen flourishing on a daily basis. Such species include Nesting Red Kites and Barn Owls</i></p>	<p>Harwell Science Park is in Vale of White Horse, not South Oxfordshire.</p>

Date of comment and document consulted on	Comment	HRA response
	<i>which are seen regularly (These are protected species). Woodpeckers and Mistle Thrush will all lose their habitats should this development be approved.</i>	
25 April 2017 HRA of the Second Preferred Options Local Plan 2031	Member of the public: <i>Table 3.1 in HRA refers to Waste Water Treatment with the additional waste water going into the River Thame. The fields adjacent to the River Thame on the opposite side of London road from the commercial area are flood meadows.</i>	This does not alter the conclusions of the HRA.
15 May 2017 HRA of the Second Preferred Options Local Plan 2031	Member of the public: <i>Additional subject: HRA Comment on the Second Preferred Options document:</i> <i>I am delighted to see that the following proposed development sites are not to go forward in the plan at this stage:</i> <i>Harrington (Jn 7 M40) because of the potential dreadful negative impact on Spartum fen SSSI. This development would be on the rainwater catchment of this fen (this is as yet uncalculated) and restrict infiltration plus cause groundwater pollution of the spring water. The catchment should not be built on. Also there may be a call for drinking water abstraction which would deprive the fen of water flow.</i> <i>Wick Farm and Lower Elsfield¹¹⁰ because of the potential negative impact of these developments on Sydlings Copse SSSI fen. Both an increase in public recreational pressure and negative impacts on the water quality of the fen would be expected with development so close to the site. The water catchment of the springs is not known, but this critical area needs protection from ANY development. Should these sites return as proposals in a few year's time, I will strongly oppose their inclusion as viable/sustainable development sites for the above reasons.</i> <i>Comments on the HRA document:</i> <i>Page 44 Aston Rowant SAC</i> <i>As a voluntary expert species recorder for Natural England at Aston Rowant NNR/SAC I am very surprised to see that the following qualifying feature of the site is omitted from the table:</i> <i>'H6210 Semi-natural dry grasslands and scrubland facies: on calcareous substrates; dry grasslands and scrublands on chalk and limestone' This should surely be included? After all, it is a qualifying feature of both Hackpen Down SAC and Hartslock SAC which have the same habitat, so why is it not included for the similar and very important chalk grassland at Aston Rowant? This needs to go in because the impact of increased traffic on the M40 from proposed developments needs to be assessed in terms of the critical load for N deposition on such dry</i>	The summary of site features in Appendix 1 has been reviewed and updated based on the latest Site Improvement Plans. As stated above, further consideration has been given to potential air pollution impacts at Oxford Meadows SAC. The site's qualifying features are not considered to be particularly sensitive to airborne nitrogen and the contribution of the Local Plan to increases in traffic is expected to be negligible.

¹¹⁰ Now referred to as 'Land North of Bayswater Brook'

Date of comment and document consulted on	Comment	HRA response
	<p><i>calcareous grassland flora (See APIS – Air Pollution Information Service)</i></p> <p><i>Page 50 Oxford Meadows SAC</i> <i>Again as a voluntary species recorder on these meadows for Natural England and Oxford City Council, I am very surprised to see that the site description is wrong. They are NOT 'unimproved chalk grassland...uncommon in the Berkshire Downs' ! The Qualifying Features are right, some of the meadows are certainly H6510 Lowland Haymeadows – and specifically they are the rare floodplain community known as MG4 Meadow Foxtail – Great Burnet in the NVC. However the Port Meadow section is not haymeadow and is best described as grazing marsh. This is the only portion where the rare Creeping Marshwort <i>Apium repens</i> is to be found as it requires both winter flooding and moderately heavy grazing. I am voluntary 'Flora Guardian' for Creeping Marshwort <i>Apium repens</i> within the Ashmolean Natural History Society of Oxon (ANHSO) in association with Natural England and Oxford City Council.</i></p> <p><i>The Site Improvement plan, pressures, threats and related development section also has an important omission. The MG4 Lowland Haymeadows are sensitive to the impacts of air pollution and risks of atmospheric nitrogen deposition and the HRA should say this. The air pollution from the A40 and the A34 already negatively impacts Oxey Mead and Pixey Mead within the SAC. Indeed the N deposition on Pixey Mead is already over the critical load limits for this habitat (See APIS) for some 60m of the meadow to either side of the A34 road. This is important when assessing the predicted traffic increase on this road as a result of some of the planned future development. [Widening the A34 should not be an option, no land-take from these meadows should occur because their loss will be irreplaceable, plus a wider road will mean more traffic and even more air pollution impact.]</i></p> <p><i>If the HRA does not contain accurate information, how can the impacts of proposed developments in the plan be properly assessed in the future?</i></p>	
<p>17 May 2017</p> <p>HRA of the Second Preferred Options Local Plan 2031</p>	<p>Member of the public:</p> <p><i>The objection and comment I wish to make is to the statement "that only 'A' roads are likely to have a significant increase in traffic" If the very large development at Chalgrove, Berinsfield, Benson and Watlington go ahead the 'B' roads will have very significant increases in traffic and 'Edge' streets and bypasses will only increase this further. Air pollution is already a problem in Watlington and Henley on Thames and further pollution will have a detrimental effect on the local SACs. I understand there are regulations against building more than 50 houses within 5 - 7 km of a European Site (SAC) and proposed development at Chinnor and Berinsfield will undoubtedly do this.</i></p>	<p>The HRA refers to 'significance' in terms of traffic increase with reference to DMRB guidance, ie increases of 1,000 AADT or more, rather than in terms of percentage increase in traffic.</p> <p>B roads that the named site allocations are located on are as follows: B4015 (Berinsfield), B480 (Chalgrove and Watlington), and B4009 (Benson). None of these B-roads passes a European site (SAC/SPA) before connecting to the A-road network. The B-roads therefore do not need to be considered in the HRA.</p> <p>Where an increase in traffic of 1,000 AADT or more indicates that an air quality assessment is required, an HRA would take into account the baseline and predicted future air quality at the European site, rather than at the source of additional traffic (e.g. Watlington).</p> <p>There are no regulations against building more than 50 houses</p>

Date of comment and document consulted on	Comment	HRA response
		within 5-7km of an SAC.
17 May 2017 HRA of the Second Preferred Options Local Plan 2031	<p>Chalgrove Airfield Action Group:</p> <p><i>A Habitats Regulation Assessment March 2017 has been undertaken of the Local Plan, as discussed in STRAT1 above, air pollution impacts have been assessed as uncertain in relation to potential increases in traffic. Further information will be required from SODC's transport study to determine whether the Local Plan proposals will result in a degree of change in those locations that could have a significant effect.</i></p> <p><i>In STRAT1, the HRA states: At this stage, with the information available, air pollution impacts have been assessed as uncertain in relation to potential increases in traffic on the following roads within 200 metres of sensitive European sites:</i></p> <p><i>M40: Aston Rowant SAC; A355: Burnham Beeches SAC; A404 & A4010: Chilterns Beechwoods SAC; and A332 & A329: Windsor Forest & Great Park SAC.</i></p> <p><i>None of these are relevant to Chalgrove or the B480. Instead of referring to the March HRA, carry out specific HRA reviews in the area that will be affected. And please, not in March, when many species are still hibernating.</i></p>	<p>The version of the HRA Report issued for consultation was written in March; this does not mean that habitat/species surveys were undertaken in March (or at all). The HRA is based on existing data and there is no requirement to survey sites to complete the work.</p> <p>The HRA report covers the entire local plan area and is therefore relevant to Chalgrove.</p>
November 2017 Local Plan 2011-2033 - Final publication version	<p>Natural England:</p> <p>The HRA reports that it has not been possible to conclude the Appropriate Assessment of air pollution impacts arising from the Local Plan in combination with other plans or projects. NE have met with SODC and the other Oxfordshire Districts to consider the approach to in-combination assessment of air quality impacts on SACs within 200m of roads. NE's advice to SODC has been that air quality modelling needs to be undertaken at Aston Rowant SAC in order to inform the Appropriate Assessment, and specifically to understand whether the in-combination effect of development on air quality would have an adverse effect on the integrity of the SAC, and any mitigation measures that may be required as a result. This is needed in order to ensure the Plan is compliant with the requirements of the Conservation of Habitats and Species Regulations 2017.</p>	<p>An air quality model for the M40 at Aston Rowant SAC has been carried out, as requested by NE. The results of this model are provided as Appendix 5 to the HRA, and are considered in the Appropriate Assessment at Section 5.</p>
November 2017 Local Plan 2011-2033 - Final publication version	<p>Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust:</p> <p>STRAT9: Land at Chalgrove Airfield</p> <p>This allocation is located some distance from any designated site and as such we are not concerned about direct impacts on designated sites. We are however concerned about potential indirect impacts further afield such as Aston Rowant SAC and the Chilterns caused by increased air pollution and recreational pressure</p>	<p>The air quality and recreational pressure effects of Policy STRAT9 upon Aston Rowant SAC have been assessed as part of the HRA.</p> <p>With regards to recreational pressure, the likely significant effects upon Aston Rowant SAC were screened out on the basis of distance and conversations with Natural England officers about the management and condition of the site who felt that recreation was</p>

Date of comment and document consulted on	Comment	HRA response
	<p>(see comments on HRA below). We consider the adequate provision of sustainable transport alternatives and sufficient amount of Green Infrastructure and open space essential in mitigating any such effects.</p> <p>In the absence of any baseline ecological information the nature conservation interest of the site cannot be fully assessed. In our experience former military sites often develop considerable nature conservation interest due to the lack of disturbance and this should be assessed at the earliest opportunity. Nature conservation interest could potentially comprise botanical interests (edges of the site), invertebrates, amphibians, reptiles and birds.</p>	<p>not a risk to the favourable conservation status of the qualifying features.</p> <p>With regards to air quality, an air quality model was carried out to fully assess the potential effects of increasing traffic on the M40 as a result of the plan (Appendix 5). This issue was subject to an Appropriate Assessment which concluded that the air quality effects of the plan would not have an adverse effect on the integrity of the site; Natural England concurs with the conclusion of the Appropriate Assessment.</p>
<p>November 2017 Local Plan 2011-2033 - Final publication version</p>	<p>Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust:</p> <p>The Habitats Regulation Assessment (HRA) considers potential impacts of the South Oxfordshire Local Plan on Special Areas for Conservation (SAC) including Aston Rowant SAC, Chilterns Beechwoods SAC, Cothill Fen SAC; Hartslock Wood SAC, Little Wittenham SAC and Oxford Meadows SAC.</p> <p>During the previous consultation BBOWT raised concerns about the HRA's conclusion that the Local Plan would not cause significant recreational impacts on Aston Rowant SAC and Cothill Fen SAC. We note and welcome that LUC have revisited this issue and have also sought Natural England's (NE) view on this. This has confirmed LUC's initial assessment and we accept the arguments being put forward.</p> <p>However, it is our experience as managers of several designated sites in the three counties that recreational pressures from developments are difficult to quantify and are often underestimated. Considering the amount of development coming forward not only in South Oxfordshire but also in the neighbouring districts some of our concerns about recreational impacts on designated sites (including Aston Rowant SAC and Cothill Fen SAC) still remain.</p> <p>Having said this, we are guided by NE's judgement on this (recreational impacts) as well as on effects on hydrology, air quality and in combination effects for these European sites.</p> <p>However, we would ask that appropriate monitoring is carried out for all the above mentioned SACs with regard to recreational pressure and air quality pressure to help build an evidence base that can be used when assessing the potential impacts of developments in the future.</p>	<p>BBOWT's experience as site managers for Aston Rowant SAC and Cothill Fen SAC is welcomed and valued, and indeed this issue has been further investigated in consultation with Natural England officers as a result of the concerns raised during the previous consultation. While it is acknowledge that recreational pressure at these sites may be generally increasing, the qualifying of the SACs are not considered to be particularly sensitive to recreation and are not at risk.</p> <p>While the recommendation for monitoring at the site is noted, this is not required to support the conclusions of the HRA. Monitoring of effects at the SACs would provide a useful future evidence base, however the burden of doing so need not fall solely upon the Council.</p>
<p>November 2017 Local Plan 2011-2033 - Final publication version</p>	<p>N/A:</p> <p>STRAT7 is in my opinion unsound for the following reasons:</p> <p>Unsound consideration given to the natural environment.</p> <p>The Habitats Regulations assessment makes reference to European sites, but not</p>	<p>Regulation 102 of the Habitats Regulations require the LPA to carry out an Appropriate Assessment of likely significant effects upon 'European sites', as defined by Regulation 8. That definition does not include SSSIs (other than those which are also designated as SAC/SPA). It would therefore be inappropriate and legally flawed for the HRA to include an assessment of likely significant effects upon all</p>

Date of comment and document consulted on	Comment	HRA response
	<p>local SSSIs. The STRAT7 site is close to the Culham Brake SSSI, which is listed as such for having the rare summer snowflake plant. There needs to be a complete and thorough study of the impact that such a huge development would have on the Culham Brake SSSI. As such the Habitats Regulations Assessment is unsound, particularly as Natural England states that the following are offences.</p> <p>"Carrying out or authorising operations likely to damage an SSSI without meeting the requirements to notify us.</p> <p>Failing to minimise any damage to an SSSI and if there is any damage, failing to restore it to its former state so far as is reasonably practical and possible."</p> <p>To my knowledge SODC have not carried out any assessments relating to how much the enormous STRAT7 would be affected by either due to the increase in population near the site, or changes in drainage (to which the summer snowflake is particularly susceptible – information taken from Natural England Website). Failure to have specifically done so do this would also make the plan illegal.</p>	<p>SSSIs.</p> <p>SSSIs are afforded strong policy and legislative protection in the planning system through NPPF118, Circular 06/2005 and Section 28 of the Wildlife and Countryside Act. It would therefore be most appropriate for any potential effects upon Culham Brake SSSI to be considered within that policy / legislative framework.</p>
<p>November 2017 Local Plan 2011-2033 - Final publication version</p>	<p>N/A:</p> <p>There is no assessment of the combined impact on air pollution of developments close to the B4009 from Lewknor to Benson. There is no traffic data for the B4009 and no mention of obtaining any.</p> <p>It is likely that increased traffic and associated air pollution will negatively affect Aston Rowant SAC and Chiltern Beechwoods SAC. The effects of nitrogen deposits from vehicle exhausts damage plants and degrade soil and water quality.</p> <p>Some towns and villages along this route are in designated Air Quality Management areas. Poor air quality is the largest environmental risk to public health in the UK (Health Improvement Board 2016/17).</p>	<p>It is accepted best practice to only consider the effects of increasing traffic and on A roads and motorways on air quality receptors, therefore the effects of increased traffic on the B4009 was not included in the traffic model.</p> <p>The effects of increased traffic on Chiltern Beechwoods were screened out in the basis of distance, while the effects on Aston Rowant SAC were subject to a deposition model and considered as part of an Appropriate Assessment.</p>
<p>November 2017 Local Plan 2011-2033 - Final publication version</p>	<p>University of Reading:</p> <p>Policy ENV2 (Biodiversity - Designated Sites, Priority Habitats and Species)</p> <p>Our first comment on Policy ENV2 is that it limits its definition of 'sites of international nature conservation importance' to Special Areas of Conservation (SACs). Whilst it is acknowledged that this may be because no other internationally important nature conservation sites are located within the District boundary, the Council in our view should not entirely preclude the possibility that large-scale development within the District could exert effects over a 'Zone of Influence' (ZoI) that encompasses other types of internationally important sites elsewhere. This can only be established once the full details of proposed development have been subject to assessment under the Habitats Regulations.</p> <p>We suggest therefore that the list of sites included within brackets in paragraph 1 of Policy ENV2 is extended to include Special Protection Areas (SPAs) and Ramsar</p>	<p>This amendment is not considered necessary for the purposes of this HRA, as no likely significant effects were identified on any SPA or Ramsar sites.</p> <p>It is therefore at the Council's discretion whether to incorporate the suggested amendment for reasons of clarity.</p>

Date of comment and document consulted on	Comment	HRA response
	<p>Sites (the latter of which are provided the same protection as SPAs and SACs as a matter of National Planning Policy under Section 11 of the NPPF).</p> <p>The Conservation of Habitats and Species Regulations 2010, referred to in paragraph 1 of Policy ENV2, have been subject to amendments (in 2012). We suggest that, for clarity, the words '(as amended)' are added.</p>	

Appendix 5

Air Quality Modelling



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South Oxfordshire Local Plan 2034: Final Publication Version 2

Air Quality Assessment of Aston Rowant SAC to Inform Habitats Regulations Assessment

Prepared by LUC in association Air Quality Assessments Ltd
December 2018

Project Title: HRA of South Oxfordshire Local Plan 2034: Final Publication Version 2

Client: South Oxfordshire District Council

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1.1	04/12/2018	First Issue	Bob Thomas and David Green	David Green	Jeremy Owen
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1 Introduction

Background

- 1.1 LUC and Air Quality Assessments Ltd (AQA) have been commissioned by South Oxfordshire District Council (SODC) to assess the air quality effects of the South Oxfordshire Local Plan 2034 Final Publication Version 2nd (referred to as the “Local Plan” from now on) on the Aston Rowant Special Area of Conservation (SAC). The Local Plan will lead to an increase in road traffic on the M40, which runs through the Aston Rowant SAC within South Oxfordshire (see **Figure 1**). The increase in emissions due to the additional traffic may have an adverse effect on the sensitive habitats within the SAC.

