# A428 Black Cat to Caxton Gibbet improvements

## Environmental Statement
## Chapter 5: Air Quality

**AECOM**

**HE551495-ACM-LSI-A428_Z_Z_ZZ-DG-DC-0201**

**P01 S4**

**February 2021**

## Document Control

| | |
|---|---|
| **Document Title** | **Chapter 5: Air Quality** |
| **Document Reference** | HE551495-ACM-LSI-A428_Z_Z_ZZ-DG-DC-0201 |
| **Author** | Nichola Egan |
| **Document Status** | For Review and Comment |

**Prepared for:**

**Highways England**
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

**Prepared by:**

**AECOM**
AECOM House
Horne Lane
Bedford
MK40 1TS
United Kingdom

### Revision History

| Version | Date | Status | Description | Author |
|---|---|---|---|---|
| P01 | November 2020 | S3 | For Review and Comment | Nichola Egan |
| P02 | February 2021 | S4 | For Stage Approval | Nichola Egan |

### AECOM Approvals

| Version | Role | Name | Signature | Date |
|---|---|---|---|---|
| 2.0 | Author | Nichola Egan | [redacted] | February 2021 |
| | Checker | Fergus Boughton | | February 2021 |
| | Approver | Elisha Coutts | | February 2021 |

# A428 Black Cat to Caxton Gibbet improvements

TR010044

Volume 6

6.1 Environmental Statement

Chapter 5: Air Quality

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

26 February 2021

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009**

# A428 Black Cat to Caxton Gibbet improvements

Development Consent Order 202[ ]

## Chapter 5: Air Quality

| | |
|---|---|
| **Regulation Reference:** | Regulation 5(2)(a) |
| **Planning Inspectorate Scheme Reference** | TR010044 |
| **Application Document Reference** | TR010044/APP/6.1 |
| **Author** | A428 Black Cat to Caxton Gibbet improvements Project Team, Highways England |

| Version | Date | Status of Version |
|---|---|---|
| Rev 1 | 26 February 2021 | DCO Application |

# Table of contents


| Chapter | | Pages |
|---|---|---|
| **5** | **Air quality** | **1** |
| 5.1 | Competent expert evidence | 1 |
| 5.2 | Legislative and policy framework | 1 |
| 5.3 | Assessment methodology | 7 |
| 5.4 | Assessment assumptions and limitations | 17 |
| 5.5 | Study area | 19 |
| 5.6 | Baseline conditions | 21 |
| 5.7 | Potential impacts | 30 |
| 5.8 | Design, mitigation and enhancement measures | 31 |
| 5.9 | Assessment of significant effects | 32 |
| 5.10 | Monitoring | 42 |
| 5.11 | References | 43 |


## Table of Tables


Table 5-1: Air quality objectives and EU limit values 3
Table 5-2: Definitions of the magnitude of change criteria 13
Table 5-3: Guideline band for the number of properties informing a judgement of significant air quality effects 13
Table 5-4: Model verification statistics 15
Table 5-5: Summary of estimated background pollutant concentrations across the study area in the base year and opening year 24
Table 5-6: Air Quality Management Areas within the study area 25
Table 5-7: Defra PCM links within the study area 26
Table 5-8: Nitrogen sensitive designated habitats within the air quality study area 27
Table 5-9: Summary of predicted nitrogen deposition rates at designated habitats for construction 33
Table 5-10: Predicted annual mean $NO_2$ concentrations and magnitude of change bands at public exposure receptors used to inform the judgement of significance 34
Table 5-11: Summary of predicted annual mean $NO_2$ concentrations at public exposure receptors within AQMAs 36
Table 5-12: Matrix to inform a judgement of significant air quality effects 36
Table 5-13: Summary of predicted nitrogen deposition rates at designated habitats for operation 37
Table 5-14: Summary of compliance risk assessment 41

# 5 Air quality

## 5.1 Competent expert evidence

5.1.1 This chapter presents the results of an assessment of the likely significant effects of the Scheme on existing air pollution concentrations and potential air quality impacts associated with the construction and operation of the Scheme. The assessment has been undertaken and reported by a team of competent air quality specialists within AECOM, the quality and completeness of which has been approved by an Associate Director who holds the qualifications of BSc Chemistry and Molecular Physics and MSc Environmental Science and is a Member of the Institute of Air Quality Management (IAQM) and Institution of Environmental Sciences (IES).

5.1.2 They have 15 years of experience in undertaking and reporting air quality assessments for a variety of development types, including road schemes ranging from small junction improvements to large scale infrastructure schemes. They have worked on and acted as technical lead on many road schemes across the UK from the scoping and options appraisal stages through to detailed design. They have been involved in air quality assessments for nationally significant infrastructure projects and acted as the expert witness for a public inquiry.

## 5.2 Legislative and policy framework

5.2.1 The following legislation and planning policy is of direct relevance to the assessment of air quality. Compliance (or otherwise) with statute and policy relating to the protection of air quality is addressed (where applicable) within the Case for the Scheme **[TR010044/APP/7.1]**.

**Relevant legislation and national strategy**

*The Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC*

5.2.2 European Union (EU) air quality legislation is provided within *The Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC* ('The Air Quality Directive') (Ref 5-1), which is transcribed into UK legislation by the *Air Quality Standards Regulations 2010* (Ref 5-2). EU Limit Values (EULVs) were published in these regulations for seven pollutants, as well as Target Values for an additional 5 pollutants. These EULVs are legally binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment.

*Environment Act 1995*

5.2.3 Part IV of the *Environment Act 1995* (Ref 5-3) requires the UK government to produce a national Air Quality Strategy (AQS) (Ref 5-4), which sets out Air Quality Objectives (AQOs) for key pollutants as a tool to help local authorities manage local air quality improvements.

*Clean Air Strategy 2019*

5.2.4 The Department for Environment, Food, and Rural Affairs (Defra) published the *Clean Air Strategy* (Ref 5-5) in January 2019, which outlines proposals to tackle emissions from a range of sources. This includes providing clear and effective guidance on how Air Quality Management Areas (AQMAs), Clean Air Zones (CAZ) and Smoke Control Areas interrelate and how they can be used by local government to tackle pollution. New legislation will seek to shift the focus towards prevention of exceedances rather than tackling pollution when limits have been surpassed. The AQOs were not adjusted.

5.2.5 The AQOs have been set down in regulation solely for the purposes of local air quality management. Under the requirements of Part IV of the *Environment Act 1995* (Ref 5-3), local authorities have a duty to carry out a phased review and assessment of local air quality against the AQOs. Areas at risk of exceeding the AQOs must be identified and an AQMA declared. Once an AQMA has been declared the local authority has a responsibility to make efforts to improve the air quality within it, including publishing an Air Quality Action Plan (AQAP).

5.2.6 AQOs as defined by the AQS are generally in line with the EULVs, although they have different dates for compliance, and a different legal status as follows:

a. EULVs (as transcribed into UK legislation) are legally binding on the UK. National government compliance at the agglomeration scale is mandatory.

b. UK AQOs are for the purposes of local air quality management and while there is no legal obligation for local authorities to achieve them, they do have a responsibility to work towards achieving them.

5.2.7 Of the seven pollutants for which EULVs have been set, the latest *Compliance Assessment Summary* (Ref 5-6) published by Defra in 2019 identifies that the UK has been compliant with the EULVs for carbon monoxide (CO), 1,3-butadiene, benzene, lead, sulphur dioxide ($SO_2$) and $PM_{2.5}$ in all years since 2008; and has been compliant with the EULVs for $PM_{10}$ since 2010. $PM_{10}$ and $PM_{2.5}$ have been considered as part of this assessment, but the other pollutants are not considered further in this assessment as there are no areas of the UK where these objectives are exceeded. Exceedances of annual mean $NO_2$ limit values remain in some areas and this pollutant has been considered within this assessment.

