

**Begbroke Innovation District  
23/02098/OUT**

Information to Inform a Habitats  
Regulations Assessment (IHRA)

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<b>Client</b>	Oxford University Development
<b>Project</b>	Begbroke Innovation District
<b>Version</b>	FINAL
<b>Project number</b>	P22-1029 Begbroke IHRA

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<b>Reviewed</b>	Peter Shepherd	Director	24 July 2023
<b>Approved for issue to client</b>	Peter Shepherd	Director	24 July 2023
<b>Issued to client</b>	Tom Flynn	Principal Ecologist	24 July 2023
<b>Revised and re-issued</b>	Tom Flynn	Principal Ecologist	02 Sept 2023
<b>Revised and re-issued following consultation with Natural England</b>	Tom Flynn	Principal Ecologist	14 Aug 2024

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## 1 Introduction

- 1.1 This Information to support a Habitats Regulations Assessment (IHRA) has been prepared by BSG Ecology on behalf of OUD Ltd (the 'Applicant'). The Applicant is a joint venture partnership between Oxford University and Legal & General.
- 1.2 The IHRA considers the implications of the proposed Begbroke Innovation District development on sites within the UK's National Site Network (formerly called European Sites) within the Zone of Influence ('Zol') of the proposed development ('Proposed Development').

### Site and the Proposed Development

- 1.3 The site of the Proposed Development ('Site') is centred at Ordnance Survey National Grid Reference SP 47883 13533 and is within the administrative area of Cherwell District Council (CDC). The location of the Site is shown in Figure 1 and comprises approximately 170 hectares of land to the east of the villages of Yarnton and Begbroke, north of Oxford.
- 1.4 The Applicant has submitted an outline planning application for a mixed-use development of Begbroke Science Park and surrounding land known as the 'Begbroke Innovation District' which has been validated by CDC and given reference number 23/02098/OUT.
- 1.5 The Site forms part of a wider allocated area for development in the Cherwell Local Plan 2011-2031 (Part 1) Partial Review (Cherwell District Council, 2020) which was adopted in September 2020. Specifically, the Site forms part of 'Policy PR8: Land east of A44 at Begbroke/Yarnton' and is one of six strategic site allocations identified to meet Oxford's unmet housing need.
- 1.6 The Proposed Development would provide up to 215,000 square metres (sqm) gross external area (GEA) of residential floorspace. This would be capable of delivering approximately 1,800 new homes (including affordable homes and houses of multiple occupation); up to 155,000 sqm of flexible employment space associated with the expansion of Begbroke Science Park; and supporting retail, leisure, education and community/amenity uses. The Proposed Development will also include highway works, new cycle and pedestrian paths, safeguarded land for a rail halt and substantial areas of landscape and public realm.

### Purpose of this Report

- 1.7 This report provides relevant technical information to help enable CDC, as the competent authority to discharge their statutory functions under Regulations 7 and 63 (requirement to carry out Appropriate Assessment) of the Conservation of Habitats and Species Regulations 2017 (as amended) ('2017 Regulations') in relation to the Proposed Development of the Site. See 'Legislative Background' below for further details of the relevant legislation.
- 1.8 The IHRA sets out the contextual baseline for the Site, identifies the potential National Site Network sites within the Zol and the potential sources of effects upon those sites arising from the Proposed Development. These are then considered within Stage 1 of the Habitats Regulations Assessment ('HRA') process, known as the 'Screening Stage'. Likely Significant Effects ('LSE') are screened in or out. LSE screened in are then subject to further assessment as to whether the Proposed Development would have adverse effects upon the integrity of sites within the National Site Network during Stage 2 of the assessment known as the 'Appropriate Assessment'.

### Legislative Background

- 1.9 The source directive that led to European Community requirements for HRA originated from E218C Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora ('the Habitats Directive') which are transposed into domestic law by means of the 2017 Regulations. The 2017 Regulations were amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ('2019 Regulations') to enable them to continue to be operative following the UK's exit from the European Union. The 2017 Regulations as amended by the 2019 Regulations are subsequently referred to in this IHRA as the 'Habitats Regulations'. Local planning authorities have

a statutory duty under Regulation 63 of the Habitats Regulations to assess the likely significant implications of a plan or project on National Site Network sites either individually or in combination with other plans and projects.

- 1.10 Competent authorities have a statutory duty under Regulation 63 of the Habitats Regulations to assess the likely significant implications of a plan or project on National Site Network sites either individually or in combination with other plans and projects.
- 1.11 National Site Network sites are defined as Special Protection Areas (SPA), Special Areas of Conservation (SAC) designated under the Habitats Regulations and sites designated under the Ramsar Convention on Wetlands of International Importance 1971 ('Ramsar Sites'). In addition, it is a matter of law that candidate SACs (cSCA) and potential SPAs (pSPA) are also considered.
- 1.12 Regulation 63 (1) of the Habitats Regulations states that: "...a competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and (b) is not directly connected with or necessary to the management of that site, must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives."
- 1.13 Regulation 63 (2) of the Habitats Regulations further states that "a person applying for any such consent, permission or other authorisation must provide such information as the competent authority may reasonably require for the purposes of the assessment or to enable it to determine whether an appropriate assessment is required".
- 1.14 Regulation 63 (3) of the Habitats Regulations states that "the competent authority must for the purposes of the assessment consult the appropriate nature conservation body and have regards to any representations made by that body within such reasonable time as the authority specifies".
- 1.15 Regulation 63 (5) of the Habitats Regulations goes on to state that "in the light of the conclusions of the assessment, and subject to regulation 64, the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European Site or the European offshore marine site (as the case may be)".
- 1.16 Regulation 63 (6) of the Habitats Regulations concludes that "in considering whether a plan or project will adversely affect the integrity of the site, the competent authority must have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which it proposes that the consent, permission or other authorisation should be given".
- 1.17 Regulation 63 of the Habitats Regulations defines that HRA is a two-stage process:
  - **Stage 1** - Under Regulation 63(1)(a), Stage 1 is to assess whether or not the plan or project is likely to have a significant effect on a European site, either alone or in combination with other plans or projects. When carrying out this initial 'screening' assessment, it is necessary to determine if the plan or project is directly connected with or necessary to the management (conservation) of the site (Regulation 63(1)(b)).
  - **Stage 2** - If it is found to be the case and based on objective information that the plan or project either individually or in combination with other plans and projects is likely to have a significant effect on a European site, and that it is not directly connected with or necessary for the management of the site, the requirement for completing Stage 2 is triggered. Stage 2 is set out at the end of Regulation 63(1) of the Habitats Regulations. This states that (where the above conditions have been met) the competent authority (in this case CDC) shall make an appropriate assessment of the implications for the European Site(s) in view of that European Site's conservation objectives to ascertain whether there would be an adverse effect on the integrity of the National Site Network sites(s).
- 1.18 Following the Court of Justice of the European Union case of *People Over Wind and Sweetman v Coillte Teoranta* (C-323/17 ('People over Wind')) mitigation measures intended to avoid or reduce impacts on a European Site cannot be regarded as part of the 'project' and therefore should not be

taken into account at the screening Stage 1 when judging whether LSE on the integrity of a European Site can occur.

- 1.19 The Habitats Regulation Assessment Handbook was updated in light of the People over Wind judgment to state that any measures inherently part of the project design (e.g., embedded mitigation) which are not specifically incorporated into the project for mitigation reasons, but reduce ecological effects, can be considered at the Stage 1 screening stage. If there is reliance on mitigation measures as part of the project, which would not have been put in place without the presence of a European Site, then an appropriate assessment under Stage 2 is required.
- 1.20 Paragraph 65-007-20190722 of the national Planning Practice Guidance ('PPG') also confirms that features that are integral to the design or physical characteristics of a project that is being assessed may be considered at the screening stage.
- 1.21 Although it is the duty of the competent authority to undertake the Stage 1 screening test, the relevant information needs to be provided by the applicant to enable them, as the competent authority, to carry out their statutory duties under the Habitats Regulations. This derives from Regulation 63(2) of the Habitats Regulations which states: *"A person applying for any such consent, permission or other authorisation must provide such information as the competent authority may reasonably require for the purposes of the assessment to enable them to determine whether an appropriate assessment is required."*

#### **Cherwell Local Plan HRA**

- 1.22 A two-stage HRA for the Cherwell District Local Plan Partial Review was carried out by Atkins in August 2018 (Atkins, 2018) and updated (following modifications to the Local Plan) in September 2019 (Atkins, 2019). The 2019 update did not change the findings of the 2018 report. The HRA undertaken for the Cherwell District Local Plan is subsequently referred to as the 'Local Plan HRA'.
- 1.23 The Local Plan HRA considered the potential for impacts of the Local Plan Partial Review (including various policies allocating residential development sites ('PR sites') on Oxford Meadows SAC, with the potential for LSE on any other European or International Site being screened out in the introduction section of the report. The Partial Review includes Policy PR8, which covers a new urban neighbourhood on 190 ha of land to the east of the A44 at Begbroke, to include 1,950 dwellings, plus a local centre and schools.
- 1.24 The Proposed Development is in line with the broad layout, quantum of development, quantum of residential development, and quantum of greenspace specified in Policy PR8. It is therefore considered that the methods and findings of the Local Plan PRA are highly relevant to this IHRA.
- 1.25 At Stage 1 (Screening), the Local Plan HRA concluded that there was potential for PR8 to have LSE on Oxford Meadows SAC via the following pathways:
- recreation;
  - water quality;
  - groundwater flow; and
  - air quality.
- 1.26 It was considered that there was potential for LSE on Oxford Meadows SAC from PR8 considered alone, and from the Partial Plan Review considered in combination with nine other projects and plans that were identified (listed in Table 6.1 of the Local Plan HRA (Atkins 2018)). A Stage 2 assessment (Appropriate Assessment) was therefore carried out. The Local Plan HRA was informed by detailed air quality modelling undertaken by Atkins, addressing 2031 traffic emissions on two roads in proximity to Oxford Meadows SAC (the A34 and the A40). The Air Quality Assessment is Provided in Appendix C of the Local Plan HRA; further details are provided under *Stage 2: Appropriate Assessment* below.

- 1.27 The Stage 2 assessment (Appropriate Assessment) in the Local Plan HRA, in summary, drew the following conclusions in relation to these recreation, water quality, groundwater flow and air quality pathways:
- 1.28 **Recreation** - The Stage 2 Appropriate Assessment concluded that the provision of public open space in the Proposed Submission Plan incorporating Focused Changes and Minor Modifications will be to a standard above that usually required and thus the potential for residents of the new development visiting the Oxford Meadows SAC is further reduced. In addition, the potential for recreational impacts is further reduced by Policies ESD17, BSC10 and BSC11 of the adopted plan. These policies provide for green infrastructure; open space, outdoor sport and recreation provision; and outdoor recreation provision. It was therefore concluded that no adverse effect on the integrity of the Oxford Meadows SAC would result from the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs alone through recreational pressure.
- 1.29 **Water Quality** - The Stage 2 Appropriate Assessment for potential water quality issues concluded that Policies ESD8 and ESD9 of the adopted plan will require developers to demonstrate that during construction and operation of any new development that there will be no adverse effects on water quality of any adjacent or nearby watercourses. The mechanism for delivering these policies will be through the planning application process which will enable compliance with these policies to be secured. It was therefore concluded that no adverse effect on the integrity of the Oxford Meadows SAC would result from the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs alone through changes in water quality.
- 1.30 **Groundwater flow** - The Stage 2 Appropriate Assessment for groundwater flows concluded that Policies PR6a, PR6b, PR7a, PR7b, PR8, PR9 and PR10 of the adopted plan are overlying only semi permeable soils and therefore are unlikely to have a significant contribution to groundwater recharge and will not have an effect on the hydrology of the Oxford Meadows SAC. Furthermore, Policy ESD9 of the adopted plan and the control mechanisms it provides ensure that development will not take place unless it is clearly demonstrated by the developer that groundwater flows will have no adverse effect on the integrity of the Oxford Meadows SAC. It is therefore concluded that no adverse effect on the integrity of the Oxford Meadows SAC would result from the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs alone through changes in groundwater flow.
- 1.31 **Air quality** - The air quality assessment undertaken for the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs Proposed Submission Plan June 2017 concluded that there would be no LSE on the Oxford Meadows SAC, because either HRA screening thresholds for pollutants would not be exceeded at the SAC, or would be exceeded only marginally in close proximity to the A34. It was therefore concluded that the changes introduced by the Partial Review Proposed Submission Plan alone will not lead to an adverse effect on the integrity Oxford Meadows SAC alone as a result of air quality.
- 1.32 The Stage 2 assessment (Appropriate Assessment) concluded that no adverse effect on the integrity of the Oxford Meadows SAC would result from the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs through recreational pressure, water quality, groundwater flow and air quality. This conclusion was made for the PR sites (including PR8) considered together, and in combination with nine other plans and projects for which HRAs have been undertaken in Cherwell and adjacent Districts.
- 1.33 The assessment conclusion noted that: 'Following consultation on the proposed submission Partial Review Plan Natural England raised concerns of the potential for in-combination effects with the Vale of White Horse District Council's emerging LPP2 plan. Further air quality assessment was subsequently undertaken and agreement reached with all parties that there would be no effect on the integrity of the Oxford Meadows SAC as a result of changes in NOx levels arising from the Partial Review Plan and the Vale of White Horse LPP2'.
- 1.34 The overall Local Plan HRA conclusion was as follows: 'It can therefore be concluded that the Partial Review of the Cherwell Local Plan 2011-2031 (Part 1): Oxford's Unmet Housing Needs Proposed Submission Plan incorporating Focused Changes and Minor Modifications will not have an effect on



the integrity of the Oxford Meadows SAC either alone or in-combination with other projects and plans’.

- 1.35 The HRA report includes a memo from Natural England, agreeing that they were satisfied with the conclusion that changes in NO<sub>x</sub> levels arising from the Vale of White Horse and Cherwell Local Plans would not have an adverse effect on the integrity of Oxford Meadows SAC.

#### **Cherwell Local Plan Review 2040 HRA**

- 1.36 A report to inform a habitats regulations assessment for the Cherwell 2040 Local Plan Review 2040 was issued in August 2023 (Aecom, 2023). This includes Policy PR8 as a retained policy. The report included a Stage 1 screening assessment for Oxford Meadows SAC and Cothill Fen SAC, which found potential for LSE in combination from new policies via the following impact pathways: recreational pressure, water resources, quality and hydrological change, and air quality. The Stage 2 Appropriate Assessment considered these impact pathways in turn for both SAC sites, and concluded that *‘the Cherwell Local Plan Review will not have an adverse effect on the integrity of any Habitats Sites either alone or in combination with other plans and projects’*.
- 1.37 The report included the results of air quality modelling employing seven transects across the A34 and A40. The modelled growth was predicted to increase NO<sub>x</sub> and NH<sub>3</sub> levels and N deposition rate by more than 1% of the critical threshold within the SAC. However, inclusion of Oxfordshire County Council’s Local Transport and Connectivity Plan and the assumption that the targets therein will be met, lead to a real-terms improvement over the 2019 baseline for these pollutants, even including all of predicted growth (including that set out in the Cherwell Local Plan Review 2040).
- 1.38 The critical thresholds used in the air quality assessment predate the July 2023 update to Air Pollution Information System, and therefore a critical load of 20 kgN/ha/yr was used for Nitrogen, rather than the current (post July 2023) threshold of 10 kgN/ha/yr.