Scope of Assessment

- 1.2 This report describes the existing air quality conditions at the Aston Rowant SAC in proximity to the M40, and assesses the likely impact that traffic generated by the Emerging Local Plan will have on air quality. The main air pollutants of concern related to road traffic are nitrogen oxides (NO_x), nutrient nitrogen deposition and acid nitrogen deposition.
- 1.3 The assessment has been prepared taking into account all relevant local and national guidance and regulations.
- 1.4 The references and a glossary of common air quality terminology used in this assessment are shown in **Section 9** and **Section 10** respectively.

2 Air Quality Legislation and Policy

European Legislation

EU Ambient Air Quality Directive

- 2.1 The European Union's Directive on ambient air quality and cleaner air for Europe (European Parliament, Council of the European Union, 2008) sets out legally binding critical levels for the protection of vegetation. The critical level for NO_x is an annual mean concentration of 30 µg/m³ not to be exceeded after 19th July 2001. The Air Quality Standards Regulations 2010 (The Stationary Office, 2010a) implement the EU Directive critical levels in English legislation. Achievement of the critical levels is a national obligation rather than a local one. The critical levels only apply at sites more than 20 km from agglomerations, or more than 5 km away from other built up areas, industrial installations or motorways or major roads with traffic counts of more than 50,000 vehicles a day.

EU Habitats Directive

- 2.2 European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires member states to introduce a range of measures for the protection habitats and species. The Conservation of Habitats and Species Regulations 2017 transposes the Directive into law in England and Wales. The Regulations require the Secretary of State to provide the European Commission with a list of sites which are important for the habitats or species listed in the Directive. The Commission then designates worthy sites as Special Areas of Conservation (SACs). The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs); with these classified under the Council Directive 79/409/EEC on the Conservation of Wild Birds (Directive 2009/147/EC of the European Parliament and of the Council, 2009). These sites form a network termed "Natura 2000".
- 2.3 The Regulations primarily provide measures for the protection of European Sites and European Protected Species, but also require local planning authorities to encourage the management of other features that are of major importance for wild flora and fauna.
- 2.4 In addition to SACs and SPAs, some internationally important UK sites are designated under the Ramsar Convention. Originally intended to protect waterfowl habitat, the Convention has broadened its scope to cover all aspects of wetland conservation.
- 2.5 The Habitats Directive (as implemented by the Regulations) requires the competent authority, which in this case will be the planning authority, to firstly evaluate whether plans are likely to give rise to a significant effect on European sites. Where this is the case, it has to carry out an 'appropriate assessment' in order to determine whether the plans will adversely affect the integrity of the site.

National Legislation

The Air Quality Strategy

- 2.6 Part IV of The Environment Act 1995 required the UK Government to prepare an Air Quality Strategy. The Air Quality Strategy (Defra, 2007), provides an overview and outline of ambient air quality policy in the UK and the devolved administrations. The strategy sets out air quality standards and objectives intended to protect human health and the environment.
- 2.7 Standards are the concentrations of pollutants in the atmosphere, below which there is a minimum risk of health effects or ecosystem damage; they are set with regard to scientific and medical evidence. Objectives are the policy targets set by the Government, taking account of

economic efficiency, practicability, technical feasibility and timescale, where the standards are expected to be achieved by a certain date.

- 2.8 The national objective for NO_x is an annual mean of 30 µg/m³, and is the same as the EU critical level; however, the compliance date by which the objective must be achieved, and maintained thereafter, is 31st December 2000.
- 2.9 The national objective only strictly applies away from urban areas and heavily trafficked roads (see **Paragraph 2.1**); however, Natural England has adopted a precautionary approach, and applies the objective across all European sites.

Planning Policy

National Policies

- 2.10 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied (Ministry of Housing, Communities & Local Government, 2018). It provides a framework within which locally-prepared plans for development can be produced. It states that the purpose of the planning system is to contribute to the achievement of sustainable development and includes an overarching environmental objective:

"to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

- 2.11 The NPPF states that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

- 2.12 With specific reference to air quality, the NPPF states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

- 2.13 The NPPF is supported by Planning Practice Guidance (PPG) (DCLG, 2014). The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit".

- 2.14 The PPG goes on to state that:

"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)."

- 2.15 The PPG makes clear that:

"Air quality can also affect biodiversity and may therefore impact on our international obligation under the Habitats Directive".

3 Methodology

Existing Conditions

- 3.1 Information on existing air quality within the study area has been collated from the following sources:
- Background pollutant concentration maps published by Defra (Defra, 2018b). These cover the whole country on a 1 x 1 km grid; and
 - Background nitrogen deposition fluxes published by the Air Pollution Information System (APIS, 2018).

Road Traffic Impacts

Sensitive Locations

- 3.2 Concentrations have been modelled along five transects on either side of the M40. The transect locations are shown in **Figure 1**. Concentrations have been predicted every 1 m along the transects, from the SAC boundary closest to the road, up to 50 m from the boundary. The grid references for the transect receptor points are shown in **Appendix A1**.

Assessment Scenarios

- 3.3 Concentrations of NO_x have been predicted for the following scenarios:
- Model verification year (2016);
 - 2031 do-minimum (includes committed development and policy commitments from surrounding local authorities);
 - 2031 Scenario 5A (includes Local Plan sites, transport schemes in the Didcot area and bypasses at Stadhampton and Chisilhampton); and
 - 2031 Scenario 5B (includes Scenario 5A plus the A40 bypass near Oxford, improvements to the A4074 Golden Balls junction and access to the Culham site on the A415).
- 3.4 In addition to predictions using emissions data published by Defra, a sensitivity analysis has been undertaken that assumes higher NO_x emissions from diesel vehicles. The sensitivity analysis provides a worst case assessment of future impacts (see section on uncertainty below).

Modelling Methodology

- 3.5 Concentrations have been predicted using the ADMS Roads (v4.1.1.0) dispersion model. The model requires the input of a range of data, details of which are provided in **Appendix A1**, along with details of the model verification calculations.

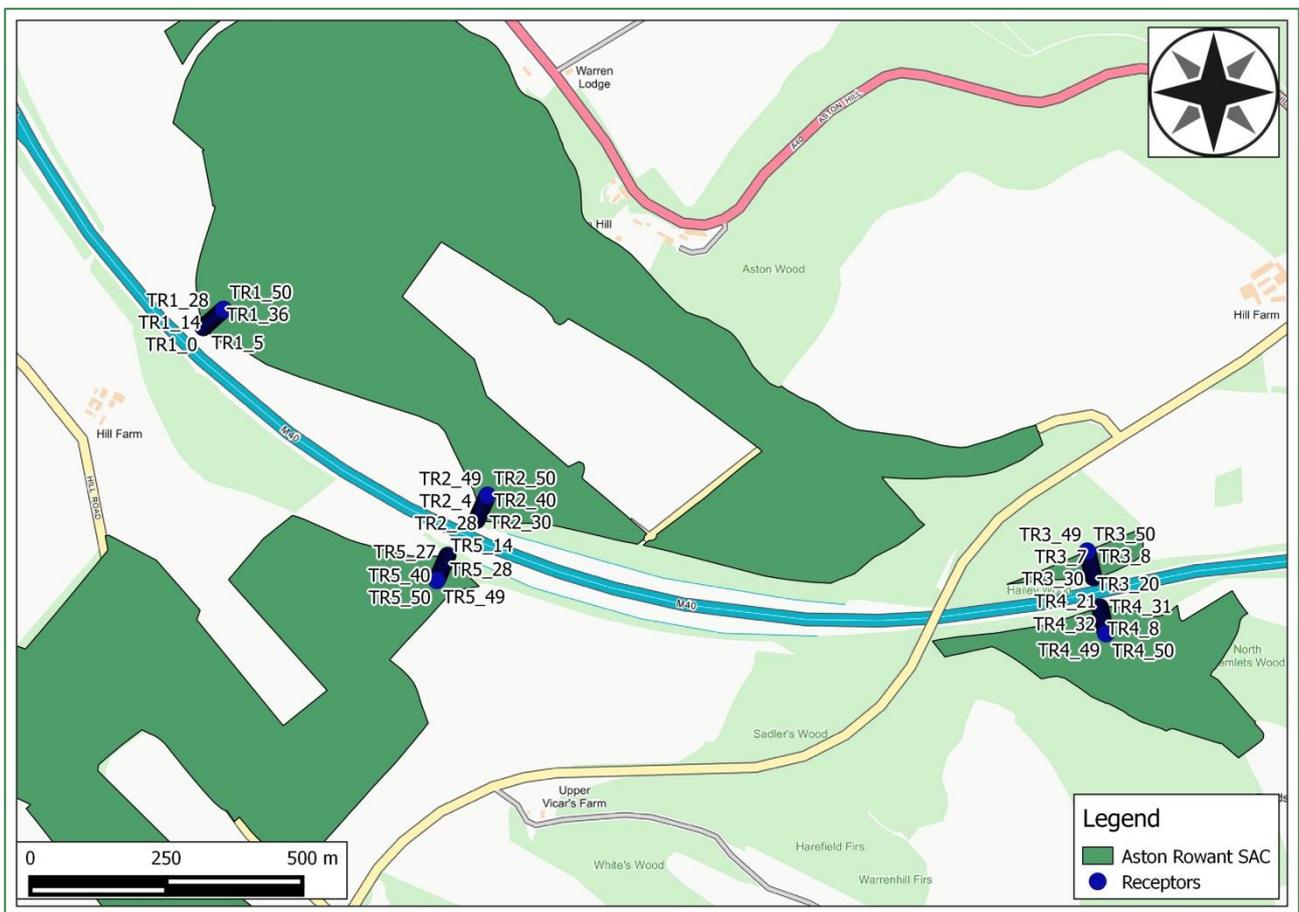


Figure 1: Aston Rowant SAC and Location of Receptors on the Transects

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Uncertainty

- 3.6 There are many factors that contribute to uncertainty when predicting pollutant concentrations. The emission factors utilised in the air quality model are dependent on traffic data, which have inherent uncertainties associated with them. There are also uncertainties associated with the model itself, which simplifies real world conditions into a series of algorithms. The model verification process, as described in **Appendix A1**, minimises the uncertainties; however, future year predictions use projected traffic data, emissions data, and background concentrations. The most recent emission factors and background data have been used in this assessment; however, there are still uncertainties associated with this data.
- 3.7 Past analysis has shown a disparity between historical monitoring data and the projected background concentrations published by Defra (Carslaw, et al., 2011). Overall, there has been little evidence of the consistent downward trend in NO₂ and NO_x concentrations suggested by previous emission inventory estimates.
- 3.8 This disparity is believed to have arisen due to the actual on-road performance of diesel vehicles when compared with emissions calculations based on the Euro standards and published in the Emissions Factor Toolkit (EFT) used for modelling.
- 3.9 Air Quality Consultants Ltd (AQC) have produced the Calculator Using Realistic Emissions for Diesels (CURED) tool that applies adjustments to diesel emission factors from the EFT for use by consultants when undertaking sensitivity analysis of future air quality impacts (AQC, 2018a). The report describing the development of CURED V3A explains that emissions from the most recent EFT v8.0.1 reflect the adjusted emissions used in earlier versions of CURED and that the EFT emissions for the current vehicle fleet are now appropriate (AQC, 2018b). However, as there is no published real-world emissions test results for Euro 6c and Euro 6d vehicles, CURED V3A takes a conservative approach with regard to emissions from future Euro 6d diesel vehicles and

assumes no benefit over those of Euro 6c. Therefore, a sensitivity analysis with regard to emissions has been undertaken for the assessment year of 2031.

- 3.10 The road traffic components of NO_x and NO₂ in the Defra background maps have also been adjusted to produce background concentrations for the sensitivity test following the methodology recommended by AQC (AQC, 2018c).

Assessment Criteria and Significance

Assessment Criteria

- 3.11 Critical loads for nitrogen deposition onto sensitive ecosystems have been specified by the United Nations Economic Commission for Europe (UNECE). They are defined as a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge. The critical load relates to the quantity of pollutant deposited from air to ground, whereas the critical level is the gaseous concentration of a pollutant in the air. It must be emphasised that exceedence of the critical load does not provide a quantitative estimate of damage to an ecosystem, but only the *potential* for damage to occur. The critical loads for the ecosystems under consideration in this assessment, as defined in the Air Pollution Information System (APIS, 2018), are provided in **Table 1**.
- 3.12 The critical loads from the habitats most sensitive to nutrient or acid nitrogen deposition have been used, along with the NO_x objective for the protection of vegetation and ecosystems, to determine the assessment criteria, as shown in **Table 2**.

Table 1: Critical Loads

Site	Feature of Interest	Critical Load			
		Nutrient N (kg/ha/yr)		Acid N (keq/ha/yr)	
		min	max	min	max
Aston Rowant SAC	Juniperus communis formations on heaths or calcareous grasslands (H5130)	10	25	1.369	5.120
	Asperulo-Fagetum beech forests (H9130)	10	20	1.953	11.920

Table 2: Assessment Criteria

Site	Annual Mean NO _x (µg/m ³)	Nutrient N (kg/ha/yr)	Acid N (keq/ha/yr)
Aston Rowant SAC	30	10	1.369

- 3.13 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. Online guidance published by Defra and the Environment Agency (EA) has been used in the first instance to screen out impacts that will have an insignificant effect (Defra & EA, 2016). The guidance explains that regardless of the baseline environmental conditions, a process can be considered as insignificant if:
- The long-term (annual mean) process contribution is less than 1% of the long-term environmental standard.
- 3.14 It should be recognised that this criterion determines when an impact can be screened out as not significant. It does not imply that there will be damage to a habitat above this threshold, or that impacts will necessarily be significant above this criterion, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology, such as a detailed dispersion modelling study (as has been carried out for this assessment in any event) in association with a qualified ecologist to consider the likelihood of an adverse effect on the integrity of the habitat. A position statement published by the Institute of Air Quality

Management (IAQM)¹ suggest that only impacts clearly above 1% should be treated as potentially significant, rather than impacts that are about 1%, or slightly higher (IAQM, 2016).

- 3.15 For the purposes of this assessment, where concentrations and/or deposition rates are predicted to increase by 1% or less of the assessment criteria, the potential for significant impacts can be discounted, and no further assessment is necessary. If the initial screening shows the potential for significant impacts, i.e. concentrations and/or deposition rates are predicted to increase by more than 1% of the assessment criteria, the total concentrations and deposition rates (road contribution + background) will be compared with the critical level/loads. The overall effect of the air quality impacts should be judged as either significant or not significant following evaluation by a qualified ecologist with full consideration of the habitat's circumstances.

¹ The IAQM is the professional body for air quality practitioners.

4 Baseline Conditions

Background Concentrations and Fluxes

National Background Pollution Maps

- 4.1 Estimated background concentrations in the study area, derived from the national maps published by Defra, are shown in **Table 3**. The background concentrations are well below the critical level.

Table 3: Estimated Annual Mean Background Concentrations in 2016 and 2031 ($\mu\text{g}/\text{m}^3$)^a

Year	NO _x	NO ₂
2016	17.1-20.3	12.7-14.9
2030	8.7-9.9	6.7-7.6
2030 – CURED	10.9-12.8	8.3-9.7
Critical Level	30	-

A The range of concentrations from across the study area are shown. Predicted background concentrations from the background maps are only available up to 2030; therefore, 2031 concentrations have been assumed to be the same as in 2030.

Nutrient Nitrogen and Acid Nitrogen Deposition

- 4.2 Background nitrogen deposition fluxes have been calculated using data from the APIS website, and are shown in **Table 4**. 2015 and 2022 background deposition fluxes have been estimated from the 2013-15 average data provided by APIS using the methodology in DMRB, Volume 11, Section 3, Part 1 HA207/07 (Highways Agency, 2007). Background deposition fluxes are above the critical loads in 2016 and 2031.

Table 4: Estimated Annual Mean Background Nitrogen Deposition in 2016 and 2031 ($\mu\text{g}/\text{m}^3$)

Year	Nutrient Nitrogen (kg/ha/yr)	Acid Nitrogen (keq/ha/yr)
2016	29.30	2.093
2031	20.14	1.439
Critical Load	10	1.369

Predicted Baseline Concentrations

- 4.3 Baseline concentrations and deposition fluxes at receptors located along the five transects up to 30m into the SAC are set out in **Table 5**.