5.2.8 The EULVs and AQOs for the pollutants considered within this assessment are presented in **Table 5-1.**

**Table 5-1: Air quality objectives and EU limit values**

| Pollutant | Averaging Period | Concentration | Maximum Permitted Exceedances | Date to be achieved by and maintained thereafter | |
|---|---|---|---|---|---|
| | | | | AQO | EULV |
| **AQOs and EULVs for the Protection of Human Health** | | | | | |
| Nitrogen dioxide ($NO_2$) | Annual mean | 40µg/m$^3$ | None | 31 Dec 2005 | 1 Jan 2010 |
| | One hour mean | 200µg/m$^3$ | 18 times per year | 31 Dec 2005 | 1 Jan 2010 |
| Particulate matter with an aerodynamic diameter of 10 microns or less ($PM_{10}$) | Annual mean | 40µg/m$^3$ | None | 31 Dec 2004 | 1 Jan 2005 |
| | 24 hour mean | 50µg/m$^3$ | 35 times per year | 31 Dec 2004 | 1 Jan 2005 |
| Particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) | Annual mean | 25µg/m$^3$ | None | 2020 | 2015 |
| **AQOs and EULVs for the Protection of Vegetation and Ecosystems** | | | | | |
| Nitrogen oxides ($NO_x$) | Annual mean | 30µg/m$^3$ | None | 31 Dec 2000 | 19 Jul 2001 |

5.2.9 Limits and objectives are expressed in one of two ways: as annual mean concentrations which are not to be exceeded without exception, due to their chronic effects; or as shorter term (24 hour or one hour) mean concentrations for which only a specified number of exceedances are permitted within a specified time frame, due to their acute effects.

### National Policy Statement for National Networks

5.2.10 The *National Policy Statement for National Networks* (NPSNN) (Ref 5-7) acknowledges that the construction and operation of road infrastructure has the potential to affect air quality, and provides guidance on the identification, assessment and mitigation of effects on air quality sensitive receptors.

5.2.11 The *NPSNN* (Ref 5-7) sets out the matters that the Secretary of State for Transport should give due regard to when determining Development Consent Order (DCO) applications that would affect the air quality at sensitive receptors or affect the UK's ability to comply with the *Air Quality Directive* (Ref 5-1). It identifies the circumstances under which air quality considerations are likely to be particularly relevant and those circumstances where air quality considerations should be given substantial weight. It also sets out under what circumstances project effects on air quality should lead to a scheme being refused consent.

5.2.12 The requirements of the *NPSNN* (Ref 5-7) in relation to undertaking and reporting the air quality assessment of the effects of the Scheme and the consideration of mitigation measures for the Scheme have been taken account of in the assessment, in order to identify the likely significant effects that the Secretary of State for Transport needs to give due regard to in their decision-making.

**Overarching National Policy Statement for Energy (EN-1)**

5.2.13 The *Overarching National Policy Statement for Energy (EN-1)* (Ref 5-8) sets out the Government's policy on energy and infrastructure development.

5.2.14 EN-1 (Ref 5-8) identifies that emissions to air can lead to adverse impacts on health, on protected species and habitats, and on the wider countryside, and that consideration is needed in relation to whether mitigation measures are required for such emissions.

5.2.15 The requirements of EN-1(Ref 5-8) in relation to assessing and mitigating emissions to air associated with construction of the gas pipeline diversion within the Scheme have been considered as part of the air quality assessment.

**National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)**

5.2.16 The National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 5-9) relates to gas supply and gas and oil pipelines and sits under EN-1 (Ref 5-8).

5.2.17 EN-4 (Ref 5-9) does not contain any specific policies relating to the assessment of air quality impacts that are of relevance to the construction of the gas pipeline diversion within the Scheme.

**National Planning Policy Framework**

5.2.18 Paragraph 5.2.9 of the *National Planning Policy Framework* (NPPF) (Ref 5-11) identifies that, for nationally significant infrastructure projects, national policy statements – in this case the NPSNN (Ref 5-7) – constitute the primary decision-making framework, and that the *NPPF* (Ref 5-11) may also be a relevant consideration.

5.2.19 Air quality is considered in paragraphs 103, 170 and 181 of the *NPPF* (Ref 5-11). Paragraph 181 states that:

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

### Planning Practice Guidance

5.2.20 Planning Practice Guidance (PPG) for *Air quality* (Ref 5-12), updated in November 2019, provides a summary of the air quality issues set out in the *NPPF* (Ref 5-11) and notes that:

*'Where air quality is a relevant consideration the local planning authority may need to establish:*

a. *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
b. *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
c. *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.'*

5.2.21 Local planning policy also contains relevant air quality policy considerations. Details of planning policy across the relevant local authorities in relation to air quality is provided in **Appendix 5.1** of the Environmental Statement **[TR010044/APP/6.3]**.

### National and local air quality plans

5.2.22 In 2017, Defra released the *UK Plan for Tackling Roadside $NO_2$ Concentrations* (Ref 5-13) to address non-compliance with the EULVs for $NO_2$ in some zones and agglomerations. The national plan principally focuses on providing additional funding to local authorities so that local action can be taken to improve air quality in the shortest possible time with measures such as improving bus fleets, support for concessionary travel and sustainable modes of transport and low emission buses.

5.2.23 Alongside these plans, datasets of Defra's predicted pollutant concentrations along specific roads are regularly published in the Pollution Climate Mapping (PCM) model (Ref 5-14), which is used to inform the assessment of national compliance with EULVs.

5.2.24 Using the PCM modelling (Ref 5-14), the plan identified the local authorities with exceedances projected to persist beyond the next three to four years and required them to develop local plans to improve air quality. These local plans were specifically to include consideration of the implementation of CAZ, as well as alternative measures. Final plans were required by the end of December 2018. Twenty-eight local authorities were initially identified, and a further two, while not expected to have persistent exceedances, were anticipated to have a CAZ.

5.2.25 Defra published its *Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations* (Ref 5-16) in October 2018, which documents the feasibility studies conducted by a further 33 local authorities, which were predicted to have shorter term $NO_2$ exceedances.

5.2.26 The air quality study area for the Scheme falls into the Eastern non-agglomeration zone (UK0029) for the consideration of compliance with the *Air Quality Directive* (Ref 5-1). Defra published the *Air quality plan for nitrogen dioxide (NO2) in UK (2017)* (Ref 5-17) for tackling roadside nitrogen dioxide concentrations in the Eastern non-agglomeration zone (UK0029). The assessment undertaken for the Eastern non-agglomeration zone indicates that 29.9 kilometres of road length was predicted to exceed the annual limit value in 2015, and that the zone was expected to be compliant by 2021 taking into account the measures that local authorities across the zone had put in place. In the latest published PCM model (2018 baseline) (Ref 5-14), the expected date of compliance for the Eastern non-agglomeration zone has been revised to 2024.

5.2.27 As a consequence of the persistent modelled exceedances in the Eastern non-agglomeration zone, several local authorities in this zone were among those which were required to develop local plans as part of the national air quality plan. However, the six local authorities which encompass the air quality study area for the Scheme did not have persistent modelled exceedances, and therefore have not produced local air quality plans.

5.2.28 In addition, the *UK Plan for Tackling Roadside $NO_2$ Concentrations* (Ref 5-13) identifies that Highways England, which has responsibility for England's Strategic Road Network, is taking a number of steps to improve air quality, including working with local authorities ensuring electric vehicle charging infrastructure across its network, and delivering a ringfenced £100 million Air Quality Fund allocated as part of the Road Investment Strategy.

5.2.29 Highways England published *Our strategy to improve air quality* (Ref 5-18) in 2017, which is designed to communicate Highways England's approach to investing the Air Quality Fund to improve air quality on the strategic road network between 2015 and 2021. This includes the construction of a monitoring network, a programme of ten pilot studies to identify appropriate new and innovative solutions that can be deployed on the highway network and working with national and international partners.

**Local air quality action plans**

5.2.30 Under the local air quality management regime, the local authorities that encompass the air quality study area have declared a number of AQMAs where exceedances of the AQOs have been identified. Details of the AQMAs of relevance to the assessment are provided in paragraph 5.6.21 (Baseline Conditions) of this Chapter. Air Quality Action Plans (AQAPs) have been drawn up to detail the measures local authorities are taking to work towards achieving the AQOs within the AQMAs.

5.2.31 Bedford Borough Council published its *Air Quality Action Plan for the Bedford Borough Council* (Ref 5-19) in July 2008, which details measures to improve air quality in the pre-cursor AQMAs to the current AQMA 5 (Bedford Town Centre). It identifies a number of measures to improve air quality including the completion of a bypass road (which has since been implemented) and various other infrastructure projects, stimulating bus travel by measures including a park and ride scheme, the implementation of an Air Quality Steering Group, and considering air quality within planning applications. A revised and updated AQAP for AQMA 5 is currently under development.