#### **Cherwell Local Plan 2011 – 2031 (Part 1) adopted July 2015 – Relevant Policy**

- 1.39 Policy ESD9: Protection of the Oxford Meadows SAC of the Cherwell Local Plan Part 1 states:

*“Developers will be required to demonstrate that:*

- *During construction of the development there will be no adverse effects on the water quality or quantity of any adjacent or nearby watercourse*
- *During operation of the development any run-off of water into adjacent or surrounding watercourses will meet Environmental Quality Standards (and where necessary oil interceptors, silt traps and Sustainable Drainage Systems will be included)*
- *New development will not significantly alter groundwater flows and that the hydrological regime of the Oxford Meadows SAC is maintained in terms of water quantity and quality*
- *Run-off rates of surface water from the development will be maintained at greenfield rates.”*

#### **Scope of this assessment**

- 1.40 The scope and approach of this IHRA is based on the 2018-2019 Local Plan HRA and the 2023 Local Plan Review HRA, which is appropriate given that the Proposed Development is in line with the Policy PR8 specification for the development, e.g., in terms of location, quantum and type of development and quantum of greenspace. The IHRA therefore reconsiders the same pathways of LSE as those that were identified in the 2018-2019 Local Plan HRA and the 2023 Local Plan Review.

## 2 Methods

### Consultation

- 2.1 CDC were consulted on the scope of ecological assessment as part of the EIA process for the Proposed Development through an EIA Scoping Opinion request made on 9th December 2022. The CDC Scoping Opinion received on 27 January 2023 highlighted Policy ESD9: Protection of the Oxford Meadows SAC of the Local Plan 2011-2031. The Scoping Opinion noted that *“Oxford Meadows Special Area of Conservation and Pixey and Yarnton Meads SSSI are located approximately 1.8km south of the Site. Oxford Meadows 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. Pixey and Yarnton Meads SSSI are unimproved flood meadows on the bank of the river Thames. They have been grazed and cut for hay for more than a thousand years, with the result that they are botanically rich, with more than 150 species.”*
- 2.2 The Scoping Opinion also stated that *“Given the ecological sensitivity of this area it is essential that the EIA should include results of appropriate surveys, and an assessment of impact on each designated site. These must deal with potential impacts on both nationally and locally designated sites and how these will be avoided and if they cannot be avoided how the benefits of the development in the location proposed outweigh both its likely impact on the features of the designated site, and how the impacts will be mitigated. The assessment should include the results of appropriate surveys and an assessment of impact on each designated site.”*
- 2.3 Natural England’s were consulted on the potential impacts of the Proposed Development through their Discretionary Advice Service on 06 March 2018. In their response of 11 May 2018, they noted the following in relation to Oxford Meadows SAC:
- There is potential for traffic generated by the development to increase traffic flow, and consequently air pollution, on the A40 or A34 as they pass Oxford Meadows SAC. The potential for this to occur is being assessed through the Cherwell Local Plan HRA, which once completed should sufficiently address this issue; any mitigation requirements arising from this should be integrated into the application.*
- 2.4 The potential for air pollution from the A40 and A34 was addressed in the Cherwell Local Plan HRA (Atkins, 2018 and 2019) and the Local Plan Review 2040 HRA (Aecom, 2023).
- 2.5 Natural England also provided an EIA Scoping Response to Cherwell District Council (following the Applicant’s EIA scoping submission) on 13 January 2023. In this they identified one Site of Special Scientific Interest (SSSI), Rushy Meadows, with potential to be impacted by the Proposed Development. They did not identify any National Site Network sites with potential to be impacted and did not recommend any requirement for HRA. The Natural England scoping response included commentary on air quality in relation to nature conservation sites and that a priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. They stated *“The ES should take account of the risks of air pollution and how these can be managed or reduced. This should include taking account of any strategic solutions or SNAPs [Shared Nitrogen Action Plans], which may be being developed or implemented to mitigate the impacts on air quality. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk).”*

### Guidance

- 2.6 The following guidance has been used in this assessment:
- *The HRA Handbook* (DTA Publications, 2023).
  - *Government guidance: Habitats regulations assessments: protecting a European site* (UK Government, 2003).
  - *Guidance on Decision-making Thresholds for Air Pollution* (JNCC Report No. 696) (JNCC, 2021).

- *Managing Natura 2000 Sites: The Provision of Article 6 of the 'Habitats' Directive 92/43/EEC'* (European Commission, 2000).
- *Natural England's Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions Under the Habitats Regulations (NEA001)* (Natural England, 2018).

### Approach to assessment

- 2.7 The standard approach to HRA, in line with the structure of the Habitats Regulations (as set out in section 1 above), has been adopted in this assessment, comprising, in summary:
- **Stage 1: Screening Assessment:** this stage assesses whether or not the Proposed Development is likely to have a significant effect on National Site Network sites, either alone or in combination with other plans or projects and is not directly connected with or necessary to the management of that site. This stage screens the possibility for LSE to occur based on high-level analysis of risks, taking into account the spatial relationship between impact sources and designated sites, the magnitude of changes predicted with regard to receptor pathways (with reference to the specialist studies undertaken as part of the EIA and 2018-2019 Local Plan HRA), and any physical or other relationships between the site and each European Site. Stage 1 screening for LSE considers the project alone and in combination with other projects.
  - **Stage 2: Appropriate Assessment:** Those LSE screened in at Stage 1 are then subject to progression to Stage 2: Appropriate Assessment. Under the Habitats Regulations, the competent authority is required to carry out an Appropriate Assessment if there are considered to be LSE on National Site Network sites when considered alone or in combination with other projects, and where those LSE arise from a plan or project not directly connected with, or necessary to the management of, that site or sites. The Stage 2 assessment is informed, among other things, by traffic and air quality modelling (see details below).
- 2.8 The judgment of *People over Wind* case ruled that mitigation measures intended to avoid or reduce the harmful effects of the plan or project on a European Site could not be considered at the Stage 1 Screening Stage. Therefore, in this HRA report, such measures will only be taken into account as part of Stage 2: Appropriate Assessment. Only measures that constitute an integral part of the project design and are not intended to avoid or reduce effects on European Site features, are therefore considered at the Stage 1 in accordance with the relevant PPG guidance set out at paragraph 1.18 above.
- 2.9 The consideration of relevant plans and projects that could have in-combination effects follows the approach employed in the Cherwell 2018-2019 Local Plan HRA (Atkins, 2018 & 2019), 2023 Local Plan Review HRA (Aecom, 2023), relevant Natural England guidance (Natural England, 2018), and other plans and projects considered in the cumulative assessment within the Environmental Statement for the Proposed Development. The potential for in-combination effects is not considered in detail at the Stage 1 screening stage, but a precautionary judgement on this has been made at Stage 1, including consideration of the allocated development sites set out in the CDC Local Plan.
- 2.10 The precautionary principle has been adopted in this IHRA, for example, by considering the parts of the SAC that could be most affected by impacts, and by considering impacts at the SAC's boundaries.

### 3 Site Information

#### Relevant Sites

- 3.1 A search of Natural England's site mapping tool ([www.magic.gov.uk](http://www.magic.gov.uk) [accessed 24/07/23]) indicates that there are no National Site Network sites on or adjacent to the Proposed Development. The closest is Oxford Meadows SAC, situated ca 1.8 km to the south. There are no other National Site Network sites within 10 km of the Site, as indicated on Figure 1.
- 3.2 On a precautionary basis, a search was made for any other National Site Network sites within 20km of the Site. There is only one such site within this search radius: Cothill Fen SAC. This SAC is designated for its population of great crested newt *Triturus cristatus*. Given the distance from the Proposed Development, there is not considered to be potential for any impact pathways that could cause a LSE on the great crested newt population at this SAC, and it is therefore not considered further in this IHRA.
- 3.3 Given the nature and extent of the Proposed Development, there is not considered to be any potential for LSE on any National Site Network sites situated more than 20 km from the Proposed Development.
- 3.4 Oxford Meadows SAC is therefore the only site to be considered further in this IHRA.

#### Oxford Meadows SAC

##### Location and Extent

- 3.5 Oxford Meadows SAC is 267 ha in extent, and located to the north-east of Oxford, ca. 1.8 km south of the Proposed Development. Its location in relation to the Proposed Development is shown on Figure 1. The SAC is located in the south-western corner of the district of Cherwell. The majority of the SAC falls within the Oxford City Council boundary, although small sections are located within the districts of Cherwell and West Oxfordshire.
- 3.6 The River Thames flows through the centre of the SAC. The nearest settlement to the SAC in Cherwell is Yarnton (located approximately 0.85 km north of the SAC).

##### Description

- 3.7 Oxford Meadows qualifies for European protection due to the lowland hay meadow habitats it supports (Annex I habitat which is a primary qualifying feature of the site). The site includes vegetation communities that are considered to be potentially unique in the world (due to the influence of long term grazing and hay-cutting). The site has been traditionally managed for several centuries and so exhibits good conservation of structure and function.
- 3.8 The site is also designated as a European important site as it supports creeping marshwort (*Apium repens*) (an Annex II species which is a primary qualifying feature of the site). This is one of only two known sites in the UK that support this plant species. This SAC is one of two that are designated for lowland floodplain hay meadows in the Thames Valley. The grassland vegetation present reflects long-term and still-continuing influences of grazing and hay cutting. This site represents a good example of the structure and function of floodplain hay meadows.

##### Qualifying features

- 3.9 Oxford Meadows SAC supports unimproved lowland hay meadow and pasture and is designated for the EU Annex I habitat Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) and the EU Annex II plant species creeping marshwort *Heliosciadium repens* (formerly *Apium repens*).
- 3.10 The Proposed Development is 1.8 km from the closest area of the Lowland hay meadow feature at the SAC.

- 3.11 The Proposed Development is 3.0 km from the closest Port Meadow, which supports the creeping marsh wort features at the SAC.

**Component sites**

- 3.12 The SAC is made up of all or part of four SSSIs:
- Cassington Meadows SSSI (2.7 km south-west of the Proposed Development).
  - Pixey and Yarnton Meads SSSI (2.6 km south of the Proposed Development).
  - Wolvercote Meadows SSSI (2.6 km south of the Proposed Development).
  - Port Meadow with Wolvercote Common and Green SSSI (3 km south of the Proposed Development).

**Conservation Objectives**

- 3.13 Conservation objectives for the SAC have been set by Natural England (Natural England, 2018b) as follows:

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

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

- 3.14 Natural England have published supplementary advice in relation to the conservation objectives (Natural England, 2019), in the form of a series of targets for each of the two qualifying features.

- 3.15 For the lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) feature, these targets relate to:

- Maintaining the extent, configuration and distribution of the feature, and its component vegetation communities.
- Maintaining the vegetation community composition, transitions, abundance of typical species. and acceptable levels of undesirable species.
- Maintaining soil properties, water quality water table regime, flooding regime.
- Maintaining offsite habitat (i.e., sufficient grassland to support viable grazing and hay-making management at the SAC).
- Maintaining the ability of the feature to adapt and evolve to wider environmental change.
- Maintaining the concentrations and deposition of air pollutants to at or below the site-relevant critical thresholds (as per the APIS database).
- Maintaining the management measures necessary to maintain the structure, functions and supporting processes associated with the feature.

- 3.16 For the creeping marshwort feature, these targets relate to:

- Maintaining the area occupied by this species.
- Maintaining the abundance of the species above 100 plants.

- Maintaining the distribution and continuity of this species and the distribution, continuity and extent of its supporting habitats.
- Maintaining the regime of winter flooding and gradual drying in summer/autumn.
- Maintaining soil properties within typical values for the supporting habitat.
- Preventing impacts from non-native invasive plants.
- Maintaining vegetation structure, water level fluctuation and water level quantity and quality.
- Maintaining the ability of the feature to adapt and evolve to wider environmental change.
- Maintaining the concentrations and deposition of air pollutants to at or below the site-relevant critical thresholds (as per the APIS database).
- Maintaining the management measures necessary to maintain the structure, functions and supporting processes associated with the feature.

### **Site Risks**

- 3.17 Previous iterations of the Cherwell 2018-2019 Local Plan Part 1 HRA used the following site sensitivities, which were identified at a HRA screening workshop carried out for the South East Plan (as noted in the Oxford Core Strategy Habitats Regulations Assessment, produced by Oxford City Council in September 2008; Atkins 2018):
- Minimal air pollution;
  - Absence of excessive nutrient enrichment of waters/good water quality;
  - Balanced hydrological regime: alteration to adjacent rivers may alter flooding regime and reduce botanical diversity;
  - Maintenance of traditional hay cut and light aftermath grazing; and
  - Absence of direct fertilisation.
- 3.18 However, the Oxford Meadows SAC Natura 2000 – Standard Data Form submitted to the European Commission on the 22/12/20159 states that the Oxford Meadows SAC is vulnerable to impacts from the following sources:
- Pollution to surface waters (limnic & terrestrial, marine & brackish);
  - Invasive non-native species; and,
  - Human induced changes in hydraulic conditions.
- 3.19 Following discussions with Natural England it was agreed that the 2018-2019 Local Plan HRA should use the vulnerabilities listed in the Natura 2000 – Standard Data Form and that in addition the Oxford Meadows SAC is also vulnerable to changes in air quality and therefore this should also be considered (Atkins, 2018).
- 3.20 Natural England's Site Improvement Plan (Natural England, 2014) identifies the following pressures/threats to the SAC:
- Hydrological changes.
  - Invasive species.
- 3.21 The Joint Nature Conservation Committee (JNCC; 2015) have identified the following as the most important impacts and activities with high negative effect on the SAC:
- Invasive non-native species.
  - Pollution of surface waters.
  - Human induced changes to hydrological conditions

**Current condition**

3.22 The latest condition information available from Natural England indicates that all of the component SSSIs are in favourable condition. See Table 1.

Table 1. Condition of management units of the Oxford Meadows SAC

Component SSSI	Unit	Management Unit Condition
Cassington Meadows SSSI	1	Favourable
Pixey and Yarnton Meads SSSI	1	Favourable
	2	Favourable
	3	Favourable
Wolvercote Meadows SSSI	1	Favourable
	2	Favourable
Port Meadow with Wolvercote Common and Green SSSI	1	Favourable
	2	Favourable
	3	Favourable
	4	Favourable

3.23 The latest condition information available from Natural England on the condition of SAC features is provided in Table 2.

Table 2. Condition of SAC features.