Table 5: Predicted Baseline Concentrations and Deposition Fluxes in 2016 and 2031^a

Receptor	NO _x ($\mu\text{g}/\text{m}^3$)			Nutrient Nitrogen (kg/ha/yr)			Acid Nitrogen (keq/ha/yr)		
	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED
TR1_0	54.3	21.7	31.9	29.4	20.2	20.2	2.097	1.440	1.441
TR1_1	53.4	21.4	31.5	29.4	20.2	20.2	2.097	1.440	1.441
TR1_2	52.6	21.1	31.0	29.4	20.2	20.2	2.097	1.440	1.441
TR1_3	51.9	20.8	30.6	29.4	20.2	20.2	2.097	1.440	1.441
TR1_4	51.2	20.6	30.2	29.4	20.2	20.2	2.096	1.440	1.441

Receptor	NOx ($\mu\text{g}/\text{m}^3$)			Nutrient Nitrogen (kg/ha/yr)			Acid Nitrogen (keq/ha/yr)		
	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED
TR1_5	50.4	20.3	29.8	29.4	20.2	20.2	2.096	1.440	1.441
TR1_6	49.8	20.1	29.4	29.3	20.2	20.2	2.096	1.440	1.441
TR1_7	49.1	19.9	29.0	29.3	20.2	20.2	2.096	1.440	1.441
TR1_8	48.5	19.7	28.7	29.3	20.2	20.2	2.096	1.440	1.441
TR1_9	47.9	19.5	28.3	29.3	20.2	20.2	2.096	1.440	1.441
TR1_10	47.3	19.3	28.0	29.3	20.2	20.2	2.096	1.440	1.441
TR1_11	46.8	19.1	27.7	29.3	20.2	20.2	2.096	1.440	1.441
TR1_12	46.2	18.9	27.4	29.3	20.2	20.2	2.096	1.440	1.441
TR1_13	45.7	18.7	27.1	29.3	20.2	20.2	2.096	1.440	1.441
TR1_14	45.2	18.5	26.8	29.3	20.2	20.2	2.096	1.440	1.441
TR1_15	44.7	18.4	26.5	29.3	20.2	20.2	2.096	1.440	1.441
TR1_16	44.3	18.2	26.3	29.3	20.2	20.2	2.096	1.440	1.441
TR1_17	43.8	18.0	26.0	29.3	20.2	20.2	2.096	1.440	1.440
TR1_18	43.4	17.9	25.8	29.3	20.2	20.2	2.096	1.440	1.440
TR1_19	43.0	17.7	25.5	29.3	20.2	20.2	2.096	1.440	1.440
TR1_20	42.5	17.6	25.3	29.3	20.2	20.2	2.096	1.440	1.440
TR1_21	42.1	17.5	25.1	29.3	20.2	20.2	2.096	1.440	1.440
TR1_22	41.8	17.3	24.9	29.3	20.2	20.2	2.096	1.440	1.440
TR1_23	41.4	17.2	24.7	29.3	20.2	20.2	2.095	1.440	1.440
TR1_24	41.0	17.1	24.4	29.3	20.2	20.2	2.095	1.440	1.440
TR1_25	40.7	16.9	24.2	29.3	20.2	20.2	2.095	1.440	1.440
TR1_26	40.3	16.8	24.0	29.3	20.2	20.2	2.095	1.440	1.440
TR1_27	40.0	16.7	23.9	29.3	20.2	20.2	2.095	1.440	1.440
TR1_28	39.7	16.6	23.7	29.3	20.2	20.2	2.095	1.440	1.440
TR1_29	39.4	16.5	23.5	29.3	20.2	20.2	2.095	1.440	1.440
TR1_30	39.0	16.4	23.3	29.3	20.2	20.2	2.095	1.440	1.440
TR2_0	64.4	25.2	37.7	29.4	20.2	20.2	2.098	1.441	1.442
TR2_1	63.1	24.8	36.9	29.4	20.2	20.2	2.098	1.441	1.442
TR2_2	61.9	24.3	36.2	29.4	20.2	20.2	2.098	1.441	1.442
TR2_3	60.7	23.9	35.6	29.4	20.2	20.2	2.097	1.441	1.442
TR2_4	59.6	23.5	34.9	29.4	20.2	20.2	2.097	1.440	1.441
TR2_5	58.5	23.2	34.3	29.4	20.2	20.2	2.097	1.440	1.441
TR2_6	57.5	22.8	33.8	29.4	20.2	20.2	2.097	1.440	1.441
TR2_7	56.6	22.5	33.2	29.4	20.2	20.2	2.097	1.440	1.441
TR2_8	55.7	22.2	32.7	29.4	20.2	20.2	2.097	1.440	1.441
TR2_9	54.8	21.9	32.2	29.4	20.2	20.2	2.097	1.440	1.441
TR2_10	54.0	21.6	31.8	29.4	20.2	20.2	2.097	1.440	1.441
TR2_11	53.2	21.3	31.3	29.4	20.2	20.2	2.097	1.440	1.441
TR2_12	52.4	21.0	30.9	29.4	20.2	20.2	2.097	1.440	1.441
TR2_13	51.7	20.8	30.5	29.4	20.2	20.2	2.097	1.440	1.441
TR2_14	51.0	20.5	30.1	29.4	20.2	20.2	2.096	1.440	1.441
TR2_15	50.4	20.3	29.7	29.3	20.2	20.2	2.096	1.440	1.441
TR2_16	49.7	20.1	29.4	29.3	20.2	20.2	2.096	1.440	1.441
TR2_17	49.1	19.9	29.0	29.3	20.2	20.2	2.096	1.440	1.441
TR2_18	48.5	19.7	28.7	29.3	20.2	20.2	2.096	1.440	1.441
TR2_19	47.9	19.5	28.4	29.3	20.2	20.2	2.096	1.440	1.441
TR2_20	47.4	19.3	28.0	29.3	20.2	20.2	2.096	1.440	1.441
TR2_21	46.9	19.1	27.7	29.3	20.2	20.2	2.096	1.440	1.441
TR2_22	46.4	18.9	27.5	29.3	20.2	20.2	2.096	1.440	1.441
TR2_23	45.9	18.7	27.2	29.3	20.2	20.2	2.096	1.440	1.441
TR2_24	45.4	18.6	26.9	29.3	20.2	20.2	2.096	1.440	1.441
TR2_25	44.9	18.4	26.6	29.3	20.2	20.2	2.096	1.440	1.441
TR2_26	44.5	18.3	26.4	29.3	20.2	20.2	2.096	1.440	1.441
TR2_27	44.1	18.1	26.2	29.3	20.2	20.2	2.096	1.440	1.441
TR2_28	43.7	18.0	25.9	29.3	20.2	20.2	2.096	1.440	1.440
TR2_29	43.2	17.8	25.7	29.3	20.2	20.2	2.096	1.440	1.440
TR2_30	42.9	17.7	25.5	29.3	20.2	20.2	2.096	1.440	1.440
TR3_0	77.5	29.9	45.2	29.4	20.2	20.2	2.099	1.441	1.442
TR3_1	75.3	29.1	43.9	29.4	20.2	20.2	2.098	1.441	1.442
TR3_2	73.3	28.5	42.8	29.4	20.2	20.2	2.098	1.441	1.442
TR3_3	71.5	27.8	41.8	29.4	20.2	20.2	2.098	1.441	1.442
TR3_4	69.8	27.2	40.8	29.4	20.2	20.2	2.098	1.441	1.442
TR3_5	68.2	26.7	39.9	29.4	20.2	20.2	2.098	1.441	1.442

Receptor	NOx ($\mu\text{g}/\text{m}^3$)			Nutrient Nitrogen (kg/ha/yr)			Acid Nitrogen (keq/ha/yr)		
	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED
TR3_6	66.7	26.1	39.1	29.4	20.2	20.2	2.098	1.441	1.442
TR3_7	65.3	25.7	38.3	29.4	20.2	20.2	2.098	1.441	1.442
TR3_8	64.0	25.2	37.6	29.4	20.2	20.2	2.097	1.441	1.442
TR3_9	62.8	24.8	36.9	29.4	20.2	20.2	2.097	1.440	1.441
TR3_10	61.6	24.4	36.2	29.4	20.2	20.2	2.097	1.440	1.441
TR3_11	60.5	24.0	35.6	29.4	20.2	20.2	2.097	1.440	1.441
TR3_12	59.5	23.6	35.0	29.4	20.2	20.2	2.097	1.440	1.441
TR3_13	58.5	23.3	34.4	29.4	20.2	20.2	2.097	1.440	1.441
TR3_14	57.6	23.0	33.9	29.4	20.2	20.2	2.097	1.440	1.441
TR3_15	56.7	22.7	33.4	29.4	20.2	20.2	2.097	1.440	1.441
TR3_16	55.8	22.4	32.9	29.4	20.2	20.2	2.097	1.440	1.441
TR3_17	55.0	22.1	32.5	29.4	20.2	20.2	2.097	1.440	1.441
TR3_18	54.3	21.8	32.1	29.4	20.2	20.2	2.096	1.440	1.441
TR3_19	53.5	21.6	31.6	29.3	20.2	20.2	2.096	1.440	1.441
TR3_20	52.8	21.3	31.3	29.3	20.2	20.2	2.096	1.440	1.441
TR3_21	52.2	21.1	30.9	29.3	20.2	20.2	2.096	1.440	1.441
TR3_22	51.5	20.9	30.5	29.3	20.2	20.2	2.096	1.440	1.441
TR3_23	50.9	20.6	30.2	29.3	20.2	20.2	2.096	1.440	1.441
TR3_24	50.3	20.4	29.8	29.3	20.2	20.2	2.096	1.440	1.441
TR3_25	49.8	20.2	29.5	29.3	20.2	20.2	2.096	1.440	1.441
TR3_26	49.2	20.0	29.2	29.3	20.2	20.2	2.096	1.440	1.441
TR3_27	48.7	19.9	28.9	29.3	20.2	20.2	2.096	1.440	1.441
TR3_28	48.2	19.7	28.6	29.3	20.2	20.2	2.096	1.440	1.441
TR3_29	47.7	19.5	28.3	29.3	20.2	20.2	2.096	1.440	1.441
TR3_30	47.2	19.3	28.1	29.3	20.2	20.2	2.096	1.440	1.441
TR4_0	74.2	29.2	44.0	29.4	20.2	20.2	2.098	1.441	1.442
TR4_1	72.1	28.5	42.8	29.4	20.2	20.2	2.098	1.441	1.442
TR4_2	70.1	27.7	41.6	29.4	20.2	20.2	2.098	1.441	1.442
TR4_3	68.3	27.1	40.6	29.4	20.2	20.2	2.098	1.441	1.442
TR4_4	66.7	26.5	39.6	29.4	20.2	20.2	2.098	1.441	1.442
TR4_5	65.1	25.9	38.7	29.4	20.2	20.2	2.098	1.441	1.442
TR4_6	63.6	25.4	37.8	29.4	20.2	20.2	2.097	1.441	1.442
TR4_7	62.3	24.9	37.0	29.4	20.2	20.2	2.097	1.440	1.441
TR4_8	61.0	24.4	36.3	29.4	20.2	20.2	2.097	1.440	1.441
TR4_9	59.8	24.0	35.6	29.4	20.2	20.2	2.097	1.440	1.441
TR4_10	58.7	23.6	34.9	29.4	20.2	20.2	2.097	1.440	1.441
TR4_11	57.6	23.2	34.3	29.4	20.2	20.2	2.097	1.440	1.441
TR4_12	56.6	22.8	33.7	29.4	20.2	20.2	2.097	1.440	1.441
TR4_13	55.7	22.5	33.2	29.4	20.2	20.2	2.097	1.440	1.441
TR4_14	54.8	22.2	32.7	29.4	20.2	20.2	2.096	1.440	1.441
TR4_15	53.9	21.9	32.2	29.4	20.2	20.2	2.096	1.440	1.441
TR4_16	53.1	21.6	31.7	29.3	20.2	20.2	2.096	1.440	1.441
TR4_17	52.4	21.3	31.2	29.3	20.2	20.2	2.096	1.440	1.441
TR4_18	51.6	21.1	30.8	29.3	20.2	20.2	2.096	1.440	1.441
TR4_19	50.9	20.8	30.4	29.3	20.2	20.2	2.096	1.440	1.441
TR4_20	50.3	20.6	30.0	29.3	20.2	20.2	2.096	1.440	1.441
TR4_21	49.6	20.3	29.7	29.3	20.2	20.2	2.096	1.440	1.441
TR4_22	49.0	20.1	29.3	29.3	20.2	20.2	2.096	1.440	1.441
TR4_23	48.4	19.9	29.0	29.3	20.2	20.2	2.096	1.440	1.441
TR4_24	47.9	19.7	28.6	29.3	20.2	20.2	2.096	1.440	1.441
TR4_25	47.3	19.5	28.3	29.3	20.2	20.2	2.096	1.440	1.441
TR4_26	46.8	19.3	28.0	29.3	20.2	20.2	2.096	1.440	1.440
TR4_27	46.3	19.1	27.7	29.3	20.2	20.2	2.096	1.440	1.440
TR4_28	45.8	19.0	27.4	29.3	20.2	20.2	2.096	1.440	1.440
TR4_29	45.4	18.8	27.2	29.3	20.2	20.2	2.096	1.440	1.440
TR4_30	44.9	18.6	26.9	29.3	20.2	20.2	2.095	1.440	1.440
TR5_0	45.5	18.8	27.2	29.3	20.2	20.2	2.096	1.440	1.441
TR5_1	44.9	18.6	26.9	29.3	20.2	20.2	2.096	1.440	1.441
TR5_2	44.3	18.4	26.5	29.3	20.2	20.2	2.096	1.440	1.441
TR5_3	43.7	18.1	26.2	29.3	20.2	20.2	2.096	1.440	1.441
TR5_4	43.2	18.0	25.9	29.3	20.2	20.2	2.096	1.440	1.440
TR5_5	42.7	17.8	25.6	29.3	20.2	20.2	2.096	1.440	1.440
TR5_6	42.2	17.6	25.3	29.3	20.2	20.2	2.096	1.440	1.440

Receptor	NOx ($\mu\text{g}/\text{m}^3$)			Nutrient Nitrogen (kg/ha/yr)			Acid Nitrogen (keq/ha/yr)		
	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED	2016	2031 - EFT	2031 - CURED
TR5_7	41.7	17.4	25.0	29.3	20.2	20.2	2.096	1.440	1.440
TR5_8	41.2	17.2	24.7	29.3	20.2	20.2	2.095	1.440	1.440
TR5_9	40.8	17.1	24.5	29.3	20.2	20.2	2.095	1.440	1.440
TR5_10	40.3	16.9	24.2	29.3	20.2	20.2	2.095	1.440	1.440
TR5_11	39.9	16.8	24.0	29.3	20.2	20.2	2.095	1.440	1.440
TR5_12	39.5	16.6	23.7	29.3	20.2	20.2	2.095	1.440	1.440
TR5_13	39.1	16.5	23.5	29.3	20.2	20.2	2.095	1.440	1.440
TR5_14	38.7	16.4	23.3	29.3	20.2	20.2	2.095	1.440	1.440
TR5_15	38.4	16.2	23.1	29.3	20.2	20.2	2.095	1.440	1.440
TR5_16	38.0	16.1	22.9	29.3	20.2	20.2	2.095	1.440	1.440
TR5_17	37.7	16.0	22.7	29.3	20.2	20.2	2.095	1.440	1.440
TR5_18	37.4	15.9	22.5	29.3	20.2	20.2	2.095	1.440	1.440
TR5_19	37.0	15.8	22.3	29.3	20.2	20.2	2.095	1.440	1.440
TR5_20	36.7	15.6	22.1	29.3	20.2	20.2	2.095	1.440	1.440
TR5_21	36.4	15.5	22.0	29.3	20.2	20.2	2.095	1.440	1.440
TR5_22	36.2	15.4	21.8	29.3	20.2	20.2	2.095	1.440	1.440
TR5_23	35.9	15.3	21.6	29.3	20.2	20.2	2.095	1.440	1.440
TR5_24	35.6	15.2	21.5	29.3	20.2	20.2	2.095	1.440	1.440
TR5_25	35.3	15.1	21.3	29.3	20.2	20.2	2.095	1.440	1.440
TR5_26	35.1	15.1	21.2	29.3	20.2	20.2	2.095	1.440	1.440
TR5_27	34.8	15.0	21.0	29.3	20.2	20.2	2.095	1.440	1.440
TR5_28	34.6	14.9	20.9	29.3	20.2	20.2	2.095	1.440	1.440
TR5_29	34.4	14.8	20.7	29.3	20.2	20.2	2.095	1.439	1.440
TR5_30	34.1	14.7	20.6	29.3	20.2	20.2	2.095	1.439	1.440
Assessment Criteria	30			10			1.369		

a Exceedances of the assessment criteria are shown in bold.