5.2.32 Central Bedfordshire Council published its *Air Quality Action Plan 2019 – 2024* (Ref 5-20) in June 2019, which recommends the implementation of four packages of measures to improve air quality within the Sandy AQMA (which is within the study area) and the Ampthill AQMA (which is outside the study area). The first package, reducing emissions through strategic measures, includes measures to strengthen links with transport planning, development planning and public health considerations. The second package, optimising traffic flow through AQMAs, includes two measures applicable to the Sandy AQMA: reviewing congestion at the A1/A603 roundabout; and research into the feasibility of the use of average speed cameras and/or a lowering of the speed limit. The third package includes six measures to reduce transport emissions primarily by greening of the fleet, and the fourth package includes six measures to promote sustainable transport options, including walking, cycling and public transport.

5.2.33 The *Air Quality Action Plan for the Cambridgeshire Growth Area*s (Ref 5-21) was jointly published in 2009 by Cambridge City Council, Huntingdonshire District Council and South Cambridgeshire District Council. Three AQMAs covered by this plan are relevant to the Scheme – Brampton AQMA, Huntingdon AQMA, and A14 Corridor (Bar Hill to Milton) AQMA. The document identifies a number of measures to improve air quality including the rerouting of the A14 improvements (which have since been implemented) and various other infrastructure projects, stimulating bus travel by measures including a guided busway, and the implementation of planning policies.

## 5.3 Assessment methodology

**Scope of the assessment**

5.3.2 A scoping exercise was undertaken in mid-2019 to identify the matters to be covered by the air quality assessment and agree the approach with relevant statutory bodies.

5.3.3 The assessment scope was established at that time by comparing available design and landtake details for the Scheme with data and information relating to air quality.

5.3.4 The scoping exercise was informed by the technical and reporting guidance contained in the *Design Manual for Roads and Bridges Volume 11: Environmental Assessment* (Ref 5-22) (DMRB) and *Interim Advice Note 125/15: Environmental Assessment Update* (Ref 5-23).

5.3.5 The outcomes of scoping were recorded in a scoping report (Ref 5-24), which was consulted upon as part of a formal request to the Inspectorate for a scoping opinion and included a summary of all assessment work undertaken as part of the design-development of the Scheme.

5.3.6 The Inspectorate's scoping opinion **[TR010044/APP/6.5]** identified a number of additional overarching EIA and topic-specific matters that were subsequently brought into the overall scope of the assessment. These further considerations are detailed in **Table 1** of **Appendix 4.3** of the Environmental Statement **[TR010044/APP/6.3]** and include a summary of how Highways England has responded to the points raised, and where this information is reported.

5.3.7 Subsequent to the publication of the Scoping opinion **[TR010044/APP/6.5]**, Highways England published a series of new DMRB standards relating to sustainability and the environment (Ref 5-25), resulting in the phased withdrawal of the guidance used to inform the scoping exercise (Ref 5-22; Ref 5-23) from July 2019.

5.3.8 **Table 2** of **Appendix 4.3** of the Environmental Statement **[TR010044/APP/6.3]** sets out the changes to the scope and methodology of the air quality assessment resulting from the adoption of the new DMRB standards (Ref 5-25).

5.3.9 In addition to matters raised in the scoping opinion **[TR010044/APP/6.5]** and through the adoption of the new DMRB standards (Ref 5-25), the final assessment scope has also been shaped by the following:

a. The outcomes of consultation and engagement with statutory bodies.

b. Design changes made to the Scheme in respect of its form and extent and the associated modelled changes to changes to traffic movements generated.

5.3.10 Consideration was given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in significant effects on air quality. Following a review of the maintenance activities associated with the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the process concluded that there would be limited potential of such effects to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic road network. Accordingly, the effects associated with this phase of the Scheme were scoped out of the assessment and not considered further.

**Consultation**

5.3.11 Discussions have been held with South Cambridgeshire District Council and Central Bedfordshire District Council to discuss the air quality methodology and the potential effects of the Scheme on sensitive receptors within their area during both the construction and operational phases of the Scheme.

5.3.12 The following Air Quality Annual Status Reports (ASRs) were obtained which contain the most recent air quality monitoring data for each local authority relevant to the Scheme and the assessment study area (described in Section 5.5):

a. Bedford Borough Council *2019 Air Quality ASR* (Ref 5-26).

b. Cambridge City Council *2019 Air Quality ASR* (Ref 5-27).

c. Central Bedfordshire Council *2019 Air Quality ASR* (Ref 5-28).

d. East Cambridgeshire District Council *2019 Air Quality ASR* (Ref 5-29).

e. Huntingdonshire District Council *2019 Air Quality ASR* (Ref 5-30).

f. South Cambridgeshire District Council *2019 Air Quality ASR* (Ref 5-31).

5.3.13 The information extracted from these reports was used to inform the baseline assessment presented in Section 5.6.

**Assessment standards and guidance**

5.3.14 The following standards and guidance have been used to inform the scope and content of the assessment, and to assist the identification and mitigation of likely significant air quality effects. This builds upon the overarching EIA methodology and guidance presented in **Chapter 4, Environmental assessment methodology** of the Environmental Statement **[TR010044/APP/6.1]**.

5.3.15 The methodology for the air quality assessment has followed the standards and guidance set out within the following:

a. DMRB *LA 105 Air quality (Revision 0)* (Ref 5-33) (LA 105).

b. *Air Quality Management Technical Guidance (TG16)* (Ref 5-34) (LAQM.TG(16)).

5.3.16 The assessment comprises a:

a. Local air quality assessment for the operation of the Scheme for public exposure and designated habitats.

b. Construction phase assessment of additional construction traffic trips and traffic management on local air quality.

c. Construction dust assessment to identify areas that could be affected by construction-phase activities.

d. Compliance risk assessment for $NO_2$.

**Local air quality assessment - operational**

*Scoping*

5.3.17 In accordance with *LA 105* (Ref 5-33), the following screening criteria for the changes in traffic between the do minimum (DM) scenario (without the Scheme) and the do something (DS) scenario (with the Scheme) in the opening year assessment year of 2025 were applied:

a. Road alignment will change by 5 metres or more.

b. Annual average daily traffic (AADT) flows will change by 1,000 or more.

c. Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more.

d. There will be a change in speed band.

5.3.18 The above criteria have been triggered on many roads within and surrounding the Scheme, and therefore an air quality assessment is required. The roads which trigger these criteria make up the Affected Road Network (ARN) for the local air quality assessment of the operation of the Scheme. The ARN is illustrated in **Figure 5.1** of the Environmental Statement **[TR010044/APP/6.2]**. Where changes in traffic are below the criteria set out above, significant effects on sensitive receptors are not anticipated.

5.3.19 The Transport Reliability Area (TRA), upon which the ARN has been defined, was determined through discussions between the competent expert for traffic and competent expert for air quality. The extents of the TRA cover the key areas that are likely to be sensitive to changes in air quality, including AQMAs, areas where monitored concentrations exceed/are close to exceeding AQOs/EULVs and designated habitats. The TRA is appropriate for use for the air quality assessment for both operation and construction.

5.3.20 A detailed level of assessment has been applied. Following *LA 105* (Ref 5-33) the project risk potential is considered 'high' due to the large scale of the works proposed. The sensitivity of the receiving environment is also considered 'high' due to the large number of sensitive receptors (>3000) within 50 metres of the ARN (see Section 5.5), and baseline monitoring indicating exceedances of the AQO for annual mean $NO_2$ (Section 5.6). Where a high project risk potential and a high sensitivity of the receiving environment are identified a detailed assessment is required.

5.3.21 Representative sensitive receptors were selected within 200 metres of the ARN and then all roads in the TRA within 200 metres of the receptors were included in the modelled road network. This constitutes the air quality study area for the local air quality assessment of the operation of the Scheme. The air quality study area is described in more detail in Section 5.5.

*Methodology – public exposure receptors*

5.3.22 A detailed air quality assessment as defined by *LA 105* (Ref 5-33Ref 5-32) requires the following elements:

a. Traffic input in the form of period flows (morning peak (AM), inter-peak (IP), afternoon peak (PM), and overnight (OP)).

b. The use of a detailed air quality dispersion model.

c. Modelling of all receptors likely to exceed AQOs (in other areas representative receptors suffice).