Component SSSI	Unit	Condition of Lowland meadows feature	Condition of creeping marsh wort feature
Cassington Meadows SSSI	1	Favourable	N/A
Pixey and Yarnton Meads SSSI	1	Favourable	N/A
	2	Favourable	N/A
	3	Favourable	N/A
Wolvercote Meadows SSSI	1	Unfavourable recovering	N/A
	2	Unknown	N/A

Port Meadow with Wolvercote Common and Green SSSI	1	N/A	Favourable
	2	N/A	Favourable
	3	N/A	N/A
	4	N/A	Favourable



## 4 Stage 1: Screening Assessment

### Potential impact pathways

- 4.1 The 2018-2019 Local Plan HRA considered the following potential impact pathways between the PR8 development and Oxford Meadows SAC:
- 4.2 **“Recreation:** PR8 is located approximately 1.70 km from Oxford Meadows SAC and as such it is likely that development will lead to an increase in visitor numbers and associated impacts as a result of trampling and dog fouling. Using the precautionary approach this policy may lead to a LSE on the Oxford Meadows SAC and as such will require a Stage 2 Appropriate Assessment to be undertaken.”
- 4.3 **“Water Quality:** PR8 is located approximately 1.70 km (at its closest point) from the Oxford Meadows SAC. Using the precautionary approach this policy may lead to a LSE on the Oxford Meadows SAC and as such will require a Stage 2 Appropriate Assessment to be undertaken.”
- 4.4 **“Water Abstraction:** Thames Water Final Water Resources Management Plan 2015 – 2040 (WRMP14) identified that the Swindon and Oxfordshire area has a planning problem that in dry conditions there will be a water supply deficit from 2019/20 of 0.1 Ml/d, increasing to 32.7 Ml/d by 2039/40. The WRMP14 has addressed this through a number of short term (2015-2020) (and medium term (2020 – 2040) actions aimed at reducing household usage. Therefore, there are no LSE of water abstraction on the Oxford Meadows SAC.
- 4.5 **“Groundwater Flows:** It is possible that groundwater flows may be disrupted as a result of development. Using the precautionary approach this policy may lead to a LSE on the Oxford Meadows SAC and as such will require a Stage 2 Appropriate Assessment to be undertaken.”
- 4.6 **“Air Quality:** It is considered possible that there may be a deterioration in air quality on the roads surrounding Oxford Meadows SAC when this allocation site is considered ‘in combination’ with the existing housing development (a total of 22,840 houses) outlined within the adopted Cherwell Local Plan 2011-2031 (Part 1) and the additional houses outlined in the Partial Review Proposed Submission Plan. Using the precautionary approach this policy may lead to a LSE on the Oxford Meadows SAC and as such will require a Stage 2 Appropriate Assessment to be undertaken.”
- 4.7 Given that JNCC (2015) have also identified the potential for invasive species to affect Oxford Meadows SAC, this impact pathway also requires consideration in this IHRA.
- 4.8 Table 3A below provides a screening assessment and considers the potential for LSEs on the relevant National Site Network sites to occur as a result of the Proposed Development, either alone or in combination with other relevant plans and projects. The screening assessment has been informed by the evidence provided, or summarised, within the 2018-2019 Local Plan HRA together with the findings of the EIA for the Proposed Development. Where potential LSEs are identified, these are taken forward to Stage 2 for further assessment, which it addresses in Section 5 of this IHRA.

Table 3A. Potential SAC impacts and pathways.

Interest feature	Impact	Pathway	Likely Significant Effect (alone/In-combination)
Lowland hay meadows	Damage from recreational pressure	New residents walking at the SAC	Yes/Yes
	Damage from reductions in air quality	Emission from increased traffic flows	Yes/Yes

	Damage from reductions in water quality	Surface or foul water discharges	Yes/Yes
	Damage from hydrological changes	Change to local hydrology and groundwater flows from development	Yes/Yes
	Damage from invasive species	None likely, given the distance between the Proposed Development and the SAC.	No/No
Creeping marshwort	Damage from recreational pressure	New residents walking at the SAC	Yes/Yes
	Damage from reductions in air quality	The population of creeping marshwort occupies the southern part of Port Meadow and is therefore more than 200 m from any road that would experience a 1000 AADT increase in traffic.	No/No
	Damage from reductions in water quality	Surface or foul water discharges	Yes/Yes
	Damage from hydrological changes	Change to local hydrology and groundwater flows from development	Yes/Yes
	Damage from invasive species	None likely, given the distance between the Proposed Development and the SAC.	No/No

4.9 There are no additional impacts and pathways screened into the 2018-2019 Local Plan HRA (Atkins 2018 and 2019) and the 2023 Local Plan Review HRA (Aecom, 2023) that have not been screened into the current assessment.

4.10 The above screening assessment includes consideration of in-combination impacts with other plans and projects, including the development allocations within the Cherwell District Local Plan and other plans and projects considered in the cumulative assessment within the Environmental Statement for the Proposed Development.

**Screening Conclusion**

4.11 The Stage 1 Screening Assessment concludes that there is the potential for LSE on Oxford Meadows SAC from the Proposed Development alone and in-combination arising from recreational pressure, air quality, water quality and hydrological changes. It is considered that the Proposed Development will not have a LSE on the SAC arising from the invasive species pathway.

## 5 Stage 2: Appropriate Assessment

- 5.1 This section provides information to enable CDC, as competent authority, to carry out an appropriate assessment of the implications of the Proposed Development for the SAC in view of the SAC's conservation objectives for each of the LSE identified at Stage 1.

### **Recreational Pressure**

- 5.2 New residential development in the vicinity of the SAC has the potential to increase the number of walkers and dog walkers using publicly accessible parts of the SAC. Whilst Natural England have not identified recreational pressure specifically as a risk or pressure for the SAC, there is potential for increase in recreational pressure to affect the conservation objectives for the SAC via the trampling of vegetation, compaction of soil structure, or increased nutrient input from dog wastes. Such impacts have the potential to affect both of the interest features at the SAC.
- 5.3 These impact pathways are consistent with those considered in the Stage 2 assessment for the 2018-2019 Local Plan HRA (Atkins, 2018 and 2019) and the 2023 Local Plan Review 2040 HRA (Aecom, 2023). In these HRAs, it was concluded that due to the limited parking provision at the SAC, the presence of busy roads there (the A40, A34, A44, and A4165) which may act as a deterrent to walkers, and due to the mitigating effect of Local Plan policies ESD17 Green infrastructure, BSC10 Open Space, Outdoor Sport and Recreation Provision, and BSC11: Local Standards of Provision - Outdoor Recreation, there would be no adverse effect of the Local Plan on the integrity of the SAC.

### **Embedded avoidance and mitigation measures**

- 5.4 The Proposed Development includes very extensive (i.e., over 81 ha) of greenspace (this provision is extensive both as a proportion of the total Proposed Development site area, and in terms of absolute area), including canalside parkland, a new local nature reserve, a central park, pedestrian paths along retained lanes and hedgerows, and green links and pocket parks. In addition to good pedestrian and cycle links between these areas and the development zones (e.g., residential) of the Proposed Development, there will also be strong links to the green corridor adjacent to the Oxford Canal. The Outline Landscape and Ecological Management Plan submitted with the application indicates that many parts of the proposed greenspaces will be natural in character and will be maintained over the long term to achieve balance between nature conservation value and public accessibility. In addition to the provision of natural and formal greenspace at the Proposed Development, there will also be formal sports pitch provision.
- 5.5 The distance between the Site of the Proposed Development and the nearest unit of the SAC (Pixey and Yarnton Meads SSSI) is approximately 2.4 km at its closest boundary via public rights of way. Given this distance (a round trip of at least 4.8 km), most additional visits to the SAC are likely to be via car journeys to Port Meadow where there are car parks. There are two such car parks, one at Wolvercote at the northern end of Port Meadow, and one on Walton Well Road at the southern end of Port Meadow. These car parks are not situated on or signposted from main road routes.
- 5.6 In line with various policies requiring accessible greenspace provision in the Cherwell Local Plan, the greenspace provision which forms part of the Proposed Development will provide substantial areas of public open space to a standard above that usually required for development.

### ***Potential for impacts during Construction***

- 5.7 Given the distance between the Site and the SAC, the general need to travel there by car, and the fact that none of the SAC access points are close to main road routes, it is considered unlikely that staff working on the construction of the Proposed Development would visit the SAC. Lunchtime walks, for example, are likely to be taken on green areas immediately adjacent to the development site or along the Oxford Canal. Any increase in recreational pressure at the SAC from the construction phase of the Proposed Development is therefore considered unlikely to have an adverse effects, both alone and in combination with other plans and projects.

**Potential for impacts during Occupation**

- 5.8 Once new households and other uses are in residence in the Proposed Development, it is possible that small numbers of them will occasionally visit the SAC for recreational purposes. However, for the accessibility reasons discussed above, and because of the extensive provision of natural greenspace with the Proposed Development, such numbers are considered likely to be negligible.
- 5.9 Access within Pixey and Yarnton Meads SSSI is only via limited public rights of way which cross these areas, and there are no circular routes around the meadows. Access to these is difficult by car due to limited parking in proximity, and requires long walks on foot from parking that is available. For example, the footpath at Pixey Mead is accessed via a 1.5 km walk from the car park at the Trout Inn in Godstow, there is no public access to Wovercote Meadows, and access to Yarnton Mead is via a 1.0 km walk from the Oxford can at the east, and long footpaths with cross the busy A40 road at the west.
- 5.10 Port Meadow and Wolvercote Common are common land with open access to the public. Port Meadow comprises grazed pasture and is included within the SAC for the presence of creeping marshwort and not floodplain meadows. The creeping marshwort is restricted to seasonally wet areas in the southern part of Port Meadow and as such is unlikely to be adversely affected by additional footfall as it grows in areas away from areas and routes that walkers generally access; the majority of visitor access is influenced by gates and established paths. Marginally higher nutrient levels from an increase in dog waste is possible in the long term (favouring more nutrient tolerant ruderal plant species). However, the effects of this are unlikely to significantly alter the plant community in the context of existing access by the public and dogs and levels of disturbance and nutrient input from livestock.
- 5.11 Wolvercote Common is a small area of grassland at the north-east corner of Port Meadow, with very limited public parking and adjacent housing which make it unlikely that this area would be visited by people from outside Wolvercote.
- 5.12 Overall, there is considered to be some potential for very a small increase in the number of people visiting the SAC from the Proposed Development during the occupation phase. However, due to the extensive provision of greenspace in the Proposed Development and the limited access to much of the Site, this increase is considered likely to be negligible. Given this, and the fact that the SAC feature at Port Meadow (the part of the SAC most likely to be visited for recreation) is in areas that are unlikely to be subject to increased footfall, any increase in recreational pressure at the SAC is considered to be negligible.

**Conclusion on Recreational Pressure**

- 5.13 Taking account of the above matters, it is considered that the Proposed Development, considered alone, will not result in an adverse effect on the integrity of Oxford Meadows SAC through recreational pressure.
- 5.14 Given the extensive provision of accessible greenspace in the Proposed Development, the accessible greenspace requirements for other allocated site set out in the Cherwell Local Plan (e.g. policies ESD 17, BSC 10, and BSC11), and that the limited access to the SAC will apply to other developments, it is further considered that the Proposed Development, in combination with other relevant plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through recreational pressure. This consideration is in agreement with the conclusion of the 2018-2019 Local Plan HRA (see pages 32 and 42; Atkins 2018 and 2019) and the 2023 Local Plan Review HRA (Aecom, 2023).

**Air Quality Impacts**

- 5.15 The SAC is directly adjacent to two busy roads, the A34 which passes Pixey Mead and the A40 which passes Yarnton Mead. Aerial pollution has the potential to affect vegetation and soils at the SAC. For example, they could change the species composition of the hay meadow habitat. Natural England (2019) have identified the following target (for both SAC features, but only air quality impact on the hay meadows feature has been screened into this assessment) relating to air quality:

- Maintain the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System ([www.apis.ac.uk](http://www.apis.ac.uk)).

- 5.16 Natural England (2018b) acknowledge that “*It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.*”
- 5.17 Traffic modelling and assessment work undertaken by the transport and air quality consultant as part of the EIA is set out in Chapter 11: Air Quality of the Environmental Statement (ES). See further information on the traffic scenarios employed under *2023 Air Quality Modelling* below.
- 5.18 Natural England have set out a HRA screening threshold for traffic increases on roads within 200 m of features that are sensitive to air pollution: this is 1,000 Average Annual Daily Trips (AADT) (Natural England, 2018).
- 5.19 The traffic modelling indicates that the Proposed Development will, in combination with other plans and projects, increase traffic above Natural England’s (2018) 1,000 AADT screening threshold on the A34 and A40 within 200 m of Oxford Meadows SAC. Further detailed assessment has therefore been undertaken.
- 5.20 The traffic increase stated above will only exceed Natural England’s screening threshold during the occupation phase of the Proposed Development. Therefore, given the distance between the Site and the SAC, it is considered that any adverse air quality impacts from the construction phase can be screened out, both when considering the development alone and in combination with other relevant plans and projects. Given the distance of the Proposed Development to the SAC, and its nature (residential and commercial, with no heavy industry), it is considered that air quality impacts from site emissions can be screened out. The air quality assessment therefore focuses on emissions from increased traffic on the A34 and A40 resulting from the Proposed Development alone and in combination with other plans and projects.

#### ***Cherwell Local Plan HRAs***

- 5.21 The assessment undertaken for the Local Plan HRA involved modelling of nitrogen oxide (NO<sub>x</sub>) concentrations at two transects within parts of the Oxford Meadows SAC adjacent to the A34 and A40, based on emissions from traffic using these roads.
- 5.22 The modelling compared the effect of housing identified in the emerging Local Plan, plus a transport and cycling improvement package (‘Transport improvement Package 2 and Super Cycle Route’) against a future (2031) baseline that included all planned and permitted housing and employment detailed in the adopted Cherwell Local Plan and that of neighbouring local authorities.
- 5.23 The transport improvements were as follows: (a) improved bus services and facilities along the A44/A4144 corridor linking Woodstock and Oxford, along the A4260/A4165 (Oxford Road) linking Kidlington, Gosford, Water Eaton and Oxford, and along Langford Lane, (b) the enhancement for cycle paths and pedestrian facilities on the A44, (c) the prioritisation of the A44 over the A4260 as the primary north-south route for private motor vehicles into Oxford, (d) improved public transport and cycling provision along the A4260 in to Oxford, improvement to the public realm in Kidlington, and (e) the provision of new and enhanced pedestrian, cycling and wheelchair routes into and out of Oxford.
- 5.24 The air quality assessment in the Local Plan HRA was updated to address a new scenario described as the “2031 Cherwell Transport Improvement Package 2 plus Cycle Super Route” which includes all the planned and permitted housing and employment detailed in the adopted Cherwell Local Plan with additional housing identified in the emerging Cherwell Local Plan Part 1 Partial Review (an additional 4,400 dwellings), plus additional policies to moderate road traffic increases and promote a modal shift to other forms of transport, notably cycling.
- 5.25 This work indicated that NO<sub>x</sub> concentrations within the SAC would be marginally higher with the Local Plan developments than under the 2031 Future Year baseline scenario. However, both would

be below current baseline levels. Nitrogen deposition was modelled and predicted to be below the critical threshold (i.e., 10 kg/ha/yr) for both scenarios.