- 4.4 Annual mean NOx concentrations are predicted to be above the assessment criterion of $30 \mu\text{g}/\text{m}^3$ up to, and beyond, 30m from the SAC boundary in 2016. By 2031 annual mean NOx concentrations are predicted to be below the assessment criterion at all receptors assuming road traffic emissions decrease in line with the EFT, but using CURED, exceedances of the assessment criterion are predicted at up to 23m from the SAC boundary.
- 4.5 Nutrient nitrogen deposition in 2016 is predicted to be above the assessment criterion at all the transect receptors. Nutrient nitrogen deposition fluxes are predicted to decrease by 2031; however the assessment criterion is still exceeded at all the transect receptors assuming EFT and CURED emissions.
- 4.6 Acid nitrogen deposition in 2016 is also predicted to be above the assessment criterion at all the transect receptors. Acid nitrogen deposition fluxes are predicted to decrease by 2031; however the assessment criterion is still exceeded at all the transect receptors assuming EFT and CURED emissions.

5 Impact Assessment

Local Plan – Scenario 5A

Screening

NO_x

- 5.1 The effects on annual mean NO_x concentrations due to Scenario 5A on each transect are set out in **Table 6**. Assuming EFT emissions, there are no exceedances of the annual mean screening criterion, and the impacts would not be significant. Assuming CURED emissions, the annual mean screening criterion is exceeded at Transect 4 up to 1m from the SAC boundary.

Table 6: Predicted Contribution of NO_x due to Scenario 5A in 2031

Receptor	Predicted Road Contribution of Annual Mean NO _x (µg/m ³)		% of Screening Criterion ^a	
	EFT	CURED	EFT	CURED
TR1_0	0.1	0.2	0	1
TR1_1	0.1	0.2	0	1
TR1_2	0.1	0.2	0	1
TR1_3	0.1	0.2	0	1
TR2_0	0.2	0.3	1	1
TR2_1	0.2	0.3	1	1
TR2_2	0.2	0.3	1	1
TR2_3	0.2	0.2	1	1
TR3_0	0.2	0.3	1	1
TR3_1	0.2	0.3	1	1
TR3_2	0.2	0.3	1	1
TR3_3	0.2	0.3	1	1
TR4_0	0.3	0.5	1	2
TR4_1	0.3	0.5	1	2
TR4_2	0.3	0.4	1	1
TR4_3	0.3	0.4	1	1
TR5_0	0.1	0.2	0	1
TR5_1	0.1	0.2	0	1
TR5_2	0.1	0.2	0	1
TR5_3	0.1	0.2	0	1
Screening Criterion	-		1	

a. Exceedances of 1% of the assessment criterion are shown in bold.

Nitrogen Deposition

- 5.2 The predicted contributions to nutrient and acid nitrogen deposition fluxes due to Scenario 5A at the closest receptors to the M40 on each transect are set out in **Table 7**. The predicted contributions are below the screening criteria for both nutrient and acid nitrogen deposition; therefore, the impacts of Scenario 5A on nutrient and acid nitrogen deposition would not be significant.

Table 7: Predicted Road Contribution to Nutrient and Acid Nitrogen Deposition due to Scenario 5A in 2031

Receptor	Predicted Road Contribution of Nutrient N (kg/ha/yr)		% of Nutrient N Screening Criterion ^a		Predicted Road Contribution of Acid N (keq/ha/yr)		% of Acid N Screening Criterion ^a	
	EFT	CURED	EFT	CURED	EFT	CURED	EFT	CURED
TR1_0	0.02	0.03	0	0	0.001	0.002	0	0
TR2_0	0.03	0.03	0	0	0.002	0.002	0	0

Receptor	Predicted Road Contribution of Nutrient N (kg/ha/yr)		% of Nutrient N Screening Criterion ^a		Predicted Road Contribution of Acid N (keq/ha/yr)		% of Acid N Screening Criterion ^a	
	EFT	CURED	EFT	CURED	EFT	CURED	EFT	CURED
TR3_0	0.03	0.04	0	0	0.002	0.003	0	0
TR4_0	0.04	0.06	0	1	0.003	0.005	0	0
TR5_0	0.02	0.03	0	0	0.001	0.002	0	0
Screening Criteria	-		1		-		1	

Impact Assessment

NO_x – CURED Emissions

- 5.3 Scenario 5A predicted total annual mean NO_x concentrations at Transect 4 receptors where the screening criterion has been exceeded assuming CURED emissions are set out in **Table 11**. The assessment criterion of 30 µg/m³ is predicted to be exceeded for both the do-minimum scenario and for Scenario 5A. With Scenario 5A, an annual mean NO_x concentration of 44.5 µg/m³ is predicted at the SAC boundary, reducing to 43.2 µg/m³ 1m in to the SAC. The maximum Scenario 5A increase in annual mean NO_x concentrations is 0.5 µg/m³, which is an increase of 2% of the assessment criterion of 30 µg/m³.
- 5.4 It should be noted that the predicted impacts represent a worst-case scenario with regard to the emissions used. In reality, the introduction of progressively cleaner vehicles into the UK fleet is likely to result in a significant reduction in NO_x emissions from diesel vehicles between 2016 and 2031. The introduction of Real Driving Emissions (RDE) tests for vehicle type-approval for Euro 6 vehicles and in-use testing for Euro VI vehicles using Portable Emissions Measurement Systems (PEMS) should ensure that real world emissions closely match those required by the Euro 6/VI standards. By 2031, most vehicles in the UK fleet will be Euro6/VI and the use of uplifted NO_x emissions from some diesel vehicles provides a conservative assessment of emissions in 2031.

Table 8: Predicted 2031 Nitrogen Oxides Impacts of Scenario 5A Assuming CURED Emissions

Receptor	Predicted Total NO _x (µg/m ³)		Impact	
	Do-minimum	With Scenario 5A	Increase (µg/m ³)	Increase as Percentage of Assessment Criterion (%)
TR4_0	44.0	44.5	0.5	2
TR4_1	42.8	43.2	0.5	2
Assessment Criterion	30		-	

a. Exceedances of the assessment criterion are shown in bold.

Local Plan – Scenario 5B

Screening

NO_x

- 5.5 The effects on annual mean NO_x concentrations due to Scenario 5B are set out in **Table 9**. Assuming EFT emissions, the annual mean screening criterion is exceeded at Transect 1 up to 15m from the SAC boundary, at Transect 2 up to 25m from the SAC boundary, at Transect 3 up to 28m from the SAC boundary, at Transect 4 up to 24m from the SAC boundary and at Transect 5 up to 2m from the SAC boundary. Assuming CURED emissions, the annual mean screening criterion is exceeded up to 50m from the SAC boundary, apart from at Transect 5, where the annual mean screening criterion is exceeded up to 31m from the SAC boundary.

Table 9: Predicted Contribution of NOx due to Scenario 5B in 2031

Receptor	Predicted Road Contribution of Annual Mean NOx ($\mu\text{g}/\text{m}^3$)		% of Screening Criterion ^a	
	EFT	CURED	EFT	CURED
TR1_0	0.6	1.0	2	3
TR1_1	0.6	1.0	2	3
TR1_2	0.6	0.9	2	3
TR1_3	0.6	0.9	2	3
TR1_4	0.6	0.9	2	3
TR1_5	0.5	0.9	2	3
TR1_6	0.5	0.9	2	3
TR1_7	0.5	0.8	2	3
TR1_8	0.5	0.8	2	3
TR1_9	0.5	0.8	2	3
TR1_10	0.5	0.8	2	3
TR1_11	0.5	0.8	2	3
TR1_12	0.5	0.8	2	3
TR1_13	0.5	0.8	2	3
TR1_14	0.5	0.7	2	2
TR1_15	0.5	0.7	2	2
TR1_16	0.4	0.7	1	2
TR1_50	0.3	0.5	1	2
TR2_0	0.8	1.3	3	4
TR2_1	0.8	1.2	3	4
TR2_2	0.7	1.2	2	4
TR2_3	0.7	1.2	2	4
TR2_4	0.7	1.1	2	4
TR2_5	0.7	1.1	2	4
TR2_6	0.7	1.1	2	4
TR2_7	0.6	1.0	2	3
TR2_8	0.6	1.0	2	3
TR2_9	0.6	1.0	2	3
TR2_10	0.6	1.0	2	3
TR2_11	0.6	1.0	2	3
TR2_12	0.6	0.9	2	3
TR2_13	0.6	0.9	2	3
TR2_14	0.6	0.9	2	3
TR2_15	0.5	0.9	2	3
TR2_16	0.5	0.9	2	3
TR2_17	0.5	0.8	2	3
TR2_18	0.5	0.8	2	3
TR2_19	0.5	0.8	2	3
TR2_20	0.5	0.8	2	3
TR2_21	0.5	0.8	2	3
TR2_22	0.5	0.8	2	3
TR2_23	0.5	0.8	2	3
TR2_24	0.5	0.8	2	3
TR2_25	0.5	0.7	2	2
TR2_26	0.4	0.7	1	2
TR2_50	0.3	0.5	1	2
TR3_0	0.9	1.5	3	5
TR3_1	0.9	1.5	3	5
TR3_2	0.9	1.4	3	5
TR3_3	0.8	1.4	3	5
TR3_4	0.8	1.3	3	4
TR3_5	0.8	1.3	3	4
TR3_6	0.8	1.2	3	4
TR3_7	0.7	1.2	2	4
TR3_8	0.7	1.2	2	4
TR3_9	0.7	1.1	2	4
TR3_10	0.7	1.1	2	4
TR3_11	0.7	1.1	2	4
TR3_12	0.6	1.0	2	3
TR3_13	0.6	1.0	2	3
TR3_14	0.6	1.0	2	3
TR3_15	0.6	1.0	2	3
TR3_16	0.6	0.9	2	3

Receptor	Predicted Road Contribution of Annual Mean NOx ($\mu\text{g}/\text{m}^3$)		% of Screening Criterion ^a	
	EFT	CURED	EFT	CURED
TR3_17	0.6	0.9	2	3
TR3_18	0.6	0.9	2	3
TR3_19	0.5	0.9	2	3
TR3_20	0.5	0.9	2	3
TR3_21	0.5	0.8	2	3
TR3_22	0.5	0.8	2	3
TR3_23	0.5	0.8	2	3
TR3_24	0.5	0.8	2	3
TR3_25	0.5	0.8	2	3
TR3_26	0.5	0.8	2	3
TR3_27	0.5	0.8	2	3
TR3_28	0.5	0.7	2	2
TR3_29	0.4	0.7	1	5
TR3_50	0.3	0.5	1	2
TR4_0	0.9	1.5	3	5
TR4_1	0.9	1.4	3	5
TR4_2	0.8	1.3	3	4
TR4_3	0.8	1.3	3	4
TR4_4	0.8	1.3	3	4
TR4_5	0.7	1.2	2	4
TR4_6	0.7	1.2	2	4
TR4_7	0.7	1.1	2	4
TR4_8	0.7	1.1	2	4
TR4_9	0.7	1.1	2	4
TR4_10	0.6	1.0	2	3
TR4_11	0.6	1.0	2	3
TR4_12	0.6	1.0	2	3
TR4_13	0.6	1.0	2	3
TR4_14	0.6	0.9	2	3
TR4_15	0.6	0.9	2	3
TR4_16	0.5	0.9	2	3
TR4_17	0.5	0.9	2	3
TR4_18	0.5	0.8	2	3
TR4_19	0.5	0.8	2	3
TR4_20	0.5	0.8	2	3
TR4_21	0.5	0.8	2	3
TR4_22	0.5	0.8	2	3
TR4_23	0.5	0.8	2	3
TR4_24	0.5	0.7	2	2
TR4_25	0.4	0.7	1	2
TR4_50	0.3	0.5	1	2
TR5_0	0.5	0.8	2	3
TR5_1	0.5	0.7	2	2
TR5_2	0.5	0.7	2	2
TR5_3	0.4	0.7	1	2
TR5_4	0.4	0.7	1	2
TR5_5	0.4	0.7	1	2
TR5_6	0.4	0.7	1	2
TR5_7	0.4	0.7	1	2
TR5_8	0.4	0.6	1	2
TR5_9	0.4	0.6	1	2
TR5_10	0.4	0.6	1	2
TR5_11	0.4	0.6	1	2
TR5_12	0.4	0.6	1	2
TR5_13	0.4	0.6	1	2
TR5_14	0.4	0.6	1	2
TR5_15	0.4	0.6	1	2
TR5_16	0.3	0.6	1	2
TR5_17	0.3	0.6	1	2
TR5_18	0.3	0.5	1	2
TR5_19	0.3	0.5	1	2
TR5_20	0.3	0.5	1	2
TR5_21	0.3	0.5	1	2
TR5_22	0.3	0.5	1	2

Receptor	Predicted Road Contribution of Annual Mean NO _x (µg/m ³)		% of Screening Criterion ^a	
	EFT	CURED	EFT	CURED
TR5_23	0.3	0.5	1	2
TR5_24	0.3	0.5	1	2
TR5_25	0.3	0.5	1	2
TR5_26	0.3	0.5	1	2
TR5_27	0.3	0.5	1	2
TR5_28	0.3	0.5	1	2
TR5_29	0.3	0.5	1	2
TR5_30	0.3	0.5	1	2
TR5_31	0.3	0.5	1	2
TR5_32	0.3	0.4	1	1
Screening Criterion	-		1	

a. Exceedances of 1% of the assessment criterion are shown in bold.

Nitrogen Deposition

5.6 The predicted contribution to nutrient and acid nitrogen deposition fluxes due to Scenario 5B are set out in **Table 10**. Assuming EFT emissions, the predicted contributions are below the screening criteria for both nutrient and acid nitrogen deposition. Assuming CURED emissions, the predicted contributions are below the screening criterion for acid nitrogen deposition; however, the screening criterion for nutrient nitrogen deposition is exceeded at Transect 2 up to 5m from the SAC boundary, at Transect 3 up to 10m from the SAC boundary and at Transect 4 up to 8m from the SAC boundary.

Table 10: Predicted Road Contribution to Nutrient and Acid Nitrogen Deposition due to Scenario 5B in 2031

Receptor	Predicted Road Contribution of Nutrient N (kg/ha/yr)		% of Nutrient N Screening Criterion ^a		Predicted Road Contribution of Acid N (keq/ha/yr)		% of Acid N Screening Criterion ^a	
	EFT	CURED	EFT	CURED	EFT	CURED	EFT	CURED
TR1_0	0.09	0.14	1	1	0.006	0.010	0	1
TR2_0	0.12	0.17	1	2	0.008	0.012	1	1
TR2_1	0.11	0.17	1	2	0.008	0.012	1	1
TR2_2	0.11	0.16	1	2	0.008	0.012	1	1
TR2_3	0.10	0.16	1	2	0.007	0.012	1	1
TR2_4	0.10	0.16	1	2	0.007	0.011	1	1
TR2_5	0.10	0.16	1	2	0.007	0.011	1	1
TR2_6	0.10	0.15	1	1	0.007	0.011	1	1
TR3_0	0.13	0.20	1	2	0.009	0.014	1	1
TR3_1	0.13	0.20	1	2	0.009	0.014	1	1
TR3_2	0.13	0.19	1	2	0.009	0.014	1	1
TR3_3	0.12	0.18	1	2	0.009	0.013	1	1
TR3_4	0.12	0.18	1	2	0.008	0.013	1	1
TR3_5	0.11	0.17	1	2	0.008	0.012	1	1
TR3_6	0.11	0.17	1	2	0.008	0.012	1	1
TR3_7	0.11	0.16	1	2	0.008	0.012	1	1
TR3_8	0.10	0.16	1	2	0.007	0.011	1	1
TR3_9	0.10	0.16	1	2	0.007	0.011	1	1
TR3_10	0.10	0.15	1	2	0.007	0.011	1	1
TR3_11	0.10	0.15	1	1	0.007	0.011	1	1
TR4_0	0.13	0.20	1	2	0.009	0.014	1	1
TR4_1	0.13	0.19	1	2	0.009	0.014	1	1
TR4_2	0.12	0.18	1	2	0.009	0.013	1	1
TR4_3	0.12	0.18	1	2	0.008	0.013	1	1
TR4_4	0.12	0.17	1	2	0.008	0.012	1	1
TR4_5	0.11	0.17	1	2	0.008	0.012	1	1
TR4_6	0.11	0.16	1	2	0.008	0.012	1	1
TR4_7	0.10	0.16	1	2	0.007	0.011	1	1
TR4_8	0.10	0.15	1	2	0.007	0.011	1	1
TR4_9	0.10	0.15	1	1	0.007	0.010	1	1

Receptor	Predicted Road Contribution of Nutrient N (kg/ha/yr)		% of Nutrient N Screening Criterion ^a		Predicted Road Contribution of Acid N (keq/ha/yr)		% of Acid N Screening Criterion ^a	
	EFT	CURED	EFT	CURED	EFT	CURED	EFT	CURED
TR5_0	0.07	0.11	1	1	0.005	0.008	0	1
Screening Criteria	-		1		-		1	

a. Exceedances of 1% of the critical load are shown in bold.