5.3.23 Traffic data has been provided by the project's Transport Consultants for road links within the TRA, for a base year of 2015, and for 2025 (to represent the opening year) both with and without the Scheme in place. Information was provided for each of the AM, IP, PM and OP time periods and consisted of:

a. Number of vehicles per hour.

b. Percentage of HDVs.

c. Speed bands (as defined by *LA 105* (Ref 5-33)Ref 5-32).

5.3.24 Further information about the traffic assessment which has informed the air quality assessment can be found in the Transport Assessment **[TR010044/APP/7.2]**.

5.3.25 Using the traffic data provided, air quality predictions were made for the following scenarios:

a. Baseline year 2015.
b. Projected baseline year 2025.
c. Do-minimum 2025 without the Scheme (DM).
d. Do-something 2025 with the Scheme (DS).

5.3.26 The assessment used the latest version of the ADMS-Roads (v5) detailed dispersion model (Ref 5-35) to calculate the air quality predictions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies.

5.3.27 ADMS-Roads calculates concentrations of pollutants emitted from roads using the following parameters:

a. Spatial information of the modelled roads (location, geometry and road widths).
b. Emission factors which account for vehicle numbers, composition, and speed.
c. Meteorological information from a suitable nearby meteorological station.

5.3.28 Detailed discussion of the inputs chosen for the modelling for the local air quality assessment are provided in **Appendix 5.3** of the Environmental Statement **[TR010044/APP/6.3]**.

5.3.29 The outputs of ADMS-Roads are road-contributed annual mean $NO_X$ concentrations (in µg/m$^3$) and annual mean road-contributed $PM_{10}$ (in µg/m$^3$) concentrations at selected sensitive receptor points.

5.3.30 Sensitive receptors are those where the AQOs apply, for example residential properties, schools, and hospitals. Sensitive receptors were chosen to represent locations where pollutant concentrations are expected to be highest (those closest to the road, and those close to junctions) and where changes due to the Scheme are expected to be greatest. Model predictions are typically made at 1.5m height to be representative of human exposure.

5.3.31 Where the modelling of worst-case exposure points indicated that the AQO may be exceeded in the opening year, additional output points have been modelled to represent all sensitive receptors in the vicinity.

5.3.32 Receptor point locations were identified using Ordnance Survey Mastermap, Ordnance Survey Addressbase Plus, and Google Earth mapping and imagery. Sensitive receptors in committed developments (as detailed in the Transport Assessment **[TR010044/APP/7.2]**) were also identified.

5.3.33 Predictions of total pollutant concentrations at receptors were calculated by combining the verified modelled road pollutant contributions with background concentrations. Background concentrations are those from many sources not explicitly modelled which individually may not be significant, but collectively, over a large area, need to be considered. Details of how background concentrations have been derived and used in this assessment are provided in **Appendix 5.3** of the Environmental Statement **[TR010044/APP/6.3]**.

5.3.34 The following post-processing methods were applied to the dispersion model outputs:

a. Road contribution $NO_X$ concentrations as outputted by ADMS-Roads were converted to $NO_2$ concentrations using an amended version of Defra's *$NO_X$ to $NO_2$ Calculator* (Ref 5-36) for comparison against the AQO for $NO_2$. This amended version of the tool was provided by Defra to allow $NO_x$ to $NO_2$ conversions for the 2015 base year.

b. Modelled $NO_2$ concentrations in the base year were compared against monitored $NO_2$ concentrations in a process known as model verification. *LAQM.TG(16)* (Ref 5-34) (Section 'Model Validation, Verification, Adjustment and Uncertainty', paragraphs 7.509-7.546) was followed and adjustment factors derived to bring modelled concentrations into line with monitored concentrations, where necessary. Further details are provided in paragraphs 5.3.49 to 5.3.56 of this Chapter and **Appendix 5.3** of the Environmental Statement **[TR010044/APP/6.3]**.

c. Highways England $LTT_{E6}$ projection factors were applied to the modelled DM and DS $NO_2$ concentrations to account for the observed gap between projected vehicle emission reductions and the estimated annual rate of improvement in annual mean $NO_2$. Further details are provided in Section 5.4.

5.3.35 The modelled annual average concentrations predicted are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]**. The predicted concentrations were compared against the relevant AQOs and predicted exceedances identified.

5.3.36 Research projects completed on behalf of Defra and the Devolved Administrations by Laxen and Marner in 2003 (Ref 5-37) and AEA Technology in 2008 (Ref 5-38) concluded that the hourly average $NO_2$ AQO is unlikely to be exceeded if annual average concentrations are predicted to be less than 60µg/m$^3$. Therefore, this assessment has evaluated the likelihood of exceeding the hourly average $NO_2$ objective by comparing predicted annual average $NO_2$ concentrations at all receptors to an annual average equivalent threshold of 60µg/m$^3$ $NO_2$. Where predicted concentrations are below this value, it can be concluded that the hourly average $NO_2$ objective is likely to be achieved.

5.3.37 Where a receptor is predicted to experience concentrations of $NO_2$ and $PM_{10}$ below the AQOs in both the DM and the DS scenario, it will not inform the judgement of significance.

5.3.38 Where concentrations of $NO_2$ and/or $PM_{10}$ at receptors are predicted to exceed the AQOs in the DM and/or DS scenario, magnitude of change descriptors will be applied in line with *LA 105* (Ref 5-33Ref 5-32) as shown in **Table 5-2**.

**Table 5-2: Definitions of the magnitude of change criteria**

| Magnitude of change criteria | Concentration range |
|---|---|
| Imperceptible | The change in concentration of $NO_2$ between DM and DS is less than or equal to 0.4µg/m$^3$ (≤1% of the AQO). |
| Small | The change in concentration of $NO_2$ between DM and DS is greater than 0.4µg/m$^3$ but less than or equal to 2.0µg/m$^3$ (1-5% of the AQO). |
| Medium | The change in concentration of $NO_2$ between DM and DS is greater than 2.0µg/m$^3$ but less than or equal to 4.0µg/m$^3$ (5-10% of the AQO). |
| Large | The change in concentration of $NO_2$ between DM and DS is greater than 4.0µg/m$^3$ (>10% of the AQO). |

5.3.39 The number of receptors assigned to 'small', 'medium' and 'large' change descriptors, for both worsening and improvement, will be tabulated as shown in **Table 5-3**.

**Table 5-3: Guideline band for the number of properties informing a judgement of significant air quality effects**

| Magnitude of change in annual mean $NO_2$ or $PM_{10}$ (µg/m$^3$) | Total number of receptors with: | |
|---|---|---|
| | Worsening of an air quality objective already above the objective or the creation of a new exceedance | Improvement of an air quality objective already above the objective or the removal of an existing exceedance |
| Large (>4) | 1 to 10 | 1 to 10 |
| Medium (>2) | 10 to 30 | 10 to 30 |
| Small (>0.4) | 30 to 60 | 30 to 60 |

5.3.40 This defines guideline bands that indicate a significant effect. Where the total number of receptors are greater than the upper guideline band in any of the magnitude categories the project shall trigger a significant air quality effect.

5.3.41 Where the total number of receptors are smaller than the lower guideline band in any of the magnitude categories the project is unlikely to trigger a significant air quality effect.

5.3.42 Where the total number of receptors falls within the guideline bands in any of the magnitude categories the following criteria will be considered to inform the judgement of significance:

a. The absolute concentration at each receptor i.e. is the modelled concentration 40µg/m$^3$ or 60µg/m$^3$.

b. How many receptors are there in each of the magnitude of change criteria i.e. does the project create more worsening than improvements.

c. The magnitude of change in concentration at each receptor e.g. a modelled change in concentration of 1.8µg/$m^3$ would carry more weight than a change of 0.6µg/$m^3$ despite both falling within the 'small' magnitude of change category.

*Methodology – designated habitats*

5.3.43 The modelling approach for designated habitats was identical to that for the public exposure receptors with regards to scenarios modelled and model inputs provided.

5.3.44 Ecological receptors were modelled at a height of 0m in the location closest to the road to represent worst case exposure, and then further transect points were selected at 10 metre intervals up to a maximum distance of 200m from the road edge, within the designated site.