- 5.26 The increases above the predicted future baseline were considered to be inconsequential given the current baseline conditions (i.e., high background NO<sub>x</sub> concentrations and N deposition rates), the fact that Oxford Meadows SAC was considered to be in good condition by Natural England, in spite of exceedances of air quality thresholds, the limited extent of the area affected by exceedances, and the fact that NO<sub>x</sub> levels and N deposition loads will decrease under both scenarios compared to current baseline levels.
- 5.27 Based on these results, the Local Plan HRA concluded no adverse effect on the integrity of Oxford Meadows SAC, from the partial review of the Local Plan, including all committed Oxfordshire growth at that time (Atkins 2018). Natural England raised concerns for the potential for in-combination effects with the Vale of White Horse District Council's emerging LPP2 plan but following the inclusion of the Vale of White Horse District LPP2 in the modelling, all parties agreed that there would be no adverse effect on the integrity of Oxford Meadows SAC from these two plan reviews considered in combination. The Local Plan HRA therefore concluded that the partial review would not have an adverse effect on the integrity of Oxford Meadows SAC in combination with other plans and projects.
- 5.28 The 2023 Local Plan Review 204 HRA (Aecom, 2023) used updated traffic modelling and additional air quality transects. Its air quality section concluded that *"Due to expected positive impact on future travel mode share as a result of the Oxfordshire Local Transport and Connectivity Plan it can be concluded that the Cherwell Local Plan Review will not cause an adverse effect upon the integrity of Oxford Meadows SAC either alone or in combination with other plans and projects. This assessment will be reviewed for the Regulation 19 Local Plan HRA"*.

#### **Embedded avoidance and mitigation measures**

- 5.29 The Proposed Development includes a very high level of connectivity for pedestrians and cyclists to the wider transport network for these modes, including routes to Oxford down the A44 and Oxford Canal, to Yarnton to the west and Kidlington to the east. The A44 and Kidlington are well connected to Oxford via bus services, and the design includes a bus route through the Site along Sandy Lane (which, subject to the necessary consents, will be closed to private vehicles). A very high level of connectivity is to be provided within the Site itself, making use of existing footpaths and bridleways, and an extensive network of multi-mode transport within the developed areas of the Site. These measures, along with the fact that a proportion of the accommodation at the Site will be allocated to university students and staff, working at Begbroke Science Park or in the centre of Oxford, are considered likely to mean that car use at and from the Site is below the typical level.
- 5.30 The Cherwell Local Plan includes Policy PR4 Sustainable Transport, which includes the provision of contributions to upgrades to the local transport network (including public transport) from developments under policies PR6 to PR10. The policy covers a number of bus, cycle and pedestrian improvements, including the provision of new routes into and out of Oxford.
- 5.31 Oxfordshire County Council's Local Transport and Connectivity Plan also provides targets and mechanisms to reduce the numbers of private vehicle trips on roads in the local areas.
- 5.32 A future modal shift is predicted to take place over the next 10 years in fossil fuel driven vehicles, which will reduce the contribution of nitrogen generated by traffic. Beyond 2033 there is likely to be a continuing reduction in the use of fossil fuel driven vehicles and as such the contribution to nitrogen deposition from road traffic is likely to continue its current decreasing trajectory.

#### **2023 Air Quality Modelling**

- 5.33 In order to allow the IHRA to fully consider the potential for air quality impacts on Oxford Meadows SAC, air quality modelling (detailed in Chapter 11: Air Quality of the ES) was carried out to investigate the potential for changes in the levels of nitrogen oxides (NO<sub>x</sub>) and ammonia (NH<sub>3</sub>), the rate of deposition of nitrogen (N), and the rate of acidification at SAC.

- 5.34 The air quality modelling sets out the predicted change in levels and loads and acidification from the Proposed Development alone and in combination with other plans or projects. Scenarios compared here are:
- Scenario 1: modelled 'current baseline';
  - Scenario 2: 2033 Future Baseline Year without the Proposed Development, but inclusive of committed developments and some transport infrastructure improvements<sup>1</sup>;
  - Scenario 3: 2033 Future Baseline Year with the Proposed Development; and
  - Scenario 4: 2033 Future Baseline 'In-combination', inclusive of the Proposed Development and other PR sites.
- 5.35 In line with the assessment approach required under the HRA Regulations, Scenario 3 predicts the effects of the Proposed Development on its own and Scenario 4 predicts the effect of the Proposed Development in combination with other PR sites.
- 5.36 These data were modelled along transects from the A34 and the A40, roads that will experience an increase of traffic of more than 1,000 AADT as a result of the Proposed Development and are within 200 m of the SAC. See Figure 2 for transect locations. This allows the distance into the SAC at which exceedances in gaseous concentrations and nitrogen deposition will occur to be determined. These distances are summarised below (detailed figures are presented in Chapter 11: Air Quality of the ES). Appropriate critical thresholds were obtained from APIS on 14 August 2023 (APIS, 2023).
- 5.37 On each transect, air quality was modelled at the point on the boundary of the SAC (i.e., the point in the SAC closest to the road) and at a series of points at 10 m intervals into the SAC. The modelling therefore has a spatial accuracy of 10 m.
- 5.38 The proximity of the SAC Lowland hay meadows feature to the aerial emissions sources of the A34 and A40 was examined in detail by overlaying the transect modelling points on to aerial photography. This allows the closest points of the SAC feature to the road to be measured, and accurate maximum pollutant values on the qualifying feature to be determined for each transect.
- 5.39 The distances between the road and the closest boundary of the SAC feature for each transect are set out in Table 3B below. These distances are rounded down the appropriate modelled transect point in order to avoid over-estimating the distance between of the SAC feature and the road.

Table 3B. Spatial assessment of qualifying feature

<b>Transect</b>	<b>Closest transect point to SAC feature (m from road)</b>	<b>Habitat between SAC and Lowland hay meadows</b>
A34-1	51	Woodland to 54m.
A34-2	17	Scrub and road verge to 17m.
A34-3	21	Woodland and scrub to 22m.
A34-4	15	Hardstanding access track to 16m.
A34-5	13	Hardstanding access track to 16m.
A34-6	N/A	Transect not in SAC.
A34-7	34	Trees / rough grassland to 35m.
A34-8	12	Rough grassland verge to 12m.
A34-9	71	River and woodland to 77m
A40-10	53	Woodland to 55m.

<sup>1</sup> As specified in the Appendix 9.1: Transport Assessment of the Environmental Statement (see Appendix J), these comprise: committed developments, proposed development access changes, Oxford County Council Growth Fund works, Local Plan Infrastructure Delivery Plan, and a background mode shift.

A40-11	23	Woodland to 23m.
A40-12	43	Hedge/trees approx. parallel to transect. Trees to 50 m.
A40-13	13	Hedgerow to 13m

5.40 As the table above shows, transect A34-6 does not cover any part of the SAC that contains the lowland hay meadow qualifying feature. It has therefore been discounted from further inclusion in the below assessment.

#### **Critical thresholds**

5.41 APIS indicates the following critical thresholds for both features at Oxford Meadows SAC:

- NO<sub>x</sub> concentration: 30 µg/m<sup>3</sup>.
- NH<sub>3</sub> concentration: 3 µg/m<sup>3</sup>.
- N deposition rate: 10 to 20 kgN/ha/yr.
- Acidification: CLminN 0.856 keq/ha/yr; CLmaxN 4.856 keq/ha/yr; CLmaxS 4.000 keq/ha/yr.

5.42 Note that the critical threshold ('CT') for acidification is a boundary on a two-dimensional graph, defined by the three points above.

5.43 The above threshold for NO<sub>x</sub> concentration was used in the air quality assessment in the 2018-2019 Local Plan HRA (Atkins, 2018). Ammonia was not considered in the 2018-2019 Local Plan HRA (this pollutant was not typically assessed prior to 2019/2020), and neither was acidification. The critical threshold range for N deposition employed in the 2018-2019 Local Plan HRA and in the 2023 Local Plan Review HRA was 20 to 30 µg/m<sup>3</sup> (reflecting the vales on APIS at the time); this is higher than the current APIS threshold (10 to 20 kgN/ha/yr) therefore this current assessment is considered to be more stringent than that in the Local Plan HRA.

#### **Traffic flows**

5.44 The A34 and the A40 are the only roads within 200m of the SAC predicted to experience increases in traffic flows above 1000 AADT. These are predicted to see increases of +2,864 and +769, respectively under the Proposed Development alone, and of +3,432 and +2,180, respectively, under the In-combination scenario.

5.45 These 2033 traffic flow increases are higher than those predicted for 2031 under the 2018-2019 Local Plan HRA, which were +1,008 and +1,129 AADT for the A34 and A40 respectively.

#### **Levels of Nitrogen Oxides (NO<sub>x</sub>)**

##### **The Proposed Development Alone**

5.46 Summary data from the air quality modelling for NO<sub>x</sub> for the Proposed Development alone (Scenario 3) is provided in Table 4 below. Exceedance distances are accurate to 10 m. NE indicates no exceedance.



Table 4: Summary data for NOx for the Proposed Development alone. The critical threshold for this pollutant is 30 µg/m³.

Transect	Max NOx (µg/m³)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase against 2033 Baseline
A34-1	35.8	25.4	25.6	0.14	0.5	0.6	80	NE	NE	0
A34-2	56.1	31.2	31.5	0.35	1.2	1.1	80	10	0	0
A34-3	52.8	30.2	30.5	0.31	1.0	1.0	80	10	NE	0
A34-4	64.1	33.5	33.9	0.43	1.4	1.3	100	10	20	10
A34-5	87.4	40.6	41.2	0.61	2.0	1.5	190	40	50	10
A34-7	58.1	31.9	32.3	0.35	1.2	1.1	190	40	30	0
A34-8	93.6	42.4	43.1	0.67	2.2	1.6	180	40	30	0
A34-9	35.1	25.3	25.4	0.14	0.5	0.6	90	NE	NE	0
A40-10	19.6	16.0	16.1	0.05	0.2	0.3	NE	NE	NE	0
A40-11	31.3	24.5	24.6	0.10	0.3	0.4	20	NE	NE	0
A40-12	22.9	18.6	18.6	0.06	0.2	0.3	0	NE	NE	0
A40-13	35.4	25.7	25.8	0.13	0.4	0.5	20	NE	NE	0

5.47 Given that increases above the CT and the 1% screening threshold are limited to 10 m extensions into the SAC on two transects and extensions below 10m on all other transects, these marginal increases are considered negligible. Therefore, it is considered that the Proposed Development, considered alone, will not cause an adverse effect on the integrity of Oxford Meadows SAC through increases in atmospheric concentrations of NOx.

**In-combination Effects**

5.48 Summary data from the air quality modelling for NOx for the Proposed Development in combination is provided in Table 5 below. The critical threshold for this pollutant is 30 µg/m³. Exceedance distances are accurate to 10m. NE indicates no exceedance.

Table 5: Summary data for NOx for the Proposed Development in combination with other plans and project.

Transect	Max NOx (µg/m³)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase against 2033 Baseline
A34 - 1	35.8	25.4	25.6	0.2	0.6	0.8	80	NE	NE	0
A34 - 2	56.1	31.2	31.6	0.43	1.2	1.4	80	10	10	0
A34-3	52.8	30.2	30.6	0.39	1.0	1.3	80	10	10	0
A34-4	64.1	33.5	34.0	0.5	1.8	1.6	100	10	20	10
A34-5	87.4	40.6	41.3	0.7	2.4	2.2	190	40	50	10
A34-7	58.1	31.9	32.4	0.4	1.4	1.2	190	40	40	0
A34-8	93.6	42.4	43.2	0.79	2.2	1.8	180	40	40	0
A34-9	35.1	25.3	25.5	0.2	0.6	0.8	90	NE	NE	0
A40-10	19.6	16.0	16.2	0.1	0.5	0.6	NE	NE	NE	0
A40-11	31.3	24.5	24.8	0.3	0.9	1.2	20	NE	NE	0
A40-12	22.9	18.6	18.8	0.2	0.6	1.0	0	NE	NE	0
A40-13	35.4	25.7	26.1	0.4	0.4	1.5	20	NE	NE	0

5.49 NOx levels are predicted to be significantly lower than the 2019 baseline (Scenario 1) under the 2033 in-combination scenario (i.e., Scenario 4).

5.50 Under the In-combination scenario (Scenario 4) the critical threshold would be exceeded on six of the eight A34 transects (and at none of the A40 transects). This is the same as for the future baseline (Scenario 2). The exceedance would extend up to 50 m onto the SAC. This is the same as for the Proposed Development alone.

5.51 Under the Proposed Development (Scenario 4), distance into the SAC at which the CT is exceeded and the increase due to the Proposed Development exceeds 1% of the CT would increase by 10m

over the 2033 baseline on two of the transects. There would not be a measurable increase on the other 11 transects (i.e., any increase would be less than 10 m).

- 5.52 The greatest difference (42.4µg/m<sup>3</sup> under the future baseline versus 43.2µg/m<sup>3</sup> under the in-combination scenario) is on the boundary of the SAC on Transect 8. This maximum increase between the future baseline and the In Combination scenario is 1.9% of the critical threshold.
- 5.53 Compared with the current baseline, there would be significant decreases in levels of NO<sub>x</sub> under the In-combination scenario. On Transect 8, for example, the decrease would be from a current baseline of 93.6µg/m<sup>3</sup> to 43.2 µg/m<sup>3</sup>.
- 5.54 Given that increases above the CT and the 1% screening threshold are limited to 10 m extensions into the SAC on two transects and extensions below 10 m on all other transects, these marginal increases are considered negligible. Therefore, it is considered that the Proposed Development, considered in combination with other relevant plans and projects, will not cause an adverse effect on the integrity of Oxford Meadows SAC through increases in atmospheric concentrations of NO<sub>x</sub>.
- 5.55 Although the modelling work and results were not identical in the 2018-2019 Local Plan HRA (the exceedance was predicted to be 1% or less of the CT at 25 m from the road centreline) the results are considered to be of the same order of magnitude. In the 2018-2019 Local Plan HRA, the exceedances were considered inconsequential given baseline conditions and the limited extent of the area (as a proportion of the SAC) that would be subject to the change.

**Levels of Gaseous Ammonia NH<sub>3</sub>**

**The Proposed Development Alone**

- 5.56 Summary data from the air quality modelling for NH<sub>3</sub> for the Proposed Development alone is provided in Table 6 below. The critical threshold for this pollutant is 3 µg/m<sup>3</sup>. Exceedance distances are accurate to 10 m. NE indicates no exceedance.

Table 6: Summary data for NH<sub>3</sub> for the Proposed Development alone.