Impact Assessment

- 5.7 Scenario 5B predicted total annual mean NO_x concentrations at receptors where the screening criterion has been exceeded assuming EFT and CURED emissions are set out in **Table 11**.

NO_x - EFT Emissions

- 5.8 The assessment criterion of 30 µg/m³ is predicted to be achieved at all receptors for the do-minimum scenario. The assessment criterion of 30 µg/m³ is predicted to be achieved at most receptors for Scenario 5B, apart from at the SAC boundary on Transect 3, where an annual mean NO_x concentration of 30.8 µg/m³ has been predicted. The maximum increase in annual mean NO_x concentrations due to Scenario 5B is 0.9 µg/m³, which is an increase of 3% as a percentage of the assessment criterion of 30 µg/m³.

NO_x - CURED Emissions

- 5.9 The assessment criterion of 30 µg/m³ is predicted to be exceeded for the do-minimum scenario up to 4m from the SAC boundary at Transect 1, up to 14m from the SAC boundary at Transect 2, up to 23m from the SAC boundary at Transect 3 and up to 22m from the SAC boundary at Transect 4. Scenario 5B is predicted to increase the distance of exceedance of the assessment criterion by 2m from the SAC boundary at Transect 1, Transect 2 and Transect 3, and by 3m from the SAC boundary at Transect 4. No exceedances of the assessment criterion are predicted at Transect 5. The maximum increase in annual mean NO_x concentrations due to Scenario 5B is 1.5 µg/m³, which is an increase of 5% as a percentage of the assessment criterion of 30 µg/m³.

Table 11: Predicted 2031 Nitrogen Oxides Impacts of Scenario 5B

Receptor	Predicted Total NO _x (µg/m ³)				Impact			
	EFT Emissions		CURED Emissions		EFT Emissions		CURED Emissions	
	Do-minimum	Scenario 5B	Do-minimum	Scenario 5B	Increase (µg/m ³)	Increase as Percentage of Assessment Criterion (%)	Increase (µg/m ³)	Increase as Percentage of Assessment Criterion (%)
TR1_0	21.7	22.3	31.9	32.9	0.6	2	1.0	3
TR1_1	21.4	22.0	31.5	32.4	0.6	2	1.0	3
TR1_2	21.1	21.7	31.0	31.9	0.6	2	0.9	3
TR1_3	20.8	21.4	30.6	31.5	0.6	2	0.9	3
TR1_4	20.6	21.2	30.2	31.1	0.6	2	0.9	3
TR1_5	20.3	20.9	29.8	30.7	0.5	2	0.9	3
TR1_6	20.1	20.6	29.4	30.3	0.5	2	0.9	3
TR1_7	19.9	20.4	29.0	29.9	0.5	2	0.8	3
TR1_8	19.7	20.2	28.7	29.5	0.5	2	0.8	3
TR1_9	19.5	20.0	28.3	29.2	0.5	2	0.8	3
TR1_10	19.3	19.8	28.0	28.8	0.5	2	0.8	3
TR1_11	19.1	19.6	27.7	28.5	0.5	2	0.8	3
TR1_12	18.9	19.4	27.4	28.2	0.5	2	0.8	3
TR1_13	18.7	19.2	27.1	27.9	0.5	2	0.8	3
TR1_14	18.5	19.0	26.8	27.6	0.5	2	0.7	2
TR1_15	18.4	18.8	26.5	27.3	0.5	2	0.7	2
TR2_0	25.2	26.0	37.7	38.9	0.8	3	1.3	4
TR2_1	24.8	25.5	36.9	38.1	0.8	3	1.2	4
TR2_2	24.3	25.0	36.2	37.4	0.7	2	1.2	4

Receptor	Predicted Total NOx ($\mu\text{g}/\text{m}^3$)				Impact			
	EFT Emissions		CURED Emissions		EFT Emissions		CURED Emissions	
	Do-minimum	Scenario 5B	Do-minimum	Scenario 5B	Increase ($\mu\text{g}/\text{m}^3$)	Increase as Percentage of Assessment Criterion (%)	Increase ($\mu\text{g}/\text{m}^3$)	Increase as Percentage of Assessment Criterion (%)
TR2_3	23.9	24.6	35.6	36.7	0.7	2	1.2	4
TR2_4	23.5	24.2	34.9	36.1	0.7	2	1.1	4
TR2_5	23.2	23.8	34.3	35.4	0.7	2	1.1	4
TR2_6	22.8	23.5	33.8	34.8	0.7	2	1.1	4
TR2_7	22.5	23.1	33.2	34.3	0.6	2	1.0	3
TR2_8	22.2	22.8	32.7	33.7	0.6	2	1.0	3
TR2_9	21.9	22.5	32.2	33.2	0.6	2	1.0	3
TR2_10	21.6	22.2	31.8	32.7	0.6	2	1.0	3
TR2_11	21.3	21.9	31.3	32.3	0.6	2	1.0	3
TR2_12	21.0	21.6	30.9	31.8	0.6	2	0.9	3
TR2_13	20.8	21.3	30.5	31.4	0.6	2	0.9	3
TR2_14	20.5	21.1	30.1	31.0	0.6	2	0.9	3
TR2_15	20.3	20.9	29.7	30.6	0.5	2	0.9	3
TR2_16	20.1	20.6	29.4	30.2	0.5	2	0.9	3
TR2_17	19.9	20.4	29.0	29.9	0.5	2	0.8	3
TR2_18	19.7	20.2	28.7	29.5	0.5	2	0.8	3
TR2_19	19.5	20.0	28.4	29.2	0.5	2	0.8	3
TR2_20	19.3	19.8	28.0	28.8	0.5	2	0.8	3
TR2_21	19.1	19.6	27.7	28.5	0.5	2	0.8	3
TR2_22	18.9	19.4	27.5	28.2	0.5	2	0.8	3
TR2_23	18.7	19.2	27.2	27.9	0.5	2	0.8	3
TR2_24	18.6	19.0	26.9	27.7	0.5	2	0.8	3
TR2_25	18.4	18.9	26.6	27.4	0.5	2	0.7	2
TR3_0	29.9	30.8	45.2	46.7	0.9	3	1.5	5
TR3_1	29.1	30.0	43.9	45.4	0.9	3	1.5	5
TR3_2	28.5	29.3	42.8	44.2	0.9	3	1.4	5
TR3_3	27.8	28.6	41.8	43.1	0.8	3	1.4	5
TR3_4	27.2	28.0	40.8	42.1	0.8	3	1.3	4
TR3_5	26.7	27.4	39.9	41.2	0.8	3	1.3	4
TR3_6	26.1	26.9	39.1	40.3	0.8	3	1.2	4
TR3_7	25.7	26.4	38.3	39.5	0.7	2	1.2	4
TR3_8	25.2	25.9	37.6	38.7	0.7	2	1.2	4
TR3_9	24.8	25.5	36.9	38.0	0.7	2	1.1	4
TR3_10	24.4	25.0	36.2	37.3	0.7	2	1.1	4
TR3_11	24.0	24.6	35.6	36.7	0.7	2	1.1	4
TR3_12	23.6	24.3	35.0	36.0	0.6	2	1.0	3
TR3_13	23.3	23.9	34.4	35.5	0.6	2	1.0	3
TR3_14	23.0	23.6	33.9	34.9	0.6	2	1.0	3
TR3_15	22.7	23.3	33.4	34.4	0.6	2	1.0	3
TR3_16	22.4	22.9	32.9	33.9	0.6	2	0.9	3
TR3_17	22.1	22.6	32.5	33.4	0.6	2	0.9	3
TR3_18	21.8	22.4	32.1	33.0	0.6	2	0.9	3
TR3_19	21.6	22.1	31.6	32.5	0.5	2	0.9	3
TR3_20	21.3	21.8	31.3	32.1	0.5	2	0.9	3
TR3_21	21.1	21.6	30.9	31.7	0.5	2	0.8	3
TR3_22	20.9	21.4	30.5	31.3	0.5	2	0.8	3
TR3_23	20.6	21.1	30.2	31.0	0.5	2	0.8	3
TR3_24	20.4	20.9	29.8	30.6	0.5	2	0.8	3
TR3_25	20.2	20.7	29.5	30.3	0.5	2	0.8	3
TR3_26	20.0	20.5	29.2	30.0	0.5	2	0.8	3
TR3_27	19.9	20.3	28.9	29.6	0.5	2	0.8	3
TR3_28	19.7	20.1	28.6	29.3	0.5	2	0.7	2
TR4_0	29.2	30.1	44.0	45.5	0.9	3	1.5	5
TR4_1	28.5	29.3	42.8	44.2	0.9	3	1.4	5
TR4_2	27.7	28.6	41.6	43.0	0.8	3	1.3	4
TR4_3	27.1	27.9	40.6	41.9	0.8	3	1.3	4
TR4_4	26.5	27.2	39.6	40.8	0.8	3	1.3	4
TR4_5	25.9	26.7	38.7	39.9	0.7	2	1.2	4
TR4_6	25.4	26.1	37.8	39.0	0.7	2	1.2	4

Receptor	Predicted Total NO _x (µg/m ³)				Impact			
	EFT Emissions		CURED Emissions		EFT Emissions		CURED Emissions	
	Do-minimum	Scenario 5B	Do-minimum	Scenario 5B	Increase (µg/m ³)	Increase as Percentage of Assessment Criterion (%)	Increase (µg/m ³)	Increase as Percentage of Assessment Criterion (%)
TR4_7	24.9	25.6	37.0	38.2	0.7	2	1.1	4
TR4_8	24.4	25.1	36.3	37.4	0.7	2	1.1	4
TR4_9	24.0	24.7	35.6	36.6	0.7	2	1.1	4
TR4_10	23.6	24.2	34.9	36.0	0.6	2	1.0	3
TR4_11	23.2	23.8	34.3	35.3	0.6	2	1.0	3
TR4_12	22.8	23.5	33.7	34.7	0.6	2	1.0	3
TR4_13	22.5	23.1	33.2	34.1	0.6	2	1.0	3
TR4_14	22.2	22.8	32.7	33.6	0.6	2	0.9	3
TR4_15	21.9	22.4	32.2	33.1	0.6	2	0.9	3
TR4_16	21.6	22.1	31.7	32.6	0.5	2	0.9	3
TR4_17	21.3	21.8	31.2	32.1	0.5	2	0.9	3
TR4_18	21.1	21.6	30.8	31.7	0.5	2	0.8	3
TR4_19	20.8	21.3	30.4	31.2	0.5	2	0.8	3
TR4_20	20.6	21.1	30.0	30.8	0.5	2	0.8	3
TR4_21	20.3	20.8	29.7	30.4	0.5	2	0.8	3
TR4_22	20.1	20.6	29.3	30.1	0.5	2	0.8	3
TR4_23	19.9	20.4	29.0	29.7	0.5	2	0.8	3
TR4_24	19.7	20.2	28.6	29.4	0.5	2	0.7	2
TR5_0	18.8	19.3	27.2	28.0	0.5	2	0.8	3
TR5_1	18.6	19.0	26.9	27.6	0.5	2	0.7	2
TR5_2	18.4	18.8	26.5	27.2	0.5	2	0.7	2
Assessment Criterion	30				-			

a Exceedences of the assessment criterion are shown in bold.

Nutrient Nitrogen – CURED Emissions

- 5.10 Scenario 5B predicted total nutrient nitrogen deposition at receptors where the screening criterion has been exceeded assuming CURED emissions are set out in **Table 12**.
- 5.11 Given that background nutrient nitrogen deposition is above the assessment criterion, the assessment criterion of 10 kg/ha/yr is predicted to be exceeded for both do-minimum and Scenario 5B. The maximum increase in nutrient nitrogen deposition due to Scenario 5B is 0.20 kg/ha/yr, which is an increase of 2% as a percentage of the assessment criterion.

Table 12: Predicted 2031 Nutrient Nitrogen Impacts of Scenario 5B Assuming CURED Emissions

Receptor	Predicted Total Nutrient N Deposition (kg/ha/yr)		Predicted Road Contribution of Nutrient N (kg/ha/yr)	
	Do-minimum	Scenario 5B	Increase (kg/ha/yr)	Increase as % of Assessment Criterion
TR2_0	24.1	23.4	0.17	2
TR2_1	24.0	23.4	0.17	2
TR2_2	23.9	23.3	0.16	2
TR2_3	23.8	23.2	0.16	2
TR2_4	23.7	23.2	0.16	2
TR2_5	23.6	23.1	0.16	2
TR3_0	24.8	25.0	0.20	2
TR3_1	24.7	24.9	0.20	2
TR3_2	24.5	24.7	0.19	2
TR3_3	24.4	24.6	0.18	2
TR3_4	24.2	24.4	0.18	2
TR3_5	24.1	24.3	0.17	2
TR3_6	24.0	24.2	0.17	2
TR3_7	23.9	24.1	0.16	2

Receptor	Predicted Total Nutrient N Deposition (kg/ha/yr)		Predicted Road Contribution of Nutrient N (kg/ha/yr)	
	Do-minimum	Scenario 5B	Increase (kg/ha/yr)	Increase as % of Assessment Criterion
TR3_8	23.8	23.9	0.16	2
TR3_9	23.7	23.9	0.16	2
TR3_10	23.6	23.8	0.15	2
TR4_0	24.7	24.9	0.20	2
TR4_1	24.5	24.7	0.19	2
TR4_2	24.3	24.5	0.18	2
TR4_3	24.2	24.4	0.18	2
TR4_4	24.1	24.2	0.17	2
TR4_5	23.9	24.1	0.17	2
TR4_6	23.8	24.0	0.16	2
TR4_7	23.7	23.9	0.16	2
TR4_8	23.6	23.8	0.15	2
Assessment Criterion	10		-	

a. Exceedances of the assessment criterion are shown in bold.

Significance of Effects

- 5.12 The effects of Scenario 5A have been shown to be not significant with regard to nitrogen deposition. With regard to NO_x, the effects of Scenario 5A are not significant assuming EFT emissions; however, assuming CURED emissions results in a risk of potentially significant effects on annual mean NO_x concentrations up to 1m within the SAC at Transect 4.
- 5.13 The effects of Scenario 5B have been shown to be not significant with regard to nutrient nitrogen deposition assuming EFT emissions; however, there is a risk of significant effects on nutrient nitrogen deposition assuming CURED emissions. The effects of Scenario 5B on acid nitrogen deposition are not significant. With regard to NO_x, the effects of Scenario 5B are not significant assuming EFT emissions; however, assuming CURED emissions results in a risk of potentially significant effects on annual mean NO_x concentrations up to 25m from the SAC boundary.
- 5.14 It is considered that the use of CURED emissions provides a conservative upper estimate of the impacts. It is likely that the real in combination impact will lie somewhere between the EFT and CURED scenarios, and that the maximum increase in annual mean NO_x concentrations as a percentage of the assessment criterion will be between 3-5%.

Ecological Interpretation

- 5.15 The Critical Level does not discriminate between the role of N deposition and NO_x in the air. It is a precautionary general threshold, not specific to a particular habitat, plant species or impact pathway, below which there is currently a high degree of confidence that adverse effects on vegetation will not arise. For many habitats, increases in NO_x above the standard 30ug/m³ threshold do not necessarily result in an ecological response. For example, a recent study of the effects of atmospheric N on saltmarsh found that it was the level of N deposition relative to the Critical Load which was more important than the concentration of NO_x relative to the Critical Level². Crucially, it is typically the secondary effects of increasing NO_x concentration i.e. the resulting N deposition, which are likely to trigger a significant ecological effect, rather than the direct effects of the increasing NO_x concentrations.
- 5.16 The predicted Baseline Concentrations and Deposition Fluxes at the transect receptors is forecast to reduce significantly between 2016 and 2031. Despite 2031 levels still exceeding the critical load for nutrient nitrogen deposition, the contribution of the local plan in-combination in retarding the predicted improvement is negligible at Transects 1 and 5, and also at distances of less than 5m, 10m and 8m into the SAC for transects 3, 4 and 5 respectively.

² Boorman LA and Hazelden J. (2012) Impacts of Additional Aerial Inputs of Nitrogen to Saltmarsh and Transitional Habitats. CCW Science Report No: 995, Countryside Council for Wales, Bangor, Wales

- 5.17 Detailed consideration of the effects of the change in air quality on the Aston Rowant SAC qualifying features is provided below.