5.3.45 Receptor point locations were identified by consulting Ordnance Survey Mastermap data and the *Multi-Agency Geographic Information for the Countryside* (Ref 5-39) (MAGIC) website.

5.3.46 Post-processing was performed in the same manner as that for public exposure receptors in order to obtain road-contributed $NO_2$ concentrations at each transect point. The road-contributed $NO_2$ concentrations were converted to dry nitrogen deposition rates and combined with background nitrogen deposition rates obtained from the *Air Pollution Information System* (APIS) (Ref 5-40) to produce predictions for total nitrogen deposition rates.

5.3.47 The modelled total nitrogen deposition rates derived are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]**.

5.3.48 The process for assessing the significance of air quality effects at designated habitats from *LA 105* (Ref 5-33Ref 5-32) was followed. This states that if the total nitrogen deposition rate is under the critical load for the designated site in both DM and DS scenarios, or the change in total nitrogen deposition rate is less than 1% of the critical load, the effect is not significant. If these criteria are not met, further ecological assessment is required to determine whether the air quality effect is significant; these details are provided in the biodiversity assessment reported in **Chapter 8, Biodiversity** of the Environmental Statement **[TR010044/APP/6.1]**.

*Model performance*

5.3.49 When using modelling techniques to predict concentrations, it is necessary to make a comparison between the modelling results and available roadside monitoring data, to ensure that the model is reproducing actual observations. Where systematic bias is evident in the base year verification, the modelled results are factored to better match the monitoring data and reduce the overall uncertainty in the model predictions.

5.3.50 Annual mean $NO_2$ concentrations were predicted at 14 monitoring sites across the study area for the base year of 2015 and these were compared against the monitored concentrations for that year.

5.3.51 Two zones of model performance were identified:

a. The row of houses fronting the A1 at Sandy, between St Neots Road and Carter Street, represented by monitor N20 operated by Central Bedfordshire Council (the 'Sandy' zone).

b. Everywhere else (the 'general' zone).

5.3.52 The verification factors used to adjust raw model $NO_X$ outputs are presented in **Table 5-4** along with the statistical parameters of root mean square error (RMSE) and fractional bias, which identify the model uncertainty.

**Table 5-4: Model verification statistics**

| Description of area applied | Adjustment Factor | Root Mean Square Error (µg/m$^3$) | Fractional Bias |
|---|---|---|---|
| A1 houses Sandy | 4.48 | N/A* | N/A* |
| General | 1.23 | 4.2 | 0.0 |
| *performance statistics cannot be calculated as only one monitor makes up this zone. | | | |

5.3.53 At eight of the 14 sites modelled concentrations were within 10% of the corresponding monitored concentrations post-adjustment; a further five sites were within 25% and one site was underpredicted by more than 25%. *LAQM.TG(16)* (Ref 5-34) indicates that an RMSE within 10% of the AQO (4µg/m$^3$) is ideal; the model performance in the wider area meets this criteria.

5.3.54 A relatively high adjustment factor has been returned at the A1 houses in the Sandy zone. This is because in this location the emissions from a very busy road (the A1) cannot freely disperse due to the presence of houses by the side of the road. This area is part of Sandy AQMA (see **Table 5-6**)

5.3.55 In the absence of appropriate $PM_{10}$ monitoring within the study area, the adjustment factors calculated for $NO_2$ were applied to modelled $PM_{10}$ outputs, as recommended in *LAQM.TG(16)* (Ref 5-34).

5.3.56 Further details regarding model verification and adjustment are provided in **Appendix 5.3** of the Environmental Statement **[TR010044/APP/6.3]**.

**Local air quality assessment - construction**

5.3.57 The main construction works are programmed to last for approximately 4 years. As this is in excess of two years, an assessment of local air quality during the construction period has been required.

5.3.58 With respect to additional traffic movements associated with construction and temporary traffic measures (for example speed restrictions and road closures), the construction project has been split into four phases:

a. Phase 1 is proposed to last for six months and involves small works in advance of the main construction activities only.

b. Phase 2 is proposed to last for 16 months and involves main road closures and speed limits.

c. Phase 3 is proposed to last for 12 months and involves main road closures and speed limits.

d. Phase 4 is proposed to last for 11 months and involves main road closures and speed limits.

5.3.59 Traffic datasets for each of these four phases were produced by the project's Transport Consultants for road links within the TRA providing the information specified in paragraph 5.3.23.

5.3.60 The screening criteria specified in paragraph 5.3.17 were applied to the changes in traffic between the DM scenario (without the Scheme) and each of the construction phase scenarios. Four ARNs, one for each construction phase were identified following this process.

5.3.61 *LA 105* (Ref 5-33Ref 5-32) specifies that the assessment of construction traffic impacts should be *'proportionate and limited to the areas of key risk of exceeding air quality thresholds'*. To identify areas of key risk, the ARNs were cross-referenced with the base year modelling outputs.

5.3.62 Where base year modelling outputs indicated the presence of sensitive receptors within 10% of the AQO (i.e. 36µg/m$^3$ and above) and the traffic behaviour in the area was likely to cause an increase in pollutant concentrations (for example, an increase in traffic flows, an increase in heavy goods vehicle (HGV) numbers, or an increase in congestion reflected by a change in speed band), the area was considered a key risk area.

5.3.63 Areas of key risk were assessed following the same procedure as for the local air quality assessment for the operation of the Scheme, including the determination of the significance of effects. The modelled annual average concentrations, and nitrogen deposition rates, where relevant, are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]**.

5.3.64 There are no areas within 200 metres of the haul routes that would be considered to be a key risk on this basis, therefore haul routes have not been considered further in this assessment.

**Construction dust assessment**

5.3.65 A construction dust assessment has been carried out in accordance with *LA 105* (Ref 5-33Ref 5-32). The construction dust risk potential was defined based upon the scale of the works proposed, and the sensitivity of the receiving environment. All sensitive receptors within 200 metres of construction activity were identified, and the construction dust risk was classified as 'high' or 'low' based on the distance from construction activities.

**Compliance risk assessment**

5.3.66 An assessment was carried out in accordance with *LA 105* (Ref 5-33) to evaluate the effect of the Scheme on the UK's ability to comply with the *Air Quality Directive* (Ref 5-1).

5.3.67 All road links which are part of Defra's PCM model (Ref 5-14) and within the ARN of the scenario in question (operation or construction) were identified. Receptors were chosen alongside the links in question in the following locations:

a. At ‘qualifying features’ at worst-case exposure (no closer than 1 metre to the edge of the running lane), for example footpaths that run parallel to the road.

b. At ‘validation points’ 4 metres from the road edge at a height of 2 metres, for comparison with PCM modelled concentrations.

5.3.68 The concentrations of $NO_2$ at these points were modelled following the procedure described in paragraphs 5.3.25 to 5.3.34; with the exception that Highways England $LTT_{E6}$ projection factors were not applied to the modelled concentrations. This is to ensure the compliance risk assessment is consistent with Defra's reporting on compliance with the EULVs.

5.3.69 The concentrations of $NO_2$ predicted by the air quality model at the validation points in the DM scenario were compared to the PCM modelled concentrations for 2025, representing the opening year. Where there are significant differences between the two (i.e. greater than 10%) then the model is scrutinised to ensure that the outputs of the project traffic and air quality modelling are robust.

5.3.70 *LA 105* (Ref 5-33Ref 5-32) indicates that the compliance risk assessment can conclude there is no risk to the UK’s reported ability to comply with the *Air Quality Directive* (Ref 5-1) in the shortest timescale possible where:

a. There are no modelled exceedances of the air quality thresholds for any PCM link.

b. There are modelled exceedances of the air quality thresholds for any PCM link, but the change in annual mean $NO_2$ concentrations between the do minimum and do something is less than or equal to +/-0.4µg/$m^3$.

5.3.71 If these criteria are not met, further assessment is required to evaluate the compliance risk, including comparison to the maximum PCM modelled concentrations within the reporting zone.

**Overall significance determination**

5.3.72 The overall significance of the Scheme with respect to air quality has been determined for the construction phase and the operation phase.