Transect	Max NH <sub>3</sub> (µg/m <sup>3</sup> )						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 baseline (Sc 2)	2033 Alone (Sc 3)	Increase against 2033 Baseline
A34 - 1	2.6	2.6	2.6	0.01	0.5	0.4	NE	10	NE	0
A34 - 2	3.1	3.3	3.3	0.03	1.1	1.0	10	10	10	0
A34-3	3.0	3.2	3.2	0.03	1.0	0.9	10	10	10	0
A34-4	3.3	3.5	3.6	0.04	1.4	1.1	20	30	20	0
A34-5	4.0	4.3	4.4	0.06	2.0	1.4	40	50	40	0
A34-7	3.2	3.4	3.4	0.03	1.1	0.9	30	40	40	0
A34-8	4.1	4.5	4.6	0.07	2.2	1.5	30	40	40	0
A34-9	2.5	2.6	2.6	0.01	0.5	0.4	NE	NE	NE	0
A40-10	2.3	2.4	2.4	0.01	0.2	0.2	NE	NE	NE	0
A40-11	2.5	2.6	2.6	0.01	0.4	0.4	NE	NE	NE	0
A40-12	2.4	2.4	2.4	0.01	0.2	0.4	NE	NE	NE	0
A40-13	2.6	2.7	2.8	0.01	0.5	0.4	NE	NE	NE	0

- 5.57 NH<sub>3</sub> levels are predicted to be higher than the 2019 baseline under all of the 2033 scenarios (i.e., both with and without the Proposed Development).
- 5.58 The critical threshold for NH<sub>3</sub> (3µg/m<sup>3</sup>) is exceeded in proximity to the A34 and A40 on five of the twelve transects under the 2019 baseline scenario (i.e., Scenario 1). The exceedances extend up to 40 m into the SAC. The highest level (4.1 µg/m<sup>3</sup>) is on the SAC boundary (i.e., considered just within the SAC) on Transect 8.
- 5.59 Levels of NH<sub>3</sub> are predicted to be higher under the future baseline scenario, such that the exceedances will extend up to 50m into the SAC. I.e. up to an additional 10 m in the SAC compared with the 2019 baseline.

- 5.60 Under the Proposed Development alone the critical threshold would be exceeded on six transects, (no change from the future baseline). Under the Proposed Development NH<sub>3</sub> levels would not be above the CT and more than 1% above the future baseline more than 40 m into the SAC.
- 5.61 The distance into the SAC at which the CT is exceeded and the increase due to the Proposed Development exceeds 1% of the CT would not measurably increase (i.e., any increases would be less than 10 m) above the future baseline.
- 5.62 The greatest difference (4.5 µg/m<sup>3</sup> under the future baseline (Scenario 2) versus 4.6 µg/m<sup>3</sup> under the Proposed Development alone) is on the boundary of the SAC on Transect 8. This maximum increase between the future baseline and the Proposed Development alone scenario is 2.2 % of the critical threshold.
- 5.63 Given that increases above the CT and the 1% screening threshold due to the Proposed Development alone will all extend less than 10 m into the SAC on all transects, these marginal increases are considered negligible. Therefore, the Proposed Development, considered alone, will not cause an adverse effect on the integrity of Oxford Meadows SAC through increases in atmospheric concentrations of NH<sub>3</sub>.

**In-combination Effects**

- 5.64 Summary data from the air quality modelling for NH<sub>3</sub> for the Proposed Development in combination with other plans and projects is provided in Table 7. The critical threshold for this pollutant is 3 µg/m<sup>3</sup>. Exceedance distances are accurate to 10 m. NE indicates no exceedance.

Table 7: Summary data for NH<sub>3</sub> for the Proposed Development in combination with other plans and project.

Transect	Max NH <sub>3</sub> (µg/m <sup>3</sup> )						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase against 2033 Baseline
A34-1	2.6	2.6	2.6	0.02	0.6	0.8	NE	10	10	0
A34-2	3.1	3.3	3.3	0.04	1.4	1.2	10	10	10	0
A34-3	3.0	3.2	3.2	0.04	1.3	1.3	10	10	10	0
A34-4	3.3	3.5	3.6	0.05	1.7	1.5	20	30	30	0
A34-5	4.0	4.3	4.4	0.07	2.3	1.6	40	50	50	0
A34-7	3.2	3.4	3.4	0.04	1.3	1.2	30	40	40	0
A34-8	4.1	4.5	4.6	0.08	2.5	1.8	30	40	50	10
A40-9	2.5	2.6	2.6	0.02	0.6	0.8	NE	NE	NE	0
A40-10	2.3	2.4	2.4	0.02	0.5	0.8	NE	NE	NE	0
A40-11	2.5	2.6	2.6	0.03	0.9	1.2	NE	NE	NE	0
A40-12	2.4	2.4	2.4	0.02	0.6	0.8	NE	NE	NE	0
A40-13	2.6	2.7	2.8	0.04	1.5	1.4	NE	NE	NE	0

- 5.65 Under the In-combination scenario (Scenario 4) the critical threshold for NH<sub>3</sub> would be exceeded on six of the eight A34 transects (and none of the A40 transects). The exceedance would extend up to 10 m onto the SAC.
- 5.66 Under the In-combination scenario, the distance into the SAC at which the CT is exceeded and the increase due to the Proposed Development exceeds 1% of the CT would increase by 10 m over the 2033 baseline on one of the transects. There would not be measurable increases on the other 11 transects (i.e., any increase would be less than 10 m).
- 5.67 The greatest difference (4.5 µg/m<sup>3</sup> under the future baseline versus 4.6 µg/m<sup>3</sup> under the in-combination scenario) is on the boundary of the SAC on Transect 8. This maximum increase between the future baseline and the In Combination scenario is 2.5% of the critical threshold.
- 5.68 Compared with the current baseline, there would be an increase in levels of NH<sub>3</sub> under the In-combination scenario. On Transect 8, for example, the increase would be from a current baseline of 4.1 µg/m<sup>3</sup> to 4.6 µg/m<sup>3</sup> as compared to 4.5 µg/m<sup>3</sup> under the future baseline scenario.

5.69 Given that increases above the CT and the 1% screening threshold are limited to a 10 m extension into the SAC on one transect and extensions below 10 m on all other transects, these marginal increases are considered negligible. Therefore, it is considered that the Proposed Development, in combination with other plans and projects, will not cause an adverse effect on the integrity of Oxford Meadows SAC through increases in atmospheric concentrations of NH<sub>3</sub>.

**Nitrogen (N) deposition**

**The Proposed Development Alone**

5.70 Summary data from the air quality modelling for N deposition for the Proposed Development alone is provided in Table 8. The critical threshold for this pollutant is 10kgN/ha/yr. It should be noted that the 2018-2019 Local Plan HRA and the 2023 Local Plan Review HRA used a critical threshold of 20 kgN/ha/yr. The lower value, of 10 kgN/ha/yr is used here because critical thresholds for nitrogen deposition were updated on the UK Government’s APIS website on 10 July 2023. Exceedance distances are accurate to 10 m. NE indicates no exceedance. WT indicates whole transect.

Table 8: Summary data for N deposition for the Proposed Development alone.

Transect	Max N deposition (kgN/ha/yr)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase against 2033 Baseline
A34-1	18.16	16.2	16.3	0.08	0.8	0.5	WT	WT	20	20
A34-2	22.33	19.9	20.2	0.2	2.0	1.0	WT	WT	30	30
A34-3	21.67	19.3	19.5	0.2	1.8	1.0	WT	WT	30	30
A34-4	23.95	21.4	21.7	0.25	2.5	1.2	WT	WT	50	50
A34-5	28.59	26.1	26.4	0.36	3.6	1.4	WT	WT	80	80
A34-7	22.75	20.5	20.7	0.20	2.0	1.0	WT	WT	70	70
A34-8	29.82	27.3	27.7	0.4	3.9	1.4	WT	WT	70	70
A34-9	18.01	16.1	16.2	0.08	0.8	0.5	WT	WT	30	30
A40-10	15.22	14.1	14.1	0.03	0.3	0.2	WT	WT	NE	NE
A40-11	17.42	15.8	15.8	0.06	0.6	0.4	WT	WT	NE	NE
A40-12	15.84	14.5	14.6	0.04	0.4	0.3	WT	WT	NE	NE
A40-13	18.46	16.8	16.9	0.1	0.8	0.6	WT	WT	NE	NE

5.71 The critical threshold for N deposition (10 kgN/ha/yr) is exceeded at all points on all 12 transects under the 2019 baseline scenario (Scenario 1). The highest load (29.82 kgN/ha/yr) is on the SAC boundary on Transect 8. Loads are predicted to be a small amount lower under both 2033 scenarios (i.e., the future baseline (Scenario 2), and the Proposed Development alone (Scenario 3)).

5.72 Under the Proposed Development alone, the distance into the SAC at which the increase due to the Proposed Development drops to 1% of the CT at 80 m into the SAC. The greatest increase (from 27.3 kg/ha/yr to 27.7 kg/ha/yr is on the boundary of the SAC on Transect OxM8. This is an increase of 3.9% of the CT.

5.73 The exceedance distance varies between transects. For transects 10 to 13, there is no exceedance of the 1% threshold, even on the SAC boundary, for transects 1 to 4 and 6 to 9, the increase drops to (or below) 1% at varying distances between 20 m and 60 m and maximum increase per transect is between 1.6 and 4.5% of the CT.

5.74 Compared with the current baseline, there would be small decreases in levels of N deposition under both the future baseline scenario and the Proposed Development alone. On transect 5, for example, the decrease would be from a current baseline of 28.95 kgN/ha/yr to 26.4 kgN/ha/yr under the Proposed Development alone.

5.75 However, the increases against the 2033 future baseline (Scenario 2) are above 1% of the critical threshold and affect more than just marginal parts of the SAC. Therefore, the potential for adverse impacts on the SAC requires further detailed consideration (see *Air quality conclusions* below).

**In-combination Effects**

5.76 Summary data from the air quality modelling for N deposition for the Proposed Development in combination with other plans and projects is provided in Table 9. The lower critical threshold for this pollutant is 10kgN/ha/yr. Exceedance distances are accurate to 10m. NE indicates no exceedance.

Table 9: Summary data for N deposition for the Proposed Development in combination with other plans and projects.

Transect	Max N deposition (kgN/ha/yr)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase against 2033 Baseline
A34-1	18.16	16.2	16.3	0.10	1.0	0.6	WT	WT	30	30
A34-2	22.33	19.9	20.2	0.25	2.5	0.9	WT	WT	40	40
A34-3	21.67	19.3	19.6	0.2	2.3	1.0	WT	WT	40	40
A34-4	23.95	21.4	21.7	0.31	3.1	1.4	WT	WT	60	60
A34-5	28.59	26.1	26.5	0.41	4.1	1.5	WT	WT	100	100
A34-7	22.75	20.5	20.7	0.24	2.4	1.2	WT	WT	90	90
A34-8	29.82	27.3	27.7	0.45	4.5	1.6	WT	WT	100	100
A34-9	18.01	16.1	16.2	0.10	1.0	0.6	WT	WT	40	40
A40-10	15.22	14.1	14.2	0.09	0.9	0.6	WT	WT	20	20
A40-11	17.42	15.8	15.9	0.17	1.7	1.0	WT	WT	40	40
A40-12	15.84	14.5	14.6	0.11	1.1	1.0	WT	WT	40	40
A40-13	18.46	16.8	17.1	0.3	2.6	1.7	WT	WT	40	40

5.77 All 13 transects show an increase above 1% of the CT under the In-combination scenario. This drops to 1% of the CT at 100 m into the SAC on transects 5 and 8. The greatest increase above the future baseline (from 36.7 kg/ha/yr to 37.4 kg/ha/yr is on the boundary of the SAC on Transect 8. This is an increase of 4.5% of the CT.

5.78 For the other 11 transects, the increase drops to (or below) 1% of the CT at various distances between 20 and 90m into the SAC.

5.79 Compared with the current baseline, there would be small decreases in levels of N deposition under both the future baseline scenario and the Proposed Development alone. On Transect 5, for example, the decrease would be from a current baseline of 28.59 kgN/ha/yr to 26.1 kgN/ha/yr under the in-combination scenario.

5.80 However, as with the Proposed Development alone, the increases against the 2033 future baseline (Scenario 2) from the in-combination scenario are above 1% of the critical threshold and affect more than just marginal parts of the SAC. Therefore, the potential for adverse impacts on the SAC on the site’s conservation objectives requires further detailed consideration (see *Air quality conclusions* below).

5.81 The air quality assessment in the 2018-2019 Local Plan HRA found that their critical threshold would not be exceeded at any location for either of their 2031 scenarios, and neither would any increases be more than 1% of the critical threshold. This is partly due their critical threshold being 20 kgN/ha/yr, as opposed to 10 kgN/ha/yr, partly due to the single A34 transect that was employed being located further from the A34 than some of the transects in the current study, and partly because of the higher increases in traffic flows predicted on the A34 in the current traffic model that that used in the 2018-2019 Local Plan HRA.

**Acidification**

**The Proposed Development Alone**

5.82 Summary data from the air quality modelling for acidification for the Proposed Development alone is provided in Table 10. Exceedance distances are accurate to 10 m. NE indicates no exceedance.

Table 10: Summary data for acidification for the Proposed Development alone.

Transect	Max Acidification (kgeq/ha/yr)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 Alone (Sc 3)	Increase against 2033 Baseline
A34-1	1.3	1.2	1.2	0.01	0.7	0.8	NE	NE	NE	0
A34-2	1.6	1.4	1.4	0.01	1.7	0.7	NE	NE	NE	0
A34-3	1.5	1.4	1.4	0.01	1.5	0.7	NE	NE	NE	0
A34-4	1.7	1.5	1.5	0.02	2.1	1.3	NE	NE	NE	0
A34-5	2.0	1.9	1.9	0.03	3.0	1.6	NE	NE	NE	0
A34-7	1.6	1.5	1.5	0.01	1.7	0.7	NE	NE	NE	0
A34-8	2.1	1.9	2.0	0.03	3.2	1.5	NE	NE	NE	0
A34-9	1.3	1.1	1.1	0.01	0.7	0.0	NE	NE	NE	0
A40-10	1.1	1.0	1.0	0.00	0.3	<0.1	NE	NE	NE	0
A40-11	1.2	1.1	1.1	0.00	0.5	<0.1	NE	NE	NE	0
A40-12	1.1	1.0	1.0	0.00	0.3	<0.1	NE	NE	NE	0
A40-13	1.3	1.2	1.2	0.01	0.7	0.8	NE	NE	NE	0

5.83 None of the points on any of the transects experience an exceedance of the critical threshold function under any scenario, as calculated using the APIS tool which calculates acid deposition as a proportion of the Minimum CL function (this is more precautionary than using the MaxCL function). The greatest increase is calculated to be 3.2% of the lower CT for N and 0.6% of the critical threshold function).

5.84 Compared with the 2019 baseline, there would be small decreases in acid deposition levels under both the future baseline scenario and the Proposed Development alone. On Transect 8, for example, the decrease would be from a current baseline of 2.1 kgeq/ha/yr to 2.0 kgeq/ha/yr under the Proposed Development alone.

5.85 There is considered, therefore, no potential for an adverse effect on the integrity of the SAC from acid deposition from the Proposed Development alone.