Juniperus communis formations on heaths or calcareous grasslands

- 5.18 Juniper is a dioecious evergreen conifer found on basic and acidic soils in a wide range of habitats, including chalk downland, heather moorland, oceanic heaths, rocky slopes and in *Betula*, *Quercus* and *Pinus* woods.
- 5.19 In the UK, its distribution is restricted to two areas of the country and two broad habitat types. The majority of populations occur on acidic substrates in heathland or acid grassland habitats in northern England and Scotland. In southern England juniper scrub may develop on a range of calcareous grassland types on thin chalk soils, while more closed juniper stands with a rich scrub flora correspond to NVC type W21d *Crataegus monogyna* – *Hedera helix* scrub, *Viburnum lantana* sub-community. Where juniper is not dominant the scrub contains a rich assemblage of other shrubs, mainly of the family Rosaceae.
- 5.20 Juniper is typically found on low nitrogen soils and has been classified as having a relatively low Ellenburg factor (an indicator value of 3 on a scale of 1 to 9). However, it is understood to be relatively tolerant of a wide range of nutrient levels. Fertilizer trials in Scotland by the Forestry Commission³ found that on poor to medium upland brown earths at Moray, applications of phosphorus at 60kg/ha had no significant effect on survival or growth of planted junipers. On nutrient deficient peaty podzols at Lochaber, various low applications of N, P and K had no effect on survival of planted junipers but application of N at 150kg/ha significantly improved height growth and root collar diameter growth. The other nutrients by themselves had no effect but K (100kg/ha) with N increased height growth, and P (90kg/ha) with N increased root collar diameter growth. The comparatively small effect of fertilizers points to juniper being well-adapted to nutrient-poor conditions. This is supported by the findings of Grubb et al.⁴ that growth on calcareous soils is limited by available light rather than P and N.
- 5.21 Transects 1 and 2 run through areas of calcareous grassland habitat which potentially support qualifying juniper formations. When the in-combination effects of growth are assessed, the annual mean screening criterion for NO_x is not exceeded under Scenario 5A but is exceeded up to 50m into the SAC for Scenario 5b.
- 5.22 Unsurprisingly, since NO_x is the main source of nitrogen from vehicle exhaust emissions, the results from the NO_x analysis carry over to the nitrogen deposition calculations. However, since most of the emitted NO_x is not deposited at the roadside the change in nitrogen deposition rates is forecast to be lower than the change in NO_x concentrations. Indeed, under Scenario 5B, assuming CURED emissions, the screening criterion for nutrient nitrogen deposition is not exceeded anywhere within the SAC at Transect 1, and is exceeded extending up to only 5m at Transect 2.
- 5.23 As described above, the use of CURED emissions provides a conservative upper estimate of the impacts. It is likely that the real in-combination impact will lie somewhere between the EFT and CURED scenarios, suggesting an exceedance of somewhere between 1-2% up to 5m from the SAC boundary at Transect 2. Given the tiny proportion of the SAC that this area represents, and that the IAQM⁵ suggests that only impacts clearly above 1% should be treated as potentially significant, rather than impacts that are about 1%, or slightly higher⁶, together with the current and historic favourable condition of the SAC, the qualifying feature *Juniperus communis formations on heaths or calcareous grasslands* is not predicted to be adversely affected by the Local Plan, either alone or in-combination.

Asperulo-Fagetum Beech Forest

- 5.24 This habitat type occurs on circumneutral to calcareous soils and mostly corresponds to NVC type W12 *Fagus sylvatica* – *Mercurialis perennis* woodland. In addition, some of the more calcareous

³ Broome, A.C. (2003) *Growing juniper; propagation and establishment practices*. Information Note No. 50, Forest Commission, Edinburgh

⁴ Grubb, P.J., Lee, W.G., Kollmann, J. & Wilson, J.B. (1996) Interaction of irradiance and soil nutrient supply on growth of seedlings of ten European tall-shrub species and *Fagus sylvatica*. *Journal of Ecology*, **84**, 827–840

⁵ The IAQM is the professional body for air quality practitioners.

⁶ IQAM (2016) Position Statement - Effect of Air Quality Impacts on Sensitive Habitats

stands of NVC type W14 *Fagus sylvatica* – *Rubus fruticosus* woodland are also included. The main concentrations shown occur in the lowlands of southern Britain, along the Downs, in the Weald and the Chilterns, down the Hampshire Hangers and into the New Forest, and westward through the Cotswolds, Wye Valley and to the coalfields of south-east Wales.

- 5.25 A series of studies on beech woodlands in Switzerland has demonstrated that they are sensitive to N deposition, with a range of significant ecological effects recorded including increased susceptibility to pest and pathogens^{7,8,9,10}, a reduction in root and stem growth¹¹, changes in flowering patterns, seed and litterfall production and decomposition¹², and lower mycelium density¹³.
- 5.26 Transects 3, 4 and 5 are all within areas of beech woodland. Under Scenario 5A the NO_x screening criterion is exceeded at Transect 4 only, up to a distance of just 1m into the SAC. Under Scenario 5B the NO_x screening criterion is exceeded at Transects 3 and 4 up to 50m and up to 31m at Transect 5.
- 5.27 As described above, since most of the emitted NO_x is not deposited at the roadside the change in nitrogen deposition rates is forecast to be lower than the change in NO_x concentrations. Indeed, under Scenario 5B, assuming CURED emissions, the screening criterion for nutrient nitrogen deposition is exceeded (lying between 1-2%) at Transect 3 at a distance of up to 10m inside the SAC, and at Transect 4 at up to 8m inside the SAC. The screening criterion for nutrient nitrogen is not exceeded at Transect 5.
- 5.28 This could potentially affect an estimated 0.12ha of the SAC. This equates to approximately <0.1% of the SAC potentially affected by increasing N deposition due to the in-combination effects of growth.

Conservation objectives

- 5.29 The potential effects of increasing N identified by the model on the qualifying features of the SAC have been considered in light of the available scientific evidence and the conservation objectives for Ashton Rowant SAC.
- 5.30 Both of the qualifying features are understood to currently be in favourable condition at the SAC, as recent condition assessments have recorded all units as being in favourable condition¹⁴. The following objectives have therefore been considered in the context of maintaining, rather than achieving favourable conservation status of the qualifying features.

The extent and distribution of qualifying natural habitats

- 5.31 The potential effects of N deposition on juniper populations and beech forest habitats are relatively subtle, typically relating to the structure, function and supporting processes (see below), however there is no evidence that these effects could result in a change in the extent or distribution of these habitats.

The structure and function (including typical species) of qualifying natural habitats

- 5.32 Research has shown that increasing NO_x concentrations can affect the growth, physiology and biochemistry of plants. At Aston Rowant SAC, the total NO_x concentrations could reach 46.7µg/m³ and total nutrient nitrogen deposition could reach 25 kg/ha/yr when assuming a worst case in-combination scenario and taking background levels of NO_x into account. At these concentrations, effects on growth such as increased biomass, changes in root to shoot ratio,

⁷ Westling, O. (1991) Nitrate in soil water *Miljöatlas*. pp 1-20

⁸ Flückiger, W. and Braun, S. (1999) Nitrogen and its effects on growth, nutrient status and parasite attacks in beech and Norway Spruce *Water, Air and Soil Pollution* Vol.116, pp99-110

⁹ Flückiger, W. and Braun, S. (1998) Nitrogen deposition in Swiss forests and its possible relevance for leaf nutrient status, parasite attacks and soil acidification *Environmental Pollution* Vol.102, pp69-76

¹⁰ Flückiger, W. and Braun, S. (2004) Wie geht es unserem Wald? Ergebnisse aus Dauerbeobachtungsflächen von 1984 bis 2004 67

¹¹ Flückiger, W. and Braun, S. (2011) Auswirkung erhöhter Stickstoffbelastung auf die Stabilität des Waldes

¹² Vangelova, E. and Pitman, R. (2011) Impacts of Short Rotation Forestry on Soil Sustainability In McKay, H. (ed.) *Short Rotation Forestry: review of growth and environmental impacts* 212pp

¹³ Braun, S., Thomas, V.F.D., Quiring, R. and Flückiger, W. (2010) Does nitrogen deposition increase forest production? The role of phosphorus *Environmental Pollution* 158 2043-2052

¹⁴ <https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S1002737&ReportTitle=Aston Rowant SSSI>

growth of more competitive species, and growth suppression of some species could occur, however physiological and biochemical changes are considered to be unlikely as the evidence indicates that they are triggered at much higher concentrations.

- 5.33 These growth effects would be likely to become noticeable over the long-term, most likely manifesting themselves as changes in species composition and habitat structure. Indeed the M40 has been operational through the SAC since 1974 and the habitats at Aston Rowant would have been exposed to high concentrations of NO_x throughout that period, therefore it is expected that any long-term impacts on the structure and function of the habitats within the site would have been identified through habitat condition monitoring. Condition assessments at the SAC indicate that the unit potentially affected by the elevated NO_x concentrations and nutrient nitrogen deposition (Unit 4) has remained in favourable condition over a period of at least 11 years, which indicates that there has been no significant ecological response to the prolonged exposure to elevated concentrations of NO_x or N deposition, or that any response has been so subtle as to not materially affect the condition targets for the habitats, which Natural England use to establish compliance with the conservation objectives. Given that SAC is still understood to be in favourable condition, and that the overall NO_x concentrations and nutrient nitrogen deposition are expected to continue to fall over time despite the effects of growth on increased traffic flows, it is considered highly unlikely that the structure or function of the qualifying features would not be maintained.

Ecological Conclusion

- 5.34 In summary, and in light of the above discussion, despite the screening threshold for NO_x and nutrient nitrogen being exceeded within peripheral parts of the SAC, **the effect would not be expected to result in any material changes to the qualifying features of the SAC** for the following reasons:
- Using 'CURED' vehicle emissions is highly precautionary and no exceedances in screening thresholds were triggered under the EFT emissions. In reality the emissions are likely to be between the EFT and CURED predictions.
 - The proportion of SAC qualifying habitat affected by forecast exceedances in nutrient nitrogen deposition is <0.1% of the total area of SAC and therefore the integrity, in terms of ecological coherence, structure and function would not be affected.
 - Calcareous habitat and particularly juniper scrub have been reported to be resilient to the effects of nutrient nitrogen deposition.
 - The SAC, including those locations where screening thresholds have regularly been exceeded, have been in favourable condition for over 11 years despite historic exceedances of the critical level. While the effects of changes to growth rates are technically possible, in the long-term it is expected that such effects would result in notable changes to habitat condition, however no such changes have been recorded within the potentially affected parts of the site during 11 years of condition monitoring.
 - The M40 is located within a steep cutting along much of its length in proximity to the SAC, and therefore the actual distance between the M40 and SAC is often considerably greater than is apparent on 2D mapping. In addition, the topography of the steep cutting is likely to reduce the levels of NO_x and nutrient N reaching the SAC.
 - The majority of the length of M40 in proximity to the SAC is bordered by an intervening belt of dense scrub and woodland habitat, which is likely to act to some degree as a buffer and barrier to the effects of nutrient nitrogen deposition in particular.

6 Mitigation

- 6.1 Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation. It is not considered appropriate to propose further mitigation measures for this scheme. The South Oxfordshire District Council's Air Quality Action Plan will also be helping to deliver improved air quality.
- 6.2 It should be noted that the predicted impacts represent a worst-case scenario with regard to the emissions used. In reality, the introduction of progressively cleaner vehicles into the UK fleet is likely to result in a significant reduction in NO_x emissions from diesel vehicles between 2016 and 2031.
- 6.3 The area of SAC affected by exceedances of critical loads is less than 0.1% of the total area of SAC. The predicted forecast is for background levels of air pollutants to continue to reduce across the majority of the SAC, with background level falling below the critical load. This would be expected to offset the effects of roadside pollutants in the context of the overall condition of the SAC.
- 6.4 The model has also assumed that the M40 is at grade with the surrounding area, including the Aston Rowant SAC. A significant proportion of the M40 is actually within a cutting as the road passes through the SAC. Modelling the road at grade would likely result in a precautionary assessment of concentrations at parts of the SAC where it lies above a cutting as the distance between the emissions source and the receptor is increased, also, entrainment and recirculation of emissions within the cutting would result in a reduced impact outside the cutting.
- 6.5 The cutting is also heavily vegetated by a dense belt of scrub which would act as a buffer by intercepting and absorbing some NO_x from the air before it reaches the SAC^{15,16,17}, therefore concentrations in the SAC which have been buffered by these belts of scrub are likely to be lower than shown by the model, and the 1% screening threshold is likely to be breached over a much smaller area of the SAC (if at all).

¹⁵ Xu, Y. (2008) Modelling the effects of roadside trees, results and conclusions. Report for the London Borough of Harrow. AEA, Harwell, Oxon

¹⁶ Air pollution removal by urban trees and shrubs in the United States (2006). David J. Nowak, Daniel E. Crane, Jack C. Stevens. *Urban Forestry & Urban Greening* Vol. 4, pp115-123

¹⁷ Freer-Smith, P.H., Beckett, K.P. and Taylor, G. (2005). Deposition velocities to *Sorbus aria*, *Acer campestre*, *Populus deltoides* x *trichocarpa* 'Beaupre', *Pinus nigra* and x *Cupressocyparis leylandii* for coarse, fine and ultra-fine particles in the urban environment. *Environmental Pollution* Vol.133, pp157-167

7 Residual Impacts

7.1 The residual impacts will be the same as those identified in **Section 5**.

8 Conclusions

- 8.1 Air quality modelling has been carried out to inform the Appropriate Assessment of the potential effects of the South Oxfordshire Local Plan on the Aston Rowant SAC as a result of increased air pollution in combination with other plans and projects. While the 'worst case' in-combination effects of growth would result in increased NO_x concentrations and N deposition at the periphery of the SAC, levels of nutrient nitrogen deposition exceeding the 1% screening threshold are restricted to the edge of the SAC and are limited to an area comprising less than 0.1% of the total SAC area. When the mitigating factors outlined above, together with the long-term trends and past monitoring at the SAC, and the current favourable condition status of the SAC, these increases are likely to be negligible in ecological terms and are considered unlikely to have an adverse effect on the SAC's qualifying features.

9 References

- APIS. (2018). *APIS*. Retrieved from Air Pollution Information System Database: www.apis.ac.uk
- AQC. (2018a). *Updated CURED to V3A*. Retrieved from <http://www.aqconsultants.co.uk/News/January-2018/UPDATED-CURED-TO-V3A.aspx>
- AQC. (2018b, January). *Development of the CURED V3A Emissions Model*. Retrieved from <http://www.aqconsultants.co.uk/AQC/media/Reports/Development-of-CURED-V3A-110117.pdf>
- AQC. (2018c). *Deriving Background Concentrations of NOx and NO2 for Use with 'CURED V3A'*.
- Carslaw, D., Beevers, S., Westmoreland, E., Williams, M., Tate, J., Murrells, T., et al. (2011). *Trends in NOx and NO2 Emissions and Ambient Measurements in the UK*. Defra.
- DCLG. (2014). *Planning Practice Guidance Air Quality*. Retrieved from <http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality>
- Defra & EA. (2016). *Air Emissions Risk Assessment for your Environmental Permit*. Retrieved from <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>
- Defra. (2007). *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. Defra.
- Defra. (2018a). *Local Air Quality Management (LAQM) Support*. Retrieved from <http://laqm.defra.gov.uk/>
- Defra. (2018b). *UK-AIR*. Retrieved from <http://uk-air.defra.gov.uk/>
- DfT. (2018a). *Traffic Counts*. Retrieved from <http://www.dft.gov.uk/traffic-counts/>
- DfT. (2018b). *Road Traffic Statistics*. Retrieved from <https://www.gov.uk/government/collections/road-traffic-statistics>
- Directive 2009/147/EC of the European Parliament and of the Council*. (2009).
- Environment Agency. (2011). *AQTAG06 Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air*.
- European Parliament, Council of the European Union. (2008). *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe*.
- Highways Agency. (2007). *Design Manual for Roads and Bridges: Volume 11 Environmental Assessment, Section 3, Part 1, HA207/07 Air Quality*.
- IAQM. (2016). *Position Statement - Effect of Air Quality Impacts on Sensitive Habitats*.
- Ministry of Housing, Communities & Local Government. (2018). *National Planning Policy Framework*.
- The Stationary Office. (2010a). *Statutory Instrument 2010, No 1001, The Air Quality Standards Regulations 2010*. London.
- The Stationary Office. (2010b). *The Conservation of Habitats and Species Regulations 2010 (No. 490)*. Stationery Office.