5.3.73 In each case, the assessment of significance has been informed by:

a. The effects on human health (as determined by the significance of the local air quality assessment for public exposure receptors).

b. The effects on designated habitats (as determined by the significance of the local air quality assessment for designated habitats).

c. The outcomes of the compliance risk assessment.

## 5.4 Assessment assumptions and limitations

**Scheme design and limits of deviation**

5.4.1 The assessment has been based on the Scheme description presented in **Chapter 2, The Scheme** of the Environmental Statement **[TR010044/APP/6.1]** and has taken into account the lateral limits of deviation illustrated on the Works Plans **[TR010044/APP/2.3]** and vertical limits of deviation secured in the DCO in order to establish a realistic worst case assessment scenario.

5.4.2 For the operational assessment, changes to the road alignment of less than the DMRB criteria of 5m is unlikely to lead to potentially significant effects on air quality and therefore would not need to be considered in detail. If changes in alignment of more than 5m compared to the design assessed in this assessment were proposed then further air quality assessment may be required.

5.4.3 The air quality assessment undertaken for the construction dust assessment has considered receptors and their proximity to the Order limits. The limits of deviation are within the Order limits. Therefore, the air quality assessment has considered a worst case.

5.4.4 Taking the above into account, the limits of deviation associated with the Scheme are not considered to change the conclusions of the construction phase assessment. Additionally, no further essential mitigation would be required.

**Baseline survey data**

5.4.5 Air quality monitoring data from 2015 was obtained from local authorities and used to verify the air quality model. This year aligns with the year for which baseline traffic was provided, and also pre-dates the construction for the A14 Cambridge to Huntingdon improvement scheme which used traffic management measures that affected traffic flows within the study area and therefore made subsequent years unsuitable as a base year. This approach minimises the assumptions and limitations of the local operational air quality assessment as far as practicable.

**Impact assessment and mitigation**

5.4.6 Model performance has been assessed and results are provided in **Table 5-4**, indicating good model performance after the application of appropriate adjustment factors. The accuracy of the future year modelling results is relative to the accuracy of the base year results, therefore greater confidence can be placed in the future year concentrations where good agreement is found for the base year.

5.4.7 The air quality modelling uses a traffic dataset prepared for the Scheme. Details regarding the traffic modelling undertaken to support the Scheme are detailed in the Transport Assessment **[TR010044/APP/7.2]**.

5.4.8 Uncertainties associated with vehicle emissions data have been minimised by using the speed-band emission factors described within *LA 105* (Ref 5-33Ref 5-32), which is based on version 9.0 of Defra's *Emissions Factors Toolkit* (EFT) (Ref 5-41). Speed bands are assigned on a link by link basis as informed by the pivoted speeds provided by the appointed Traffic Consultant.

5.4.9 The use of the latest version of the Defra background[1] concentrations and tools[2] available when the assessment was undertaken has also minimised the uncertainty associated with the air quality predictions presented. Since the assessment was undertaken Defra have published updated emission rates, background concentrations and associated tools. On the basis of a review of

[1] 2017-based background maps

[2] $NO_X$ to $NO_2$ Calculator v7.1.1 and $NO_X$ Sector Removal Tool v7.0

these tools and datasets it is not anticipated that the overall conclusions of the air quality assessment would change from those presented in this Chapter.

5.4.10 Additionally, there is uncertainty associated with air quality predictions using historical meteorological data to estimate future concentrations. The key limiting assumption is that conditions in the future will be the same as in the past; however, in reality no two meteorological years are the same. In line with best practice, the base year meteorology (as used in the model verification and adjustment process) has been used in future year modelling to allow any adjustments to be applied in future cases.

5.4.11 The forecasting method used to predict future $NO_2$ concentrations is the gap analysis methodology as described in *LA 105* (Ref 5-33Ref 5-32). The gap analysis is the application of Highways England long term trend ($LTT_{E6}$) adjustment factors which decrease Defra's assumed roadside rates of reduction in $NO_X$ and $NO_2$ by comparison with observed roadside trends. This prediction methodology is more conservative than the projections used by Defra.

5.4.12 The construction air quality assessment is based on the construction information available at the time of writing, with advice being provided by Highways England's appointed buildability advisors. The exact details of construction activities will not be known before the Principal Contractor is appointed to complete the works. Once appointed, the Principal Contractor would determine their exact construction methods and programme during the detailed design stage.

5.4.13 It has been assumed, in line with the details presented in the Transport Assessment **[TR010044/APP/7.2]** that there would be four phases of construction traffic management – one stage of advance works and three phases of main construction works. These scenarios are outlined in paragraph 5.3.58. These construction phase traffic management scenarios have been subject to traffic modelling, with the traffic data outputs being used to predict potential resultant air quality effects.

5.4.14 As explained in **Chapter 2, The Scheme** of the Environmental Statement [**TR010044/APP/6.1**], the assured traffic data available for the assessment of the Scheme is for an assessment year of 2025. In practice, in line with the delay in the opening year, the construction phases will be approximately 12 months later. The use of the earlier year represents a conservative assumption due to predicted improvements in background concentrations and fleet emissions in later years.

## 5.5 Study area

### Construction dust assessment

5.5.2 The study area for the construction dust assessment is defined as the area within 200 metres of dust-generating activities, as described in paragraph 5.3.65.

5.5.3 The Order Limits for the Scheme has been chosen as a proxy for the area within which dust-generating activities would occur. This is a conservative assumption as dust generating activities are unlikely to occur right at the edge of the boundary of the Order Limits.

5.5.4 The study area for the construction dust assessment includes areas within Bedford Borough Council, Central Bedfordshire Council, Huntingdonshire District Council and South Cambridgeshire District Council.

5.5.5 Over 700 residential receptors for public exposure fall within the study area for the construction dust assessment, as well as a children's nursery (Treetops Nursery School) and a primary school (Roxton CE Academy).

5.5.6 There are eight designated habitats within the study area: Sir John's Wood Ancient Woodland/County Wildlife Site (CWS); Croxton Park CWS; Wyboston Pits CWS; Zwetsloots Pits CWS; River Great Ouse CWS; Rivers Ivel and Hiz CWS; Elsworth A428 to Common Farm CWS; and a veteran elm tree (refer to **Chapter 8, Biodiversity** of the Environmental Statement **[TR010044/APP/6.1]**).

5.5.7 The construction dust assessment study area is illustrated on **Figure 5.5** of the Environmental Statement **[TR010044/APP/6.2]** along with the designated habitats and the sensitive public exposure receptors.

**Local air quality assessment - construction**

5.5.8 The study area for the local air quality assessment for the construction of the Scheme focuses on the key risk areas for potential exceedances of the annual mean objectives identified by the process described in Section 5.3 as set out in *LA 105* (Ref 5-33).

5.5.9 One key risk area was identified for public exposure, consisting of one residential property on the south side of Bedford Road (B1042), immediately east of Sandy Roundabout (the junction with the A1 and A603). This property is within Central Bedfordshire Council area, within the Sandy AQMA (see **Table 5-6**).

5.5.10 Five designated habitats were identified as key risk areas. These were: Lords Wood Ancient Woodland and CWS; Cople Pits CWS; Sandy Cemetery CWS; Knapwell Roadside Verge CWS; and Barton Orchard CWS.

**Local air quality assessment - operational**

5.5.11 The study area for the local air quality assessment for the operation of the Scheme was defined according to the screening criteria set out in Section 5.3.

5.5.12 The resultant study area encompasses the following local authorities:

a. Bedford Borough Council. Covers the western end of the Scheme (Black Cat junction), and contains ARN links including the existing A428, the A1, the A421, the A603 and the A6.

b. Central Bedfordshire Council. Covers a section of approximately 2 kilometres of the Scheme just east of Black Cat junction, and contains ARN links including the A1, the A603, and the A421 as far as Marston Moretaine.

c. Huntingdonshire District Council. Covers much of the central part of the Scheme (the new dual carriageway), and contains ARN links including the existing A428, the A1, the A14 as far as junction 16, and the A141 north of Huntingdon.

d. South Cambridgeshire District Council. Covers the eastern end of the Scheme (Caxton Gibbet junction), and contains ARN links including the existing A428, the A14, the A1198, the A603, and the M11.

e. Cambridge City Council. Small sections of the ARN fall within Cambridge City boundaries including parts of the A1303, the A14, and the M11.

f. East Cambridgeshire District Council. The eastern extent of the ARN falls within East Cambridgeshire boundaries, consisting of the A14 as far as Newmarket racecourse.