**In-combination Effects**

5.86 Summary data from the air quality modelling for acidification in combination with other plans and projects is provided in Table 11. Exceedance distances are accurate to 10 m. NE indicates no exceedance.

Table 11: Summary data for acidification for the Proposed Development in combination with other plans and projects.

Tran-sect	Max Acidification (kgeq/ha/yr)						Max distance of CT exceedance into SAC (m)		Max distance of CT & 1% exceedance into SAC (m)	
	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc4)	Increase above 2033 Baseline	% of CT	% of total	2019 Baseline (Sc 1)	2033 Baseline (Sc 2)	2033 In-combination (Sc 4)	Increase against 2033 Baseline
A34-1	1.3	1.2	1.2	0.01	0.7	0.8	NE	NE	NE	0
A34-2	1.6	1.4	1.4	0.02	2.1	1.4	NE	NE	NE	0
A34-3	1.5	1.4	1.4	0.02	1.9	1.4	NE	NE	NE	0
A34-4	1.7	1.5	1.6	0.02	2.6	1.4	NE	NE	NE	0
A34-5	2.0	1.8	1.9	0.03	3.4	1.6	NE	NE	NE	0
A34-7	1.6	1.5	1.5	0.01	1.7	0.7	NE	NE	NE	0
A34-8	2.1	1.9	2.0	0.03	3.7	1.5	NE	NE	NE	0
A34-9	1.3	1.1	1.2	0.01	0.8	0.8	NE	NE	NE	0
A40-10	1.1	1.0	1.0	0.01	0.3	0.8	NE	NE	NE	0
A40-11	1.2	1.1	1.1	0.01	1.4	0.9	NE	NE	NE	0
A40-12	1.1	1.0	1.0	0.01	0.9	1.0	NE	NE	NE	0
A40-13	1.2	1.2	1.1	0.01	1.4	1.0	NE	NE	NE	0

5.87 None of the points on any of the transects experience an exceedance of the critical threshold function under any scenario, as calculated using the APIS tool which calculates acid deposition as a proportion of the Minimum CL function (this is more precautionary than using the MaxCL function).

The greatest increase is calculated to 3.7 % of the Lower Ct for N and 0.6 % of critical threshold function.

- 5.88 Compared with the 2019 baseline, there would be small decreases in acid deposition levels under both the future baseline scenario and the Proposed Development in combination with other plans and projects. On transect 5, for example, the decrease would be from a current baseline of 2.0 kgeq/ha/yr to 1.9 kgeq/ha/yr under the Proposed Development in combination with other plans and projects.
- 5.89 There is considered, therefore, no potential for an adverse effect on the integrity of the SAC from acid deposition from the Proposed Development in combination with other plans and projects.

**Temporal effect of the Proposed Development on the ‘Restore’ Objective**

- 5.90 The above data has been used to calculate whether the Proposed Development would materially affect the ‘restore’ objective for the Oxford Meadows SAC. The results are provided in Tables 12 – 15 below. The methodology used, agreed with Natural England at a consultation meeting on this IHRA document, held on 06 June 2024, has been to consider the year-on-year reduction in pollution levels from cleaner vehicle technology as modelled by APIS over the 14 year modelling period (2019-2033) and use that to deduce an average year on year change over this period. The process contribution of the Proposed Development both alone and in combination is then considered. Where the process contribution is less than the average yearly decline, this is considered not to represent an adverse effect. This approach assumes a linear reduction between 2019-2033, and that this linear reduction will continue thereafter.
- 5.91 For NO<sub>x</sub> and NH<sub>3</sub>, the figures relate to points where the transect from the road first intercepts the SAC boundary, which is a precautionary approach. For N deposition, both this approach and a more detailed approach have been used. Under and the figures relate to the point where the transect from the road first intercepts the hay meadow interest feature of the SAC (as per Table 3B), and then a further analysis, for transect points 20 m into the hay meadows feature.
- 5.92 The green figures indicate where the change equates to less than 1 year of the average change. Acidification has been excluded from this assessment given that the critical thresholds are not breached.

Table 12. Average annual change in NO<sub>x</sub> 2019-2033 for baseline (based on Scenario 2), 2033 + Proposed Development (based on Scenario 3) and 2033 + Proposed Development In Combination (based on Scenario 3).

Transect	Max NO <sub>x</sub> (µg/m <sup>3</sup> )						
	Baseline			2033 + Proposed Development		2033 + Proposed Development In Combination	
	2019 baseline	2033 baseline	Avg annual change	Level	Increase above 2033 baseline	Level	Increase above 2033 baseline
A34-1	49.7	29.4	-1.5	29.7	0.28	29.7	0.35
A34-2	56.1	31.2	-1.8	31.5	0.35	31.6	0.43
A34-3	52.8	30.2	-1.6	30.5	0.31	30.6	0.39
A34-4	97.1	43.0	-3.9	43.8	0.79	44.0	0.99
A34-5	141.8	57.0	-6.1	58.1	1.09	58.2	1.26
A34-7	87.3	40.5	-3.3	41.1	0.61	41.2	0.72
A34-8	93.6	42.4	-3.7	43.1	0.67	43.2	0.79
A34-9	48.4	29.0	-1.4	29.3	0.27	29.4	0.34
A40-10	21.9	16.8	-0.4	16.8	0.07	17.0	0.21
A40-11	35.5	25.8	-0.7	26.0	0.13	26.2	0.38
A40-12	31.4	21.2	-0.7	21.3	0.13	21.6	0.43
A40-13	35.4	25.7	-0.7	25.8	0.13	26.1	0.40

Table 13. Average annual change in NH<sub>3</sub> 2019-2033 for baseline (based on Scenario 2), 2033 + Proposed Development (based on Scenario 3) and 2033 + Proposed Development In Combination (based on Scenario 3).

Transect	Max NH <sub>3</sub> (µg/m <sup>3</sup> )						
	Baseline Level			2033 + Proposed Development		2033 + Proposed Development In Combination	
	2019 baseline	2033 baseline	Avg annual change	Level	Increase above 2033 baseline	Level	Increase above 2033 baseline
A34-1	2.9	3.1	+0.2	3.1	0.03	3.1	0.03
A34-2	3.1	3.3	+0.2	3.3	0.03	3.3	0.04
A34-3	3.0	3.2	+0.2	3.2	0.03	3.2	0.04
A34-4	4.2	4.6	+0.3	4.6	0.08	4.7	0.10
A34-5	5.4	6.1	+0.4	6.3	0.11	6.3	0.12
A34-7	4.0	4.3	+0.3	4.4	0.06	4.4	0.07
A34-8	4.1	4.5	+0.3	4.6	0.07	4.6	0.08
A34-9	2.9	3.0	+0.2	3.0	0.03	3.1	0.03
A40-10	2.4	2.5	+0.2	2.5	0.01	2.5	0.02
A40-11	2.6	2.7	+0.2	2.7	0.01	2.8	0.04
A40-12	2.7	2.8	+0.2	2.8	0.01	2.8	0.05
A40-13	2.6	2.7	+0.2	2.8	0.01	2.8	0.04

Table 14. Average annual change in N-deposition 2019-2033 for baseline (based on Scenario 2), 2033 + Proposed Development (based on Scenario 3) and 2033 + Proposed Development In Combination (based on Scenario 3).

Transect	Max N deposition (kg/ha/yr)						
	Baseline			2033 + Proposed Development		2033 + Proposed Development In Combination	
	2019 baseline	2033 baseline	Avg annual change	2033 + PD	Increase above 2033 baseline	2033 + PD IC	Increase above 2033 baseline
A34-1	18.2	16.2	-0.1	16.3	0.1	16.3	0.1
A34-2	22.3	20.0	-0.2	20.2	0.3	20.2	0.3
A34-3	21.7	19.3	-0.2	19.5	0.2	19.6	0.3
A34-4	24.0	21.3	-0.2	21.7	0.4	21.7	0.4
A34-5	28.6	26.1	-0.2	26.4	0.3	26.5	0.4
A34-7	22.8	20.5	-0.2	20.7	0.2	20.7	0.2
A34-8	29.8	27.3	-0.2	27.7	0.4	27.7	0.4
A34-9	18.0	16.1	-0.1	16.2	0.1	16.2	0.1
A40-10	15.2	14.1	-0.1	14.1	0.0	14.2	0.1
A40-11	17.4	15.8	-0.1	15.8	0.0	15.9	0.1
A40-12	15.8	14.5	-0.1	14.6	0.1	14.6	0.1
A40-13	18.5	16.8	-0.1	16.9	0.1	17.1	0.3

5.93 The above tables for N deposition consider the effect on time to restore at the closest point of the hay meadows SAC interest feature to the roads. In order to investigate how the effect changes with distance from the road, a second analysis, at transect points 20 m into the SAC hay meadows feature was carried out (i.e., 20 m beyond to the transect points listed in column three of Table 3B). See Table 15 below.



Table 15. Average annual change in N-deposition 2019-2033 for baseline (based on Scenario 2), 2033 + Proposed Development (based on Scenario 3) and 2033 + Proposed Development In Combination (based on Scenario 3), at transect points 20 m into hay meadows SAC feature.

Transect	Max N deposition (kg/ha/yr)						
	Baseline			2033 + Proposed Development		2033 + Proposed Development In Combination	
	2019 baseline	2033 baseline	Avg annual change	2033 + PD	Increase above 2033 baseline	2033 + PD IC	Increase above 2033 baseline
A34-1	17.42	15.56	-0.14	15.6	0.04	15.6	0.04
A34-2	19.29	17.2	-0.16	17.3	0.1	17.3	0.1
A34-3	19.11	17.04	-0.16	17.1	0.06	17.2	0.16
A34-4	20	17.82	-0.17	18	0.18	18	0.18
A34-5	22.68	20.39	-0.18	20.6	0.21	20.6	0.21
A34-7	20.52	18.39	-0.16	18.5	0.11	18.6	0.21
A34-8	23.05	20.74	-0.18	21	0.26	21	0.26
A34-9	17.45	15.58	-0.14	15.6	0.02	15.7	0.12
A40-10	14.93	13.77	-0.09	13.8	0.03	13.8	0.03
A40-11	16.66	15.01	-0.13	15.1	0.09	15.1	0.09
A40-12	15.46	14.15	-0.10	14.2	0.05	14.2	0.05
A40-13	16.9	15.26	-0.13	15.3	0.04	15.4	0.14

- 5.94 For NO<sub>x</sub> and NH<sub>3</sub>, the temporal effect of the Proposed Development on the restore objective would be to increase the time required to restore parts of the hay meadows SAC feature in closest proximity to the A34 and the A40 by less than one year. For NO<sub>x</sub> and NH<sub>3</sub>, the temporal effect of the Proposed Development would not materially affect the restore objective either alone or in combination. This confirms that whilst there are exceedances of the critical threshold at some points on the transects, it is considered that these do not equate to an adverse effect on the SAC from NO<sub>x</sub> and NH<sub>3</sub>.
- 5.95 For Nitrogen deposition, the temporal effect of the Proposed Development on the restore objective would be to increase the time required to restore parts of the hay meadows SAC feature in closest proximity to the A34 and the A40 by up to three years. From the figures in Table 14, the period would be three years at transect 13 (i.e. 0.3/0.1); two years at transects 4,5 and 8; 1.5 years at transects 2 and 3. For the remaining six transects the increase would be by one year or less.
- 5.96 The effect on the restore objective, would be marginal in terms of the magnitude of temporal change and also marginal in that the effect would be limited to parts of the SAC feature in close proximity to the roads. From the figures in Table 15, which relate to transect points 20 m into the hay meadows SAC feature, the restore period would be extended by 1.4 years at Transect 8; 1.2 years at transects 5 and 7; and 1.1 years at Transects 4 and 13. For the remaining six transects the increase would be by one year or less.
- 5.97 Based on this analysis, the time to reach the restore objective for NO<sub>x</sub> and NH<sub>3</sub> will not be extended by more than 1 year anywhere within the hay meadows feature. For nitrogen deposition it will not be extended by more than 3 years anywhere within the feature and will be extended by less than 1.5 years for all parts of the SAC that are more than 20 m from the A34 and the A40 (estimated via the MAGIC mapping website to constitute 97% of the ca. 107 ha of hay meadow feature at the SAC (with ca. 4.1 ha being within 20 m of the roads).
- 5.98 It is important to consider the context of these extensions. Based on the rate of decline between 2019 and 2033, the expected timescale to achieve the critical threshold for nitrogen deposition from the 2019 baseline is over 80 years for all transects, and more than 100 years for some transects. Given these timescales, and the level of uncertainty likely to be associated with them, their extension by up to three years in close proximity to the A34 and the A40 is not considered to result in an adverse effect on the integrity of Oxford Meadows SAC.
- 5.99 These timescales assume that the rate of decline predicted to be achieved between 2019 and 2033 (which will largely derive from lower traffic emissions) will continue after 2033. Given that the majority

of nitrogen deposition at Oxford Meadows SAC currently derives from other sources<sup>2</sup>, which are likely to be more difficult to reduce, it is considered that the Proposed Development will not materially affect the likelihood of the conservation objective for nitrogen deposition being achieved. It is also questionable that that this objective will be achieved in the predicted timescales of at least 80 years, with or without the Proposed Development.

***Whether the ‘restore’ objective can be achieved in the plan period***

- 5.100 The IHRA has considered a future baseline of 2033, this being the assessed year of completion of development for the purposes of the Environmental Statement. The emerging Cherwell Local Plan 2040 has been supported by a plan level HRA that was carried out by CDC in August 2023 and which models a future baseline up to 2040.<sup>3</sup>
- 5.101 The evidence presented in that plan level HRA suggests that critical threshold levels will continue to be exceeded at certain transects even in the 2040 ‘Do Something’ scenario, both alone and in combination with other plans and projects.
- 5.102 The conclusion reached in that strategic plan-level HRA is that “*The Cherwell Local Plan Review will not have an adverse effect on the integrity of any Habitats Sites either alone or in combination with other plans and projects.*”<sup>4</sup> This conclusion was reached when considering pollution levels that have been modelled as being consistently higher than has been calculated in this IHRA.
- 5.103 This conclusion is the same that has been reached by Oxford City Council, who have also carried out a plan level HRA in support of their draft Local Plan 2040, which is currently undergoing examination.

***Sensitivity of the Hay Meadows Feature***

- 5.104 The lower critical threshold for N deposition of 10 kgN/ha/yr for Lowland hay meadow for is based on Bobbink et al (2022), which states the following:
- “Previously, the CLempN (i.e. critical load for nitrogen) for low and medium altitude hay meadows was set at 20-30 kg N ha<sup>-1</sup> yr<sup>-1</sup> based on expert judgement. Although new findings from a field experiment and gradient studies have been published since the last review, the data basis is still uncertain. Therefore, the CLempN range for low and medium altitude hay meadows is as expert judgement specified as 10-20 kg N ha<sup>-1</sup> yr<sup>-1</sup>. There is, however, still a need for field addition studies in different countries, especially in regions with low atmospheric deposition.”*
- 5.105 Floodplain meadows, such as Oxford Meadows, form a subset of Lowland hay meadows which are subject to regular flooding and associated nutrient inputs from silt deposition and they are known to have higher soil nutrient levels than other types of hay meadow. The Floodplain Meadows Handbook (Rothero et al., 2016) notes states that ‘Floodplain meadows require soils that have moderate levels of soil nutrients, particularly phosphorous’.
- 5.106 Therefore, applying the nitrogen critical threshold for lowland hay meadows generally (which are already considered to be precautionary (Natural England 2018)) is likely to be highly precautionary when it comes to floodplain hay meadows of the type present at Oxford Meadows SAC.