10 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System
CURED	Calculator Using Realistic Emissions for Diesels
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
EPUK	Environmental Protection UK
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

11 Appendices

A1 Modelling Methodology

Model Inputs

Receptors

Table A1: Location of Transect Receptors

Receptor	Location	x	y	z
TR1_0	Transect1	472411.09	196966.06	0
TR1_1	Transect1	472411.84	196966.73	0
TR1_2	Transect1	472412.59	196967.41	0
TR1_3	Transect1	472413.31	196968.08	0
TR1_4	Transect1	472414.06	196968.73	0
TR1_5	Transect1	472414.81	196969.41	0
TR1_6	Transect1	472415.56	196970.08	0
TR1_7	Transect1	472416.31	196970.73	0
TR1_8	Transect1	472417.06	196971.41	0
TR1_9	Transect1	472417.78	196972.08	0
TR1_10	Transect1	472418.53	196972.73	0
TR1_11	Transect1	472419.28	196973.41	0
TR1_12	Transect1	472420.03	196974.08	0
TR1_13	Transect1	472420.78	196974.73	0
TR1_14	Transect1	472421.53	196975.41	0
TR1_15	Transect1	472422.28	196976.08	0
TR1_16	Transect1	472423	196976.73	0
TR1_17	Transect1	472423.75	196977.41	0
TR1_18	Transect1	472424.5	196978.08	0
TR1_19	Transect1	472425.25	196978.73	0
TR1_20	Transect1	472426	196979.41	0
TR1_21	Transect1	472426.75	196980.08	0
TR1_22	Transect1	472427.47	196980.75	0
TR1_23	Transect1	472428.22	196981.41	0
TR1_24	Transect1	472428.97	196982.08	0
TR1_25	Transect1	472429.72	196982.75	0
TR1_26	Transect1	472430.47	196983.41	0
TR1_27	Transect1	472431.22	196984.08	0
TR1_28	Transect1	472431.94	196984.75	0
TR1_29	Transect1	472432.69	196985.41	0
TR1_30	Transect1	472433.44	196986.08	0
TR1_31	Transect1	472434.19	196986.75	0
TR1_32	Transect1	472434.94	196987.41	0
TR1_33	Transect1	472435.69	196988.08	0
TR1_34	Transect1	472436.44	196988.75	0

Receptor	Location	x	y	z
TR1_35	Transect1	472437.16	196989.41	0
TR1_36	Transect1	472437.91	196990.08	0
TR1_37	Transect1	472438.66	196990.75	0
TR1_38	Transect1	472439.41	196991.41	0
TR1_39	Transect1	472440.16	196992.08	0
TR1_40	Transect1	472440.91	196992.75	0
TR1_41	Transect1	472441.62	196993.42	0
TR1_42	Transect1	472442.38	196994.08	0
TR1_43	Transect1	472443.12	196994.75	0
TR1_44	Transect1	472443.88	196995.42	0
TR1_45	Transect1	472444.62	196996.08	0
TR1_46	Transect1	472445.38	196996.75	0
TR1_47	Transect1	472446.12	196997.42	0
TR1_48	Transect1	472446.84	196998.08	0
TR1_49	Transect1	472447.59	196998.75	0
TR1_50	Transect1	472448.34	196999.42	0
TR2_0	Transect2	472913.72	196609.38	0
TR2_1	Transect2	472914.12	196610.28	0
TR2_2	Transect2	472914.53	196611.2	0
TR2_3	Transect2	472914.91	196612.12	0
TR2_4	Transect2	472915.31	196613.03	0
TR2_5	Transect2	472915.72	196613.95	0
TR2_6	Transect2	472916.12	196614.88	0
TR2_7	Transect2	472916.5	196615.8	0
TR2_8	Transect2	472916.91	196616.7	0
TR2_9	Transect2	472917.31	196617.62	0
TR2_10	Transect2	472917.72	196618.55	0
TR2_11	Transect2	472918.09	196619.45	0
TR2_12	Transect2	472918.5	196620.38	0
TR2_13	Transect2	472918.91	196621.3	0
TR2_14	Transect2	472919.31	196622.22	0
TR2_15	Transect2	472919.69	196623.12	0
TR2_16	Transect2	472920.09	196624.05	0
TR2_17	Transect2	472920.5	196624.97	0
TR2_18	Transect2	472920.91	196625.88	0
TR2_19	Transect2	472921.28	196626.8	0
TR2_20	Transect2	472921.69	196627.72	0
TR2_21	Transect2	472922.09	196628.62	0
TR2_22	Transect2	472922.5	196629.55	0
TR2_23	Transect2	472922.88	196630.47	0
TR2_24	Transect2	472923.28	196631.39	0
TR2_25	Transect2	472923.69	196632.3	0
TR2_26	Transect2	472924.09	196633.22	0
TR2_27	Transect2	472924.47	196634.14	0
TR2_28	Transect2	472924.88	196635.05	0

Receptor	Location	x	y	z
TR2_29	Transect2	472925.28	196635.97	0
TR2_30	Transect2	472925.69	196636.89	0
TR2_31	Transect2	472926.06	196637.81	0
TR2_32	Transect2	472926.47	196638.72	0
TR2_33	Transect2	472926.88	196639.64	0
TR2_34	Transect2	472927.28	196640.56	0
TR2_35	Transect2	472927.66	196641.47	0
TR2_36	Transect2	472928.06	196642.39	0
TR2_37	Transect2	472928.47	196643.31	0
TR2_38	Transect2	472928.84	196644.22	0
TR2_39	Transect2	472929.25	196645.14	0
TR2_40	Transect2	472929.66	196646.06	0
TR2_41	Transect2	472930.06	196646.98	0
TR2_42	Transect2	472930.44	196647.89	0
TR2_43	Transect2	472930.84	196648.81	0
TR2_44	Transect2	472931.25	196649.73	0
TR2_45	Transect2	472931.66	196650.64	0
TR2_46	Transect2	472932.03	196651.56	0
TR2_47	Transect2	472932.44	196652.48	0
TR2_48	Transect2	472932.84	196653.41	0
TR2_49	Transect2	472933.25	196654.31	0
TR2_50	Transect2	472933.62	196655.23	0
TR3_0	Transect3	474047.75	196503.11	0
TR3_1	Transect3	474047.53	196504.09	0
TR3_2	Transect3	474047.31	196505.06	0
TR3_3	Transect3	474047.06	196506.03	0
TR3_4	Transect3	474046.84	196507	0
TR3_5	Transect3	474046.59	196507.98	0
TR3_6	Transect3	474046.38	196508.95	0
TR3_7	Transect3	474046.16	196509.92	0
TR3_8	Transect3	474045.91	196510.91	0
TR3_9	Transect3	474045.69	196511.88	0
TR3_10	Transect3	474045.47	196512.84	0
TR3_11	Transect3	474045.22	196513.81	0
TR3_12	Transect3	474045	196514.8	0
TR3_13	Transect3	474044.75	196515.77	0
TR3_14	Transect3	474044.53	196516.73	0
TR3_15	Transect3	474044.31	196517.7	0
TR3_16	Transect3	474044.06	196518.69	0
TR3_17	Transect3	474043.84	196519.66	0
TR3_18	Transect3	474043.59	196520.62	0
TR3_19	Transect3	474043.38	196521.61	0
TR3_20	Transect3	474043.16	196522.58	0
TR3_21	Transect3	474042.91	196523.55	0
TR3_22	Transect3	474042.69	196524.52	0

Receptor	Location	x	y	z
TR3_23	Transect3	474042.44	196525.5	0
TR3_24	Transect3	474042.22	196526.47	0
TR3_25	Transect3	474042	196527.44	0
TR3_26	Transect3	474041.75	196528.41	0
TR3_27	Transect3	474041.53	196529.39	0
TR3_28	Transect3	474041.31	196530.36	0
TR3_29	Transect3	474041.06	196531.33	0
TR3_30	Transect3	474040.84	196532.3	0
TR3_31	Transect3	474040.59	196533.28	0
TR3_32	Transect3	474040.38	196534.25	0
TR3_33	Transect3	474040.16	196535.22	0
TR3_34	Transect3	474039.91	196536.2	0
TR3_35	Transect3	474039.69	196537.17	0
TR3_36	Transect3	474039.44	196538.14	0
TR3_37	Transect3	474039.22	196539.11	0
TR3_38	Transect3	474039	196540.09	0
TR3_39	Transect3	474038.75	196541.06	0
TR3_40	Transect3	474038.53	196542.03	0
TR3_41	Transect3	474038.28	196543	0
TR3_42	Transect3	474038.06	196543.98	0
TR3_43	Transect3	474037.84	196544.95	0
TR3_44	Transect3	474037.59	196545.92	0
TR3_45	Transect3	474037.38	196546.91	0
TR3_46	Transect3	474037.16	196547.88	0
TR3_47	Transect3	474036.91	196548.84	0
TR3_48	Transect3	474036.69	196549.81	0
TR3_49	Transect3	474036.44	196550.8	0
TR3_50	Transect3	474036.22	196551.77	0
TR4_0	Transect4	474059.59	196448.03	0
TR4_1	Transect4	474059.81	196447.06	0
TR4_2	Transect4	474060.03	196446.08	0
TR4_3	Transect4	474060.25	196445.11	0
TR4_4	Transect4	474060.47	196444.14	0
TR4_5	Transect4	474060.69	196443.16	0
TR4_6	Transect4	474060.91	196442.19	0
TR4_7	Transect4	474061.12	196441.2	0
TR4_8	Transect4	474061.34	196440.23	0
TR4_9	Transect4	474061.56	196439.25	0
TR4_10	Transect4	474061.78	196438.28	0
TR4_11	Transect4	474062	196437.31	0
TR4_12	Transect4	474062.25	196436.33	0
TR4_13	Transect4	474062.47	196435.36	0
TR4_14	Transect4	474062.69	196434.38	0
TR4_15	Transect4	474062.91	196433.41	0
TR4_16	Transect4	474063.12	196432.44	0

Receptor	Location	x	y	z
TR4_17	Transect4	474063.34	196431.45	0
TR4_18	Transect4	474063.56	196430.48	0
TR4_19	Transect4	474063.78	196429.5	0
TR4_20	Transect4	474064	196428.53	0
TR4_21	Transect4	474064.22	196427.55	0
TR4_22	Transect4	474064.44	196426.58	0
TR4_23	Transect4	474064.66	196425.61	0
TR4_24	Transect4	474064.88	196424.62	0
TR4_25	Transect4	474065.12	196423.66	0
TR4_26	Transect4	474065.34	196422.67	0
TR4_27	Transect4	474065.56	196421.7	0
TR4_28	Transect4	474065.78	196420.73	0
TR4_29	Transect4	474066	196419.75	0
TR4_30	Transect4	474066.22	196418.78	0
TR4_31	Transect4	474066.44	196417.8	0
TR4_32	Transect4	474066.66	196416.83	0
TR4_33	Transect4	474066.88	196415.84	0
TR4_34	Transect4	474067.09	196414.88	0
TR4_35	Transect4	474067.31	196413.91	0
TR4_36	Transect4	474067.53	196412.92	0
TR4_37	Transect4	474067.75	196411.95	0
TR4_38	Transect4	474067.97	196410.97	0
TR4_39	Transect4	474068.22	196410	0
TR4_40	Transect4	474068.44	196409.03	0
TR4_41	Transect4	474068.66	196408.05	0
TR4_42	Transect4	474068.88	196407.08	0
TR4_43	Transect4	474069.09	196406.09	0
TR4_44	Transect4	474069.31	196405.12	0
TR4_45	Transect4	474069.53	196404.14	0
TR4_46	Transect4	474069.75	196403.17	0
TR4_47	Transect4	474069.97	196402.2	0
TR4_48	Transect4	474070.19	196401.22	0
TR4_49	Transect4	474070.41	196400.25	0
TR4_50	Transect4	474070.62	196399.27	0
TR5_0	Transect5	472860.19	196543.69	0
TR5_1	Transect5	472859.78	196542.77	0
TR5_2	Transect5	472859.38	196541.86	0
TR5_3	Transect5	472858.97	196540.94	0
TR5_4	Transect5	472858.59	196540.02	0
TR5_5	Transect5	472858.19	196539.11	0
TR5_6	Transect5	472857.78	196538.19	0
TR5_7	Transect5	472857.38	196537.27	0
TR5_8	Transect5	472857	196536.36	0
TR5_9	Transect5	472856.59	196535.44	0
TR5_10	Transect5	472856.19	196534.52	0

Receptor	Location	x	y	z
TR5_11	Transect5	472855.78	196533.61	0
TR5_12	Transect5	472855.41	196532.69	0
TR5_13	Transect5	472855	196531.77	0
TR5_14	Transect5	472854.59	196530.84	0
TR5_15	Transect5	472854.19	196529.94	0
TR5_16	Transect5	472853.81	196529.02	0
TR5_17	Transect5	472853.41	196528.09	0
TR5_18	Transect5	472853	196527.19	0
TR5_19	Transect5	472852.59	196526.27	0
TR5_20	Transect5	472852.22	196525.34	0
TR5_21	Transect5	472851.81	196524.44	0
TR5_22	Transect5	472851.41	196523.52	0
TR5_23	Transect5	472851	196522.59	0
TR5_24	Transect5	472850.62	196521.67	0
TR5_25	Transect5	472850.22	196520.77	0
TR5_26	Transect5	472849.81	196519.84	0
TR5_27	Transect5	472849.41	196518.92	0
TR5_28	Transect5	472849.03	196518.02	0
TR5_29	Transect5	472848.62	196517.09	0
TR5_30	Transect5	472848.22	196516.17	0
TR5_31	Transect5	472847.81	196515.27	0
TR5_32	Transect5	472847.44	196514.34	0
TR5_33	Transect5	472847.03	196513.42	0
TR5_34	Transect5	472846.62	196512.52	0
TR5_35	Transect5	472846.22	196511.59	0
TR5_36	Transect5	472845.84	196510.67	0
TR5_37	Transect5	472845.44	196509.75	0
TR5_38	Transect5	472845.03	196508.84	0
TR5_39	Transect5	472844.62	196507.92	0
TR5_40	Transect5	472844.25	196507	0
TR5_41	Transect5	472843.84	196506.09	0
TR5_42	Transect5	472843.44	196505.17	0
TR5_43	Transect5	472843.03	196504.25	0
TR5_44	Transect5	472842.62	196503.34	0
TR5_45	Transect5	472842.25	196502.42	0
TR5_46	Transect5	472841.84	196501.5	0
TR5_47	Transect5	472841.44	196500.58	0
TR5_48	Transect5	472841.03	196499.67	0
TR5_49	Transect5	472840.66	196498.75	0
TR5_50	Transect5	472840.25	196497.83	0

Traffic Data

A1.1. The AADT flows for the M40 adjacent to the Aston Rowant SAC have been provided by Atkins. The vehicle fleet composition data have been determined using data from the interactive web-based map provided by the Department for Transport (DfT) (DfT, 2018a). The vehicle fleet

composition is assumed to remain the same for the 2031 scenarios as it is in 2016. Traffic speeds have been estimated based on the motorway speed limit (70 mph). The traffic data are shown in **Table A2**. The modelled road network is shown in **Figure 2**.

- A1.2. It has been assumed that the M40 is at grade with the surrounding area, including the Aston Rowant SAC. Some parts of the M40 are within a cutting as the road passes through the SAC. Modelling the road at grade would likely result in a conservative assessment of concentrations at parts of the SAC where it lies above a cutting as the distance between the emissions source and the receptor is decreased, also, entrainment and recirculation of emissions within the cutting would result in a reduced impact outside the cutting.
- A1.3. The transects have been located at points where the SAC is closest to the M40, which is also where the M40 is almost level with the SAC. Much of the SAC is located at a higher level than the road, and the impacts at these locations would be smaller; however, transects 3 and 4 are located where the M40 is level with SAC.
- A1.4. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by the DfT (DfT, 2018b).