5.5.13 The study area contains residential properties in the settlements of: Bedford; St Neots; Eaton Socon; Huntingdon; Sandy; Potton; Cambourne; Orchard Park Cambridge. The study area also contains other villages and isolated properties.

5.5.14 The study area also contains 22 schools and nurseries, and 12 hospitals and medical facilities.

5.5.15 Several designated habitats fall within the study area. There are six Sites of Special Scientific Interest (SSSIs), four Ancient Woodlands, one Local Nature Reserve (LNR), 24 CWS, three City Wildlife Sites (CiWS), and one veteran tree. For further information refer to **Chapter 8, Biodiversity** of the Environmental Statement **[TR010044/APP/6.1]** and **Table 5-8**.

5.5.16 The operational local air quality assessment study area is illustrated on **Figure 5.3** of the Environmental Statement **[TR010044/APP/6.2]**, along with the designated habitats and the modelled receptors (those representing worst-case exposure).

## 5.6 Baseline conditions

### Existing baseline

5.6.2 Baseline conditions with respect to air quality in the year of 2015 are presented in this section. 2015 was selected as the baseline year as this is the most recent year for which traffic behaviour is unaffected by the A14 Cambridge to Huntingdon Improvement Scheme. During the construction phase of the A14 Scheme traffic will be diverted away from the A14 across the study area for the existing A428. Therefore, a baseline year during the construction phase would not be representative of actual baseline conditions within the study area. Unless otherwise stated within this section, the term 'study area' refers to the local air quality operational assessment study area.

### Future baseline

5.6.3 As detailed in **Chapter 4, Environmental assessment methodology** of the Environmental Statement **[TR010044/APP/6.1]**, a review has been undertaken to determine whether the existing baseline conditions might change between the time of undertaking the assessment and the future years in which the Scheme is planned to be constructed and become operational, as a result of future planned development.

5.6.4 Future baseline conditions have been modelled in the DM scenario 2025. The DM scenario incorporates those committed developments scheduled to occur in the years between 2015 and 2025 (as detailed in the Transport Assessment **[TR010044/APP/7.2]**) as well as predicted changes in background pollutant concentrations and emissions profiles over this time period. DM concentrations are presented in full in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]**.

### Air quality monitoring

5.6.5 Baseline air quality monitoring data for the study area have been gathered from the following sources:

a. Bedford Borough Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-42) and *2019 Air Quality ASR* (for recent context) (Ref 5-26).

b. Cambridge City Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-43) and *2019 Air Quality ASR* (for recent context) (Ref 5-27).

c. Central Bedfordshire Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-44) and *2019 Air Quality ASR* (for recent context) (Ref 5-28).

d. East Cambridgeshire District Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-45) and *2019 Air Quality ASR* (for recent context) (Ref 5-29).

e. Huntingdonshire District Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-46) and *2019 Air Quality ASR* (for recent context) (Ref 5-30).

f. South Cambridgeshire District Council *2016 Air Quality ASR* (for 2015 monitoring information) (Ref 5-47) and *2019 Air Quality ASR* (for recent context) (Ref 5-31).

g. Highways England air quality monitoring data (Ref 5-48).

5.6.6 Air quality monitoring data for local authority-operated sites within the study area is presented in **Appendix 5.2** of the Environmental Statement **[TR010044/APP/6.3]** and shown on **Figure 5.2** of the Environmental Statement **[TR010044/APP/6.2]**. A summary of the monitoring sites is provided below.

5.6.7 Each of the six local authorities within the study area carry out monitoring of $NO_2$ using a combination of automatic monitoring and passive diffusion tube monitoring. In total, 48 local-authority operated monitors consisting of three automatic monitors and 45 diffusion tubes fall within the study area. At the majority of these sites, concentrations were under the AQO for annual mean $NO_2$ in the base year of 2015.

5.6.8 Two exceedances of the AQO for annual mean $NO_2$ in 2015 were measured by Central Bedfordshire Council close to the A1 at Sandy. At monitor N20, located on a property on the A1 close to the junction with Carter Lane, a concentration of 67.3µg/m$^3$ was recorded. This concentration indicates that the AQO for short term (1-hour) mean $NO_2$ is also at risk of exceedance. At monitor N17, located on the roadside of Bedford Road close to the junction with the A1 and the A603, a concentration of 45.7µg/m$^3$ was recorded. These measured exceedances are a factor that indicates that these areas are of high sensitivity.

5.6.9 In addition to the exceedances mentioned above, there are five monitors where concentrations were close to (within 10% of) the AQO for annual mean $NO_2$ in 2015. These include monitors N1 (39.3µg/m$^3$), N9 (37.6µg/m$^3$), and N16 (39.3 µg/m$^3$), which are also in the area close to the A1 at Sandy. The remaining two sites are operated by Bedford Borough Council. DT21 is a kerbside monitor on the A1 at Wyboston which measured 37.0µg/m$^3$. DT57 is a roadside monitor on Newnham Avenue, Bedford, close to the junction with Goldington Road, which measured 36.0µg/m$^3$. These measured concentrations are a factor that indicates that these areas are of medium sensitivity.

5.6.10 At all 41 remaining $NO_2$ monitors, concentrations were below 36µg/m$^3$. These measured concentrations are a factor that indicates that these areas are of low sensitivity.

5.6.11 There are two automatic monitors measuring $PM_{10}$ within the study area, both operated by South Cambridgeshire District Council. Both recorded concentrations well under the AQO for annual mean $PM_{10}$ in the base year of 2015, and therefore there is considered to be a low risk of future exceedances.

5.6.12 There are no automatic monitors measuring $PM_{2.5}$ within the study area.

5.6.13 In addition to local authority data, Highways England commissioned two passive $NO_2$ diffusion tube monitoring surveys to support the Scheme's air quality assessment, in 2016, and 2018. However, both surveys were carried out during an unrepresentative period of traffic behaviour due to the construction of the A14 Cambridge to Huntingdon Improvement Scheme (see paragraph 0) and have therefore not been used in the assessment. For details of these surveys refer to **Appendix 5.2** of the Environmental Statement **[TR010044/APP/6.3]**). Exceedances of the annual mean $NO_2$ objective were recorded at two Highways England monitoring locations adjacent to the northbound carriageway of the A1, north of the existing Black Cat roundabout (A428BC_004_0116 and A428BC_009_0116).

**Pollutant background maps**

5.6.14 Information on background pollutant levels in the study area has been gathered from the following sources:

a. Defra's 2017-based background concentration maps (Ref 5-49).

b. Local authority monitoring data as detailed in paragraph 5.6.5.

c. Automatic Urban Rural Network (AURN) monitoring data (Ref 5-50).

5.6.15 Annual mean background pollutant concentration estimates for 1 kilometre grid squares throughout the UK are available from Defra for the years 2017 – 2030 based on 2017 reference year projections. These have been sourced from Defra's 2017 based background maps for the study area for $NO_2$, $PM_{10}$, and $PM_{2.5}$.

5.6.16 As the baseline year for this assessment is 2015, the Defra 2017 background concentrations of $NO_2$ and $PM_{10}$ were compared to monitored background concentrations in 2015, and adjustment factors were derived. The factors were applied to the Defra 2017 background concentrations to estimate 2015 background concentrations. Details of these adjustments can be found in **Appendix 5.3** of the Environmental Statement **[TR010044/APP/6.3]**.

5.6.17 Contributions from motorways, trunk A-roads and primary A-roads within the grid squares of the background maps have been removed from the mapped concentrations using the *$NO_2$ Adjustment for $NO_X$ Sector Removal Tool v7.0* (Ref 5-51) provided by Defra, as these sources are explicitly modelled in the assessment. The procedure prevents these sources from being double counted.

5.6.18 The range of background concentrations for each 1 kilometre x 1 kilometre square intersecting the study area for 2015 is presented in **Table 5-5**. Background concentrations are predicted to be below the AQOs in all areas.

5.6.19 In years subsequent to 2015 background concentrations are predicted to decrease year-on-year, largely due to the influence of improving vehicle exhaust emission standards over time. This trend is reflected in the projected background concentrations for the opening year of 2025, which are also presented in **Table 5-5**.