***Air quality conclusions***

- 5.107 For NO<sub>x</sub> levels, nitrogen deposition, and acid deposition, air quality will improve at Oxford Meadows SAC against the 2019 baseline under all three future (2033) scenarios. NH<sub>3</sub> will see a small deterioration.

<sup>2</sup> 9.5% is from traffic; the remaining 90.5% being from other sources, of which livestock farming and nitrogen imports from Europe contribute 19.0% and 18.2%, respectively (APIS, 2024).

<sup>3</sup> Cherwell Local Plan 2040 Habitats Regulations Assessment, August 2023.

<sup>4</sup> Ibid., paragraph 5.1.

- 5.108 The in-combination future scenario 2033 (i.e., Scenario 4) would result in exceedances of critical thresholds of gaseous levels for NO<sub>x</sub> and NH<sub>3</sub> that extend a maximum of 10 m further into the SAC from the road sources compared to the 2033 future baseline scenario (i.e., Scenario 2, without the development). Given the overall reduction in NO<sub>x</sub> compared to the 2019 baseline, the current exceedance in NH<sub>3</sub>, the small proportion of the SAC (and specifically, of the hay meadows feature) that would be affected, and that the SAC habitats are assessed to be in favourable condition, these increases are considered marginal and are not considered to have an adverse effect on the integrity of the SAC. The 'temporal effects' assessment of the Proposed Development both alone and in combination confirm that there would not be adverse effects on the SAC arising from NO<sub>x</sub> or NH<sub>3</sub>.
- 5.109 Nitrogen deposition rates would see an increase over 1% of the critical threshold up to 70 m into the SAC from the Proposed Development alone in 2033 (i.e., Scenario 3), and up to 100 m into the SAC from the In-combination scenario in 2033 (i.e., Scenario 4) compared to the 2033 future baseline scenario (i.e., Scenario 2). The latter distance correspond to 90 to 100 m into the hay meadows SAC feature. As such, although future nitrogen deposition rates will be less than the current 2023 rates of deposition with the development alone and in-combination, they will be higher than the predicted deposition rates in 2033 without the development.
- 5.110 For nitrogen deposition, the area of increased exceedance over 1% of the critical threshold under the In-combination scenario (against the 2033 baseline) is up to ca. 8 ha adjacent to the A34 and the A40 (this is a precautionary estimate, based on exceedance distances of 100 m east and 60 m west of the A34). This represents 3% of the 267 ha SAC extent and 7.5% of the 107 ha extent of the hay meadows feature within the SAC.
- 5.111 In these circumstances, consideration has been given to the extent to which increases in N deposition above the 2033 baseline resulting from the Proposed Development and In-combination scenarios will prevent Natural England's air quality and hay meadows objective for the SAC being met. The objective is '*Maintain the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site*'. This should be assessed in the context of the following matters:
- There will be an improvement in nitrogen deposition in 2033 with the Proposed Development alone and in-combination compared with the 2019 baseline, under which the condition of the SAC has been assessed as favourable or unfavourable recovering.
  - There would be a decrease in nitrogen deposition against the current baseline 2023 for all transects.
  - Increases in comparison with the future baseline above Natural England's highly precautionary screening criteria would affect a small proportion of the SAC and of the hay meadows feature.
  - For this assessment, the highly precautionary 10 kgN/ha/yr has been used when carrying out this assessment, but taking into consideration the findings of Bobink et al (2022) and the Floodplain Meadows Handbook (Rothero et al. 2016). The analysis shows that all but two of the transects will be below higher threshold figure of 20 kgN/ha/yr in 2033, both without the development and with the development in combination with other plans and projects. I.e., Where there will be exceedances of this higher value in 2033, this will be the regardless of the Proposed Development.
  - Achieving the 'restore' objective would not be prevented by the proposed development and would be affected only marginally, both temporally and spatially.
  - According to the APIS website road-traffic-originated nitrogen at the SAC accounts for just below 10% of nitrogen deposition with just over 90% coming from other sources. Almost 20% originates from Europe imported nitrogen, just over 16% from livestock, just under 9% from international shipping, just under 10% from other non-road transport and 6% from fertiliser application. As such, road traffic makes a relatively minor contribution to the nitrogen loading on the SAC. If the conservation objective of reducing nitrogen loading on the SAC to below the critical load for this habitat type is to be achieved, then avoidance of additional nitrogen from increased road traffic is unlikely to make a significant difference to the overall nitrogen loading on the SAC and the ability to achieve this conservation objective for the SAC.

- The increases over the predicted future baseline should also be considered in light of recent declines in road traffic originated nitrogen and the future modal shift predicted to take place over the next 10 years in fossil fuel driven vehicles, which will reduce the contribution of nitrogen generated by traffic. Beyond 2033 there is likely to be a continuing reduction in the use of fossil fuel driven vehicles and, as such, the contribution to nitrogen deposition from road traffic is likely to continue its current decreasing trajectory.
- Reductions in air pollution between the 2019 and predicted 2033 baseline include reductions that result from Oxford City Council's Transport and Connectivity Plan. These reductions have been treated as mitigation for development allocated in the Local Plan in the Cherwell Local Plan Review 2040 HRA, rather than part of the baseline comparator.
- The statement by Natural England (2018b), in relation to the air quality target for Oxford Meadows SAC, that *"It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales."*

- 5.112 Natural England (2018, paragraph 5.28) guidance notes that *"Where a site is already exceeding a relevant benchmark, the extent to which additional increments from plans and projects would undermine a conservation objective to 'restore' will involve further consideration of whether there is credible evidence that the emissions represent a real risk that the ability of other national or local measures and initiatives to otherwise reduce background levels will be compromised in a meaningful manner. This is a judgement to be taken by the competent authority which should be informed by, amongst others, the extent to which any declining national trends in air pollution or strategic work to tackle emissions affecting the site more locally might otherwise lead to improvements, the rate at which such improvement are anticipated to be delivered, any credible evidence on the extent of the impacts of a plan or project and whether those impacts can properly be considered temporary and reversible."*
- 5.113 UK-wide modelling (JNCC, 2020) also predicts a substantial decrease in the impacts of nitrogen deposition on sensitive vegetation by 2030, assuming that NECR targets will be met through implementation of the UK National Air Pollution Control Programme.
- 5.114 Significant local reductions in air pollution are also likely to result from Oxford City Council's Transport and Connectivity Plan, which has targets to reduce 1 in 4 car trips by 2030 and remove 1 in 3 current car trips and deliver a net-zero transport network by 2040, setting out strategies to achieve this (an active travel strategy, a freight and logistics strategy, and an innovation framework).
- 5.115 Given the modelling work carried out here, consideration of the small increases in nitrogen deposition in proximity to the A34 and the A40, the fact that this will not prevent the restore object for the SAC from being achieved, and the long timescales for this objective, it is considered that the Proposed Development, either alone or in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through air quality effects.

### **Water Quality Impacts**

- 5.116 Being floodplain meadows, vegetation (including the SAC features floodplain hay meadows and creeping marshwort) in many parts of the SAC is reliant on groundwater supplies, and many parts are periodically flooded by the adjacent River Thames and associated watercourses. Construction activities and increased numbers of people working and/or residing upstream of the Oxford Meadows SAC has the potential to affect the quality of groundwater and or surface water which supplies the SAC.
- 5.117 Chapter 11 of the Environmental Statement for the Proposed Development notes that water from the Rowel Brook and Oxford Canal at the Site discharge into the Dukes Cut, after 1.7km this then merges into the Wolvercote Mill Stream, which flows through the Pixey and Yarnton Meads SSSI, and then merges in the Thames at the Oxford Meadows SAC, which is part of the Port Meadow with Wolvercote Common & Green SSSI.
- 5.118 The SAC is considered vulnerable to surface water pollution (JNCC 2015). Natural England (2019) have identified the following targets (for both SAC features) relating to water quality:

- Maintain water quality to a standard which provides the necessary conditions to support the feature.
- Groundwater should be assessed as 'good' in relation to Water Framework Directive targets.
- River water quality in the river Thames upstream of the SAC should be assessed as at least meeting the 'good ecological status' target.

5.119 Natural England note that 'Typically, meeting the surface water and ground water environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC conservation objectives but in some cases more stringent standards may be needed'.

5.120 There are no nutrient neutrality requirements relating to the River Thames downstream of the Proposed Development.

5.121 The Stage 2 assessment in the 2018-2019 Local Plan HRA identified the potential for untreated surface water discharging from the certain allocation sites (include PR8) to enter the sewer system and the River Thames without treatment. It concluded that water quality impact of the development allocated in the Local Plan would be limited by Policies ESD 7: Sustainable Drainage Systems (SuDS) ESD 8: Water Resources, ESD 9: Protection of Oxford Meadows SAC and therefore there would be no adverse effect of the Local Plan on the integrity of the SAC.

5.122 In the 2019 HRA Addendum (Atkins, 2019), the policy text was amended to say that planning applications under PR8 'should demonstrate that Thames Water, Natural England and the Environment Agency have been consulted regarding wastewater treatment capacity, and that an agreement has been reached in principle that foul drainage from the site will be accepted into the drainage network'. The previous iteration assessed in the HRA was that 'the application should demonstrate that Thames Water has agreed in principle that foul drainage from the site will be accepted into its network'. The original HRA assessment found that policy would have no LSE. The amendment to the text provides additional protection, therefore this amendment did not change the findings of the HRA.

5.123 This IHRA considers this impact pathway and also direct discharges to the Thames catchment upstream of the SAC. It also considers general nutrient increases in the River Thames through the increased discharges of treated sewage that will result from the Proposed Development, and the potential for the Proposed Development to increase the occurrence of storm overflows of untreated sewage into the Thames (as can happen at times of very high surface water input due to heavy rainfall).

#### **Embedded avoidance and mitigation measures**

5.124 The Proposed Development includes a Drainage Strategy which will provide treatment of surface water, to be achieved through extensive attenuation and settlement features, the majority of which are likely to be semi-natural wetland habitat know and Sustainable Drainage Systems (SuDS).

5.125 Also, extensive areas of greenspace (permanent grassland woodland and other vegetation) will be created in the Proposed Development on areas surrounding the Rowel Brook and smaller watercourses on areas of land that are currently under intensive arable farming. This change will reduce the rate of surface water runoff from the Site and is likely to reduce silt discharges, in addition to providing inherent and large watercourse protection buffers during construction. The Drainage Strategy will treat and discharge surface water separately from the sewage network, and so will not increase the likelihood of storm overflows.

5.126 Thames Water have been consulted on the Proposed Development and have confirmed that their Waste Water Treatment Works at Cassington will have the capacity to treat sewage outputs.

5.127 The Proposed Development is not closely hydrologically linked to the SAC, being separated from by at least 1.8 km, from Yarnton Mead by the extensive wetland at Cassington Gravel Pits and from the remainder of the SAC by the River Thames.

- 5.128 The Outline Construction Environmental Management Plan (CEMP) for the Proposed Development puts in place measures to avoid pollution from construction activities such as oils and silt. This includes, for example, buffers to watercourses and pollution prevention measures during the storage and transfer of materials such as fuels.
- 5.129 Local Plan Policies ESD 8 and ESD 9 will require other allocated sites within the district to adopt similar approaches and to ensure that surface and underground water quality will be maintained, that there will be no adverse effect on water quality in nearby watercourses, that environmental water quality standards will be met, and that runoff rates from new development will be maintained at greenfield rates.

#### ***Potential for impacts during Construction***

- 5.130 Given the distance of the Proposed Development from the SAC, the lack of hydrological connection, extensive watercourse buffering in the design, the drainage strategy, and the construction stage protection measures, it is not considered that there will be an adverse water quality impact on the SAC from the construction phase of the Proposed Development, considered alone and in combination with other plans and projects. This is consistent with the findings of Chapter 11: Water Resources and Flood Risk of the Environmental Statement for the Proposed Development, which concluded that the potential for pollution impacts on the SAC is negligible.

#### ***Potential for impacts during Occupation***

- 5.131 Given the distance of the Proposed Development from the SAC, the lack of hydrological connection, extensive watercourse buffering in the design, the drainage strategy, and the stated capacity of the sewage treatment network to process additional sewage outputs, it is not considered that there will be an adverse water quality impact on the SAC from the occupation phase of the Proposed Development, considered alone and in combination with other plans and projects. This is in line with Chapter 11 of the Environmental Statement for the Proposed Development, which concluded that the potential for water quality impacts SAC is negligible.

#### ***Conclusion on Water Quality Impacts***

- 5.132 It is therefore considered that the Proposed Development, considered alone, will not result an adverse effect on the integrity of Oxford Meadows SAC through water quality impacts.
- 5.133 Given the general requirements of Policies ESD 8 and ESD 9 it is considered that the Proposed Development, considered in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through water quality impacts. This conclusion is in agreement with the conclusion of the 2018-2019 Local Plan HRA (see pages 31 and 42).

#### ***Hydrological Impacts***

- 5.134 As noted under *Conservation Objectives* and *Water Quality Impacts* above, the SAC features floodplain hay meadows and creeping marshwort are reliant on groundwater supplies and on periodical flooding. Construction activities and changes in land use have potential to affect groundwater and flooding at the SAC.
- 5.135 JNCC (2015) have identified 'human induced changes to hydrological conditions' as a negative impact on the SAC.
- 5.136 Specifically, Natural England (2019) have identified the following target for lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) at the SAC relating to hydrology:
- Maintain a hydrological regime which provides a consistently near-surface water table which typically averages depths of 35 cm (winter), 45cm (spring), 70cm (summer) and 60cm (autumn) below ground level.

- Maintain a hydrological regime which provides a cumulative duration of annual surface flooding which is typically less than 10 days between December– February and less than 3 days between September–November, with no inundations during March–August, subject to natural change.

5.137 Natural England (2019) have identified the following targets for creeping marshwort at the SAC relating to hydrological regime, water level fluctuation and water quality/quantity:

- Maintain a regime of winter flooding (at least 2 weeks inundation at least one year in three in areas potentially holding the plant) and gradual drying out in late summer/autumn.
- Maintain the zones where winter flooding recedes to leave a drying muddy margin with reduced competition.
- Maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.

5.138 The Stage 2 assessment in the 2018-2019 Local Plan HRA addressed potential for human induced hydrological changes at the SAC from the development allocations. It concluded that the PR8 site (among others) is unlikely to have significant contribution to groundwater recharge and will not have an effect on the balanced hydrological regime of the Oxford Meadows SAC.