Table A2: Summary of Traffic Data used in the Assessment ^a

Road Link	AADT				Fleet Composition (%)					
	2016	2031			Car	LGV	Rigid HGV	Artic HGV	Bus Coach	MC
		Do-minimum	Scenario 5A	Scenario 5B						
M40 northbound	48,896	59,600	60,900	62,400	77.77	11.41	4.42	5.41	0.56	0.42
M40 southbound	49,675	56,100	56,200	58,700	78.61	11.08	4.01	5.19	0.62	0.49

^a LGV = light goods vehicle (<3.5 tonnes), HGV = heavy goods vehicle (>3.5 tonnes), MC = motorcycle

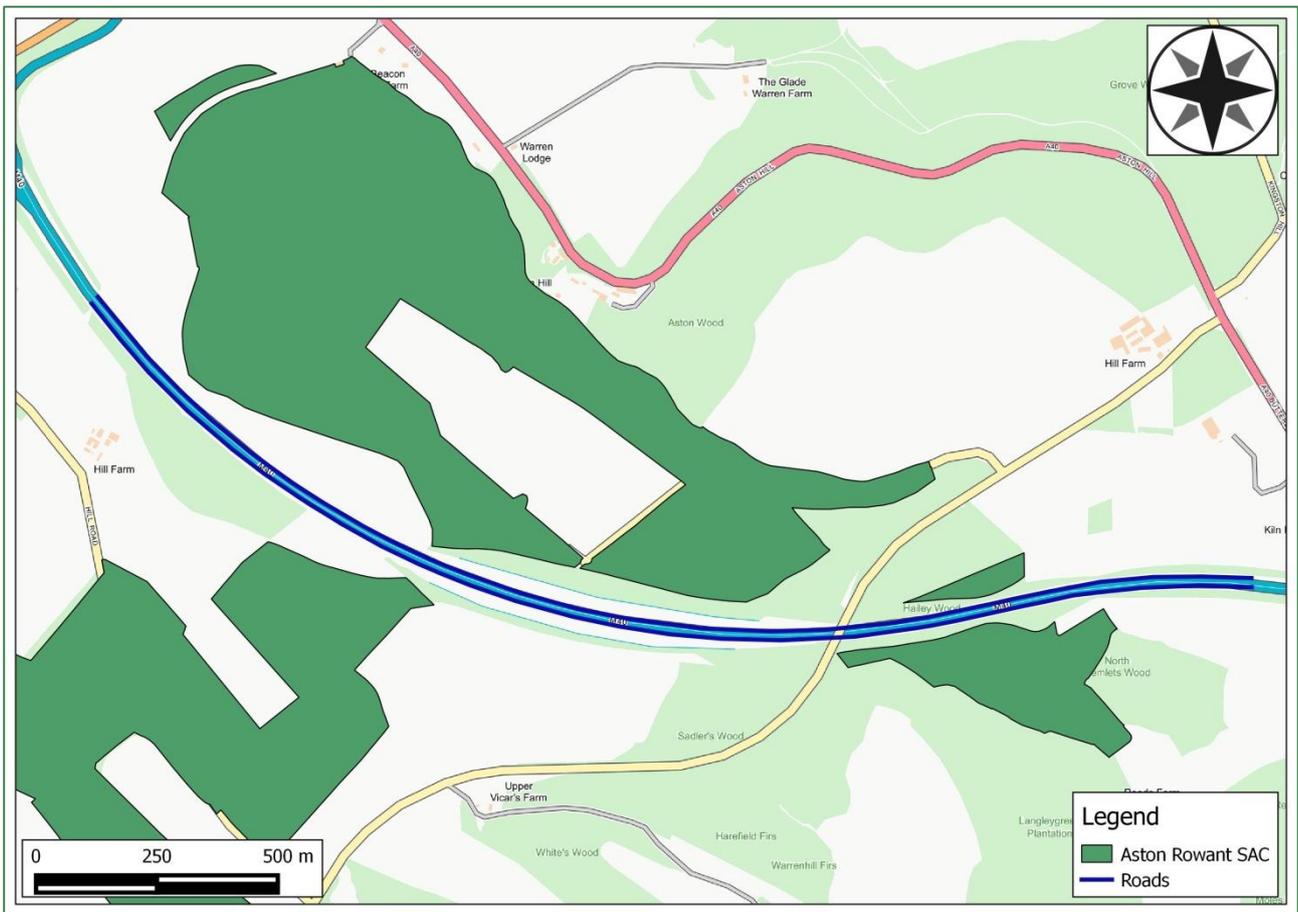


Figure 2: Modelled Roads

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Emissions

- A1.5. Emissions have been calculated using the most recent version of the Emissions Factor Toolkit (EFT) v8.0.1 (Defra, 2018a). The traffic data were entered into the EFT in order to calculate a combined emission rate for each of the road links in the modelled network. Emissions data are only available up to 2030; therefore, it has been assumed that emissions in 2031 will be the same as those in 2030.
- A1.6. The road traffic emissions for the sensitivity analysis have been calculated using the Calculator Using Realistic Emissions for Diesels (CURED) tool (V3A) (AQC, 2018a).

Meteorological Data

- A1.7. The model has been run using the full year of meteorological data that corresponds with the most recent set of monitoring data used for model verification (2016). The meteorological data has been taken from the monitoring station located at RAF Benson, approximately 10 km to the southwest of the SAC, which is considered suitable for the area. The data was provided by ADM Ltd, and a wind rose of the data is shown in **Figure 3**.

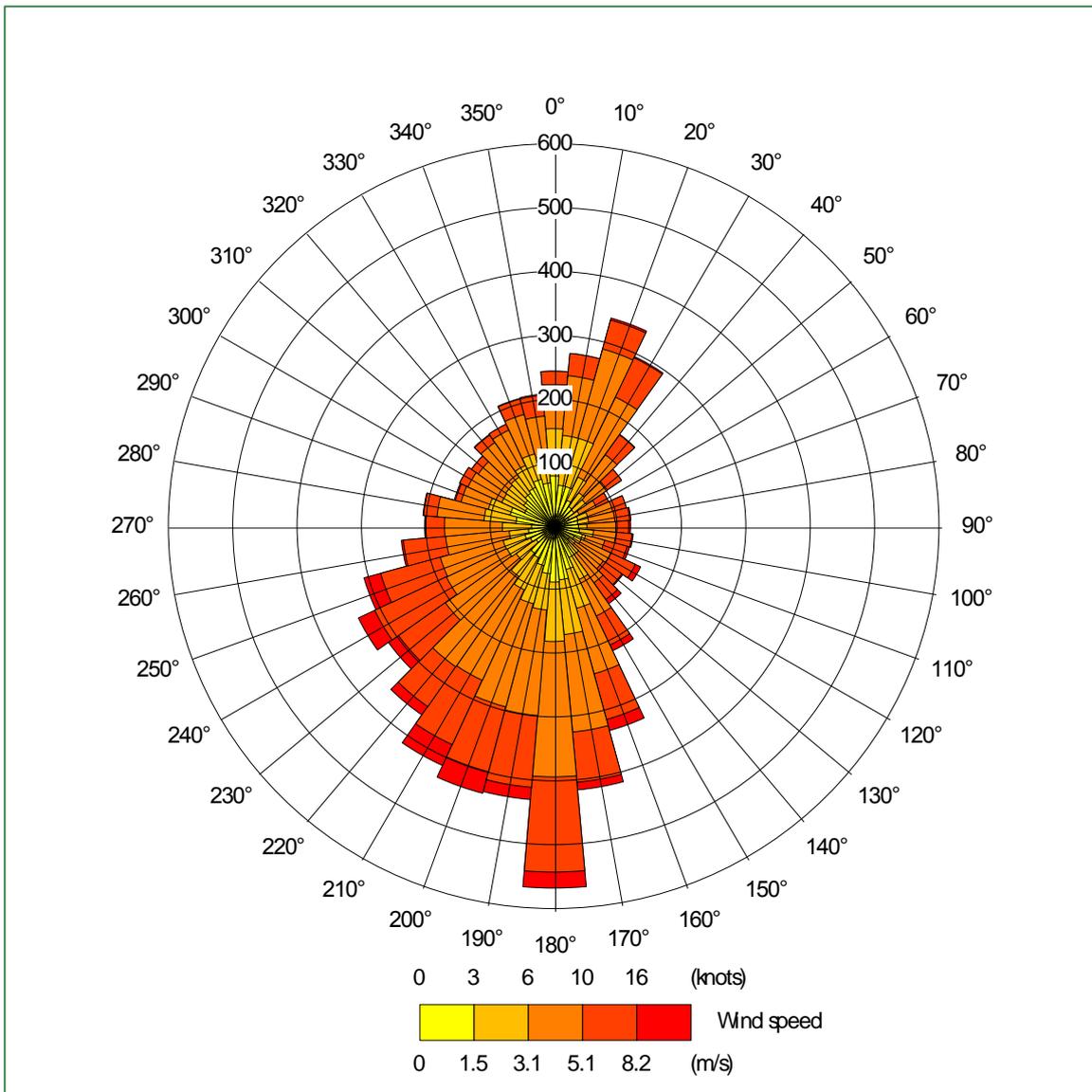


Figure 3: Wind Rose RAF Benson 2016

Background Concentrations

- A1.8. Background NO_x and NO₂ concentrations have been derived from those published by Defra (Defra, 2018b). These cover the whole country on a 1 km by 1 km grid and are published for each year from 2015 to 2030. The current maps have been verified against measurements undertaken during 2015. As the background maps are only available up to 2030, it has been assumed that background concentrations in 2031 will be the same as those in 2030. The background concentrations for the sensitivity analysis have been adjusted using the CURED methodology (AQC, 2018c).
- A1.9. Background nitrogen and acid deposition data have been taken from the APIS database (APIS, 2018). Future year background deposition fluxes have been estimated using the DMRB methodology, which assumes a 2% per year reduction in deposition levels (Highways Agency, 2007).

Verification

A1.10. The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations. The model has been verified against data from two diffusion tube monitoring sites located close to the M40, approximately 4km northwest of the study area. The verification methodology is described below.

Background Concentrations

A1.11. Background concentrations at each of the monitoring sites in the verification year (2016) have been derived from those published by Defra (Defra, 2018b) and are shown in **Table A3**.

Table A3: Annual Mean NO_x and NO₂ Background Concentrations at the Monitoring Sites (µg/m³)

Monitoring Site ID	Monitoring Site Location	Grid Square	2016	
			NO _x	NO ₂
S57	M40, 9 Adwell Cottages	470500,200500	16.8	12.5
S61	M40, 10 Adwell Cottages	470500,200500	16.8	12.5

Traffic Data

A1.12. The AADT flows and the vehicle fleet composition data have been determined using data from the interactive web-based map provided by the Department for Transport (DfT) (DfT, 2018a). Traffic speeds have been estimated based on the speed limits, the road layout and the proximity to a junction. The traffic data used for verification are shown in **Table A4**.

Table A4: Summary of Traffic Data used for Verification (2016) ^a

Road Link	AADT	Fleet Composition (%)					
		Car	LGV	Rigid HGV	Artic HGV	Bus Coach	MC
A40 2-way	5,531	81.3	13.7	2.2	0.4	0.3	2.1
M40 northbound	57,339	78.5	11.4	4.0	4.9	0.6	0.5
M40 southbound	49,953	79.6	10.5	4.0	4.7	0.7	0.5

^a LGV = light goods vehicle (<3.5 tonnes), HGV = heavy goods vehicle (>3.5 tonnes), MC = motorcycle

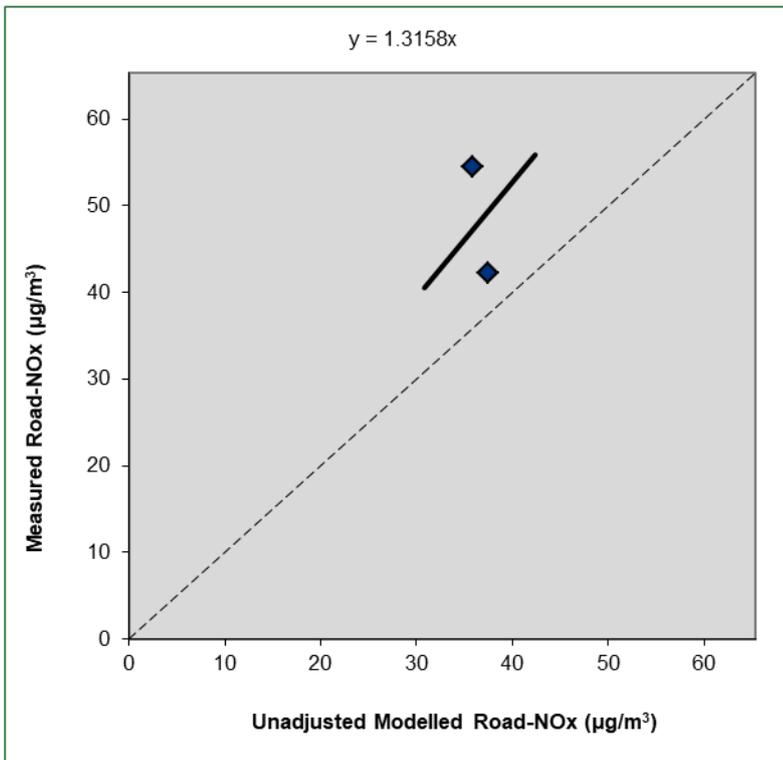


Figure 4: Modelled Roads and Monitoring Sites used for Verification

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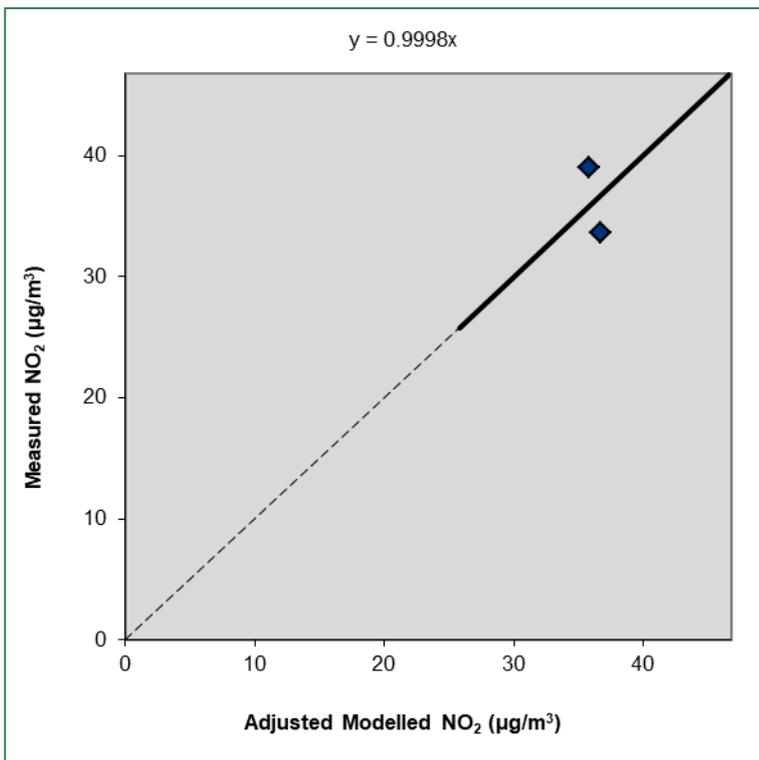
NO₂

- A1.13. Most NO₂ is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the 2016 annual mean NO_x concentrations at two diffusion tube monitoring sites located close to the M40, as shown in **Figure 4**.
- A1.14. The model output of road-NO_x has been compared with the 'measured' road-NO_x, calculated from the measured annual mean NO₂ concentrations and the background concentrations using the NO_x from NO₂ calculator v6.1 published by Defra (Defra, 2018a).
- A1.15. The slope of the best-fit line between the 'measured' road-NO_x contribution and the model derived road-NO_x contribution, forced through zero, has been used to determine the adjustment factor (**Figure 5**). The adjustment factor of 1.316 has been applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations. The NO_x to NO₂ calculator has then been used to determine total NO₂ concentrations from the adjusted modelled road-NO_x concentrations and the background NO₂ concentrations. A comparison of the final adjusted modelled total NO₂ at each monitoring site to the measured total NO₂ shows close agreement (**Figure 6**).



Correlation Coefficient: -1.00
 RMSE: 13.32
 Fractional Bias: 0.28

Figure 5: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations.



Correlation Coefficient: -1.00
 RMSE: 3.17
 Fractional Bias: 0.00

Figure 6: Comparison of Measured Total NO₂ to Primary Adjusted Modelled Total NO₂ Concentrations.

Model Post-processing

NO₂

A1.16. The NO_x to NO₂ calculator v6.1 published by Defra (Defra, 2018a) has been used to convert the modelled, verified road-NO_x output for each receptor to road-NO₂.

Deposition Fluxes

A1.17. Deposition has been calculated from the predicted ambient NO₂ concentration using the deposition velocity for forests of 0.003 m/s published by the Environment Agency (Environment Agency, 2011).

A1.18. The deposition velocity multiplied by the predicted concentration (µg/m³) gives the deposition flux (µg/m²/s). A factor of 96 was then used to calculate the nutrient nitrogen deposition due to NO₂ in units of kg/ha/yr (Environment Agency, 2011).

A1.19. The acid nitrogen deposition has been calculated from the nutrient nitrogen deposition using a factor of 0.071428 (Environment Agency, 2011).

A1.20. Wet deposition has not been assessed as it is not considered to be significant within the distances covered by the study area (Environment Agency, 2011).

A2 Professional Experience

Bob Thomas, BSc (Hons) PgDip MSc MIEnvSc MIAQM CSci

Bob Thomas is a Director at AQA, with over eleven years' experience in the field of air quality management and assessment. He has carried out air quality assessments for a wide range of developments, including residential, commercial, industrial, minerals and waste developments. He has been responsible for air quality projects that include ambient air quality monitoring of nitrogen dioxide, dust and PM₁₀, the assessment of nuisance odours and dust, and the preparation of Review and Assessment reports for local authorities. He has extensive dispersion modelling experience for road traffic, energy centre and industrial sources, and has completed many stand-alone reports and chapters for inclusion within an Environmental Statement. Bob has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers, architects and process operators, and has provided expert witness services at public inquiry. He is a Chartered Scientist, a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

A full CV for Bob Thomas is available at <http://aqassessments.co.uk/about>