**Table 5-5: Summary of estimated background pollutant concentrations across the study area in the base year and opening year**

| Statistic | Background Annual Mean $NO_2$ (µg/m$^3$) | | Background Annual Mean $PM_{10}$ (µg/m$^3$) | | Background Annual Mean $PM_{2.5}$ (µg/m$^3$) | |
|---|---|---|---|---|---|---|
| | 2015 | 2025 | 2015 | 2025 | 2015 | 2025 |
| Minimum | 10.1 | 7.8 | 16.1 | 13.0 | 10.5 | 8.2 |
| Average | 12.7 | 9.7 | 18.6 | 15.1 | 11.6 | 9.1 |
| Maximum | 22.3 | 18.0 | 22.6 | 18.7 | 13.4 | 10.8 |

### Air quality management areas

5.6.20 Information on AQMAs in the study area has been gathered from the following sources:

a. Defra's *2020 AQMA dataset* (Ref 5-15) for information (including boundaries) of current AQMAs.

b. Local authority ASRs as detailed in paragraph 5.6.5 for information on the Council's intentions for revocation, extension, or creation of AQMAs.

5.6.21 The AQMAs within the local air quality study area are listed in **Table 5-6.**

**Table 5-6: Air Quality Management Areas within the study area**

| AQMA Name | Local Authority | Declared for (pollutant and averaging period) | Location |
|---|---|---|---|
| Bedford Town Centre AQMA | Bedford Borough Council | Annual mean $NO_2$ | This AQMA covers the majority of properties within Bedford town centre. |
| AQMA No 4 Sandy | Central Bedfordshire Council | Annual mean $NO_2$ | This AQMA incorporates 10m from the kerbside of both sides of the A1 at the Georgetown exit, then south along the London Road A1 to the Bedford Road junction. |
| Brampton AQMA | Huntingdonshire District Council | Annual mean $NO_2$ | This AQMA encompasses properties at Wood View, Nursery Cottages Thrapston Road, Bliss Close and Flamsteed Drive, close to the A14 in Brampton and Hinchingbrooke. |
| Huntingdon AQMA | Huntingdonshire District Council | Annual mean $NO_2$ | This AQMA encompasses the southern part of the town centre bounded largely by the A141 to the west, A14 to the south, and the river to the east. |
| A14 Corridor AQMA | South Cambridgeshire District Council | Annual mean $NO_2$ and 24-hour mean $PM_{10}$ | This AQMA covers the area along the A14 between Bar Hill and Milton. The boundary of the $PM_{10}$ declaration is smaller and inside the $NO_2$ boundary, so the $NO_2$ boundary is the adopted one. |

5.6.22 Brampton AQMA and A14 Corridor AQMA have been compliant with the AQOs for five years and the respective local authorities intend to review revocation on Defra's recommendation.

5.6.23 The AQMA boundaries are illustrated on **Figure 5.2** of the Environmental Statement **[TR010044/APP/6.2]**.

**Compliance information**

5.6.24 Information on compliance with the *Air Quality Directive* (Ref 5-1) in the study area has been gathered from the following sources:

a. Defra's *Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Eastern (UK0029)* (Ref 5-17) for zonal information.

b. Defra's 2020 PCM Model (Ref 5-14) for link-by-link information.

5.6.25 The study area falls into the Eastern non-agglomeration zone (UK0029) for the consideration of compliance with the *Air Quality Directive* (Ref 5-1). Data from the most recent baseline (2018) indicates that the zone is currently not in compliance with the *Air Quality Directive* (Ref 5-1) due to the exceedance of the annual mean $NO_2$ EULV. Projections taking into account committed actions as of 2018 indicate that the zone is expected to achieve compliance in 2024.

5.6.26 PCM modelled $NO_2$ concentrations for links within the study area are provided in **Table 5-7**. At all links within the study area predicted concentrations are well below the EULV of 40 µg/m$^3$ in the base year, and are predicted to decrease further in the future year of 2025.

**Table 5-7: Defra PCM links within the study area**

| Road | ID | ARN road? | Local Authority | Predicted Roadside Annual Mean $NO_2$ in 2015 (µg/m$^3$) * | Predicted Roadside Annual Mean $NO_2$ in 2018 (µg/m$^3$) | Predicted Roadside Annual Mean $NO_2$ in 2025 (µg/m$^3$) |
|---|---|---|---|---|---|---|
| A4280 | 802077214 | Y | Bedford Borough Council | 29.0 | 25.9 | 17.6 |
| A1 | 802048300 | Y | Central Bedfordshire Council | 35.4 | 31.1 | 19.9 |
| A141 | 802077251 | Y | Huntingdonshire District Council | 32.8 | 27.8 | 19.5 |
| A1 | 802006079 | N† | Central Bedfordshire Council | 36.6 | 32.1 | 20.6 |

*data from 2015 has been obtained from a previous (2015-based) dataset where road IDs are different; concentrations apply to the same sections of road, where available.
†This PCM link is adjacent to an ARN link and receptors within 200m of the ARN along this section have been modelled.

### Designated Habitats

5.6.27 Baseline information on designated habitats in the study area has been gathered from the following sources:

a. *Natural England Open Data Geoportal* (Ref 5-53) for boundaries for nationally and internationally designated sites.

b. The *APIS* (Ref 5-40) for habitat types of SSSIs, background nitrogen deposition rates for all sites, and critical loads for all sites (given habitat types).

c. The *MAGIC* website (Ref 5-39) for habitat types for sites where this information is not provided by APIS (Ref 5-40).

d. Citation details for CWS and CiWS (Ref 5-54, Ref 5-55).

e. Consultation with the competent expert for the Biodiversity assessment.

5.6.28 Details of the ecologically designated sites within the air quality study area are given in **Table 5-8**. Critical loads appropriate to use at detailed assessment stage as defined by *APIS* (Ref 5-40) are given where the site contains features that are sensitive to nitrogen.

5.6.29 Of the 46 sites identified within the study area, 41 are sensitive to nitrogen. Little Paxton Pits SSSI, The Riddy LNR, River Great Ouse CWS, Rivers Ivel and Hiz CWS, and River Cam CWS are not considered sensitive to nitrogen as these are all freshwater-based meso/eutrophic systems which are not nitrogen limited. These sites have not been considered further in this assessment.

5.6.30 Of the five nitrogen-sensitive SSSIs within the study area, four have background nitrogen deposition rates that exceed their critical loads. All three additional (non-SSSI) Ancient Woodlands as well as the Veteran Tree also have background nitrogen deposition rates that exceed their critical loads. Of the 32 additional (non-Ancient Woodland) nitrogen-sensitive City/CWSs, 19 have background nitrogen deposition rates that exceed their critical loads.

**Table 5-8: Nitrogen sensitive designated habitats within the air quality study area**

| Site Name | Designation | Habitat Type (EUNIS code) | Critical load (kg N/ha/yr) | Background nitrogen deposition (kg N/ha/yr) | Deposition Conversion Rate (kg N/ha/yr) |
|---|---|---|---|---|---|
| Madingley Wood | SSSI Ancient Woodland | Meso- and eutrophic Quercus wood-land (G1.A) | 15 | 28-29 | 0.29 (Forest) |
| St Neots Common | SSSI | Low and medium altitude hay meadows (E2.2) | 20 | 17.6 | 0.14 (Grassland) |
| Great Stukeley Railway Cutting | SSSI | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 17.8 | 0.14 (Grassland) |
| Wilbraham Fens | SSSI | Rich fens (D4.1) | 15 | 15.3 | 0.14 (Grassland) |
| Newmarket Heath | SSSI | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 15.3 | 0.14 (Grassland) |
| Lords Wood | Ancient Woodland CWS | Broadleaved deciduous woodland (G1) | 10 | 27.6 | 0.29 (Forest) |
| White Wood | Ancient Woodland CWS | Broadleaved deciduous woodland (G1) | 10 | 27.7 | 0.29 (Forest) |
| Gilrags Wood | Ancient Woodland CWS | Broadleaved deciduous woodland (G1) | 10 | 31.1 | 0.29 (Forest) |
| Little Barford | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.1 | 0.14 (Grassland) |

| Site Name | Designation | Habitat Type (EUNIS code) | Critical load (kg N/ha/yr) | Background nitrogen