#### **Embedded avoidance and mitigation measures**

5.139 The Proposed Development includes a Drainage Strategy which will prevent any increase in surface water runoff above current ('greenfield') levels. This will be achieved through extensive attenuation features, the majority of which are likely to be semi-natural wetland habitat know and Sustainable Drainage Systems (SuDS). This will avoid increases in surface water discharges to watercourses.

5.140 Local Plan Policies ESD 8 and ESD 9 will require other allocated sites within the district to adopt similar approaches and to ensure that surface and underground water quality will be maintained.

#### ***Potential for impacts during Construction***

5.141 The Proposed Development is not closely hydrologically linked to the SAC, being separated from by at least 1.8 km, from Yarnton Mead by the extensive wetland at Cassington Gravel Pits and from the remainder of the SAC by the River Thames.

5.142 Given the distance of the Proposed Development from the SAC, the lack of hydrological connection, extensive watercourse buffering in the design, and the drainage strategy, it is not considered that there will be an adverse impact on the SAC from the construction phase of the Proposed Development, including the land use changes that will result from these activities, whether considered alone or in combination with other plans and projects.

#### ***Potential for impacts during Occupation***

5.143 Given the distance of the Proposed Development from the SAC, the lack of hydrological connection, extensive watercourse buffering in the design, and the drainage strategy (which will maintain discharge rates similar to the existing rate), it is not considered that there will be an adverse impact of the Proposed Development on the SAC from hydrological changes during the occupation phase, whether considered alone or in combination with other plans and projects.

#### **Conclusion on Hydrological impacts**

5.144 It is therefore considered, for the reasons set out above, that the Proposed Development, considered alone, will not result an adverse effect on the integrity of Oxford Meadows SAC through hydrological impacts.

5.145 Given the general requirements of Policies ESD 8 and ESD 9 it is further considered that the Proposed Development, considered in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through hydrological impacts. This conclusion is in agreement with the conclusion of the Local Plan HRA (see pages 34 and 42).

## Stage 2 Conclusions

- 5.146 Stage 2 of this IHRA considers, for the reasons set out above, that the Proposed Development, whether considered alone or in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through changes in recreational pressure, hydrology and water quality. It is noted that the conclusions of this IHRA are in line with the conclusions of the 2018-2019 Local Plan HRA (Atkins 2018 and 2019) and 2023 Local Plan Review HRA (Aecom, 2023).
- 5.147 For air quality, this IHRA finds that the Proposed Development, considered alone and in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through changes in levels of nitrogen oxides and ammonia, and changes in the deposition load of nitrogen and acid.
- 5.148 For nitrogen deposition, this assessment finds that the Proposed Development would cause increases above 1% of the critical threshold up to 70 m into the SAC considered alone, and up to 100 m into the SAC considered in combination with other relevant plans and projects. A number of factors (set out in detail the previous section of this IHRA) need consideration in the exercise of CDC's judgement as competent authority as to whether this pollutant will cause an adverse effect on the integrity of Oxford Meadows SAC. These factors are: the improvement in nitrogen deposition compared with the 2019 baseline, favourable (or unfavourable recovering) condition of the SAC, increases above the highly precautionary screening threshold affect a small proportion of the SAC, marginal effects on the timescale for achieving the 'restore objective' and only in close proximity to the road, road traffic contributes a minor portion of nitrogen deposition at the SAC, predicted modal shift away from fossil fuel based road vehicles, and likely reductions in air pollution resulting from Oxford City Council's Transport and Connectivity Plan and predicted UK-wide decreases in nitrogen impacts by 2030.
- 5.149 Fundamentally, however, the Proposed Development will not prevent the restore object for the SAC from being achieved.



## 6 Conclusions

- 6.1 The Cherwell District Local Plan HRA, undertaken in 2018 and 2019, included consideration of the effects of the PR8 development in combination with other relevant policies in the plan and with other relevant plans. It screened in potential for LSE on the Oxford Meadows SAC through changes in recreational pressure, air quality, hydrology and water quality. It concluded that the Partial Review of the Local Plan would not have an adverse effect on the integrity of Oxford Meadows SAC either alone or in combination with other relevant projects and plans.
- 6.2 This IHRA, which focuses on the Proposed Development, which would occupy the majority of the allocated PR8 site, updates this assessment and, at Stage 1, screens in the above likely significant effects. It then provides the information necessary for an appropriate assessment to be carried out by CDC for each of these potential impact pathways, including a detailed air quality assessment based on traffic modelling set out in the Air Quality chapter of the Environmental Statement for the development.
- 6.3 Stage 2 of this IHRA concludes, for the reasons set out in section 5 that the Proposed Development, considered alone and in combination with other relevant plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through changes in recreational pressure, hydrology and water quality. These conclusions are in line with the conclusions of the 2018-2019 Local Plan HRA.
- 6.4 For air quality, this assessment finds that the Proposed Development, whether considered alone and in combination with other plans and projects, will not result in an adverse effect on the integrity of Oxford Meadows SAC through changes in levels of nitrogen oxides and ammonia, and changes in the deposition load of acid and nitrogen.
- 6.5 For nitrogen deposition, this assessment finds that the Proposed Development, considered both alone and in combination with other plans and projects, would cause increases on parts of the SAC in proximity to the A34 above the HRA screening threshold (which is 1% of the critical threshold). However, the increases will not prevent the achievement of the 'restore' objective, and alter the timescale for achieving this to a minor extent and only in close proximity to the A34 and the A40.
- 6.6 In carrying out an appropriate assessment as to whether these increases would cause an adverse effect on the integrity of the Oxford Meadows SAC, the competent Authority should consider:
- a) That there will be a reduction in nitrogen deposition in comparison with the current baseline, under which the condition of the SAC has been assessed as favourable;
  - b) That increases in comparison with the future baseline above Natural England's highly precautionary screening criteria would affect a small proportion of the SAC;
  - c) That road-traffic-originated nitrogen at the SAC accounts for just below 10% of nitrogen deposition at the SAC, and this is likely to reduce over the next ten years.
  - d) Natural England guidance for sites already exceeding a relevant benchmark (Natural England 2018; paragraph 5.28), which guides the competent authority to consider *whether there is credible evidence that the emissions represent a real risk that the ability of other national or local measures and initiatives to otherwise reduce background levels will be compromised in a meaningful manner.*
  - e) The statement by Natural England (2018b), in relation to the air quality target for Oxford Meadows SAC, that *"It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales."*
- 6.7 This IHRA provides the information requested by Natural England during consultation held on 06 June 2024, necessary for Cherwell District Council to carry out a Habitats Regulations Assessment for this project.

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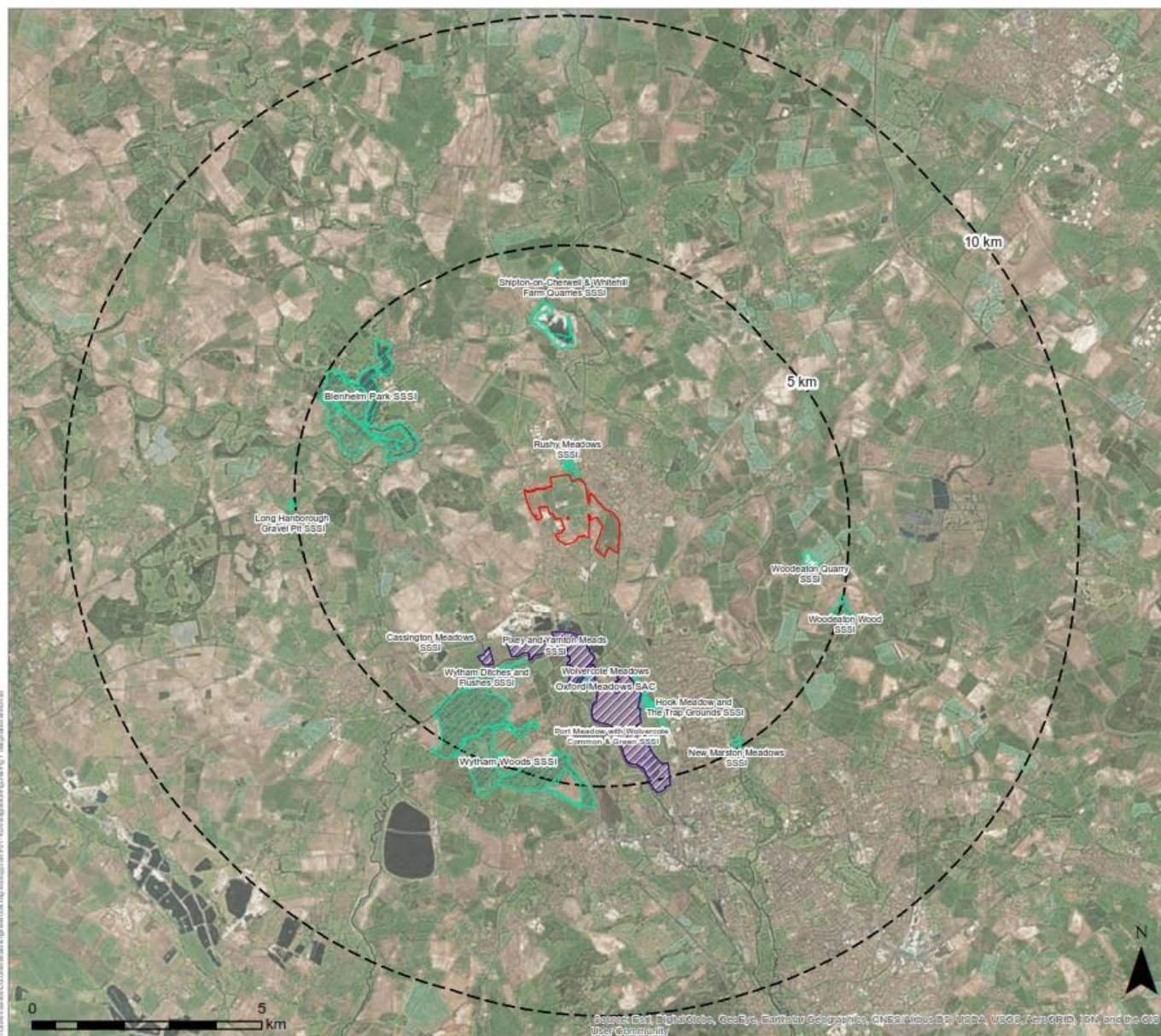
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## 8 Figures

Figure 1: Oxford Meadows SAC location

Figure 2: Air quality transect locations



LEGEND

-  Site boundary
-  5/10 km buffer around site
-  Sites of Special Scientific Interest (SSSI) within 5 km
-  Special Areas of Conservation (SAC) within 10 km

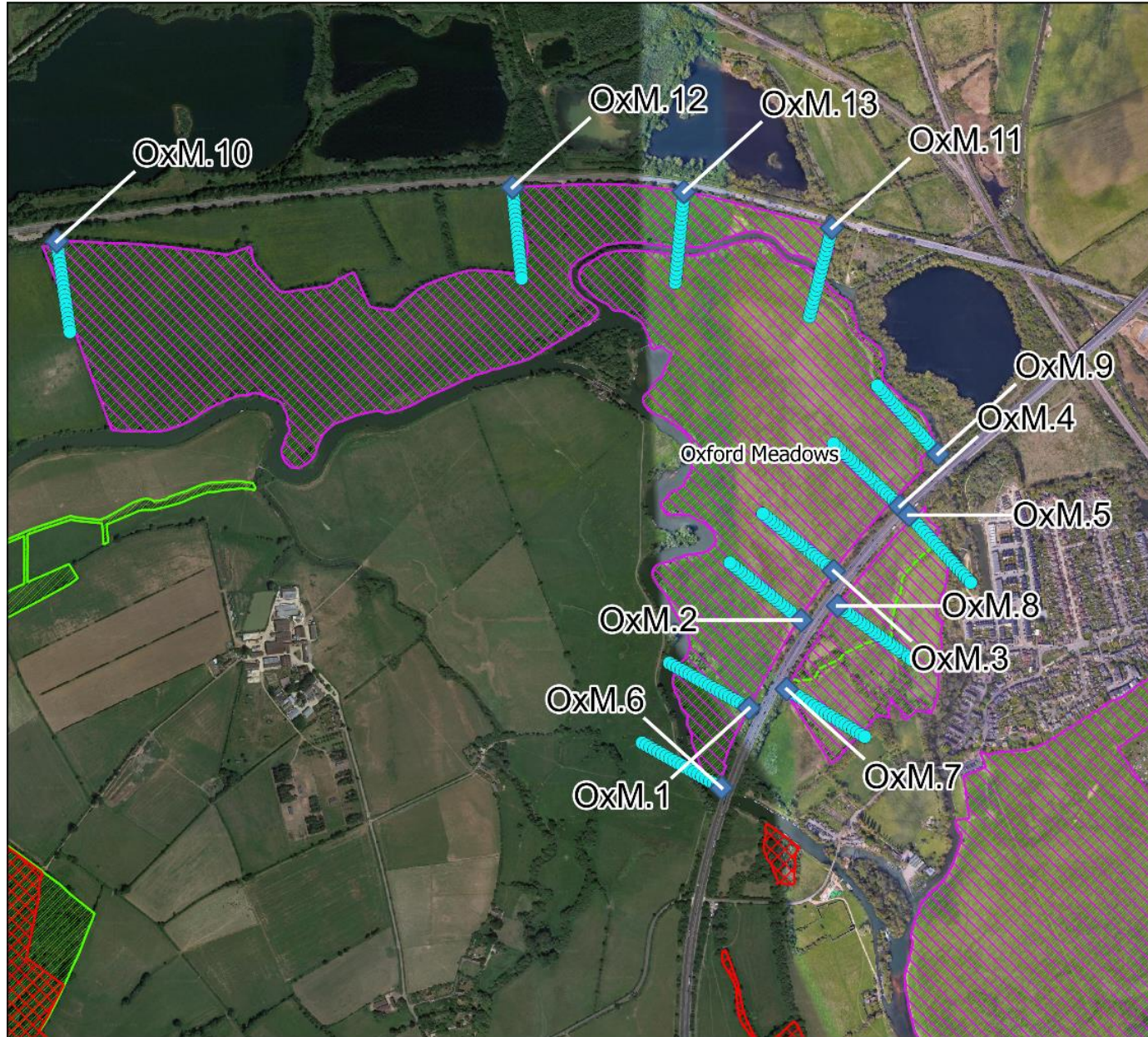
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JOB REF: P21-1029

PROJECT TITLE  
BEGBROKE ECOLOGY SURVEYS

DRAWING TITLE  
Figure 1: Site Location and Statutory Designated Sites

DATE: 09.11.2022  
DRAWN: CS  
CHECKED: KH  
APPROVED: TF  
SCALE: 1:80,000  
VERSION: 1.0

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All dimensions are to be checked on site.  
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**Legend**

- ◆ Ecological receptor points
- Ecological receptor transect

**Ecological site**

- ▨ Ancient Woodland
- ▨ Special Areas of Conservation
- ▨ Site of Special Scientific Interest

**Begbroke Innovation District**



Date: 06 2023 Created by: Buro Happold

Scale: 1:11000 @ A4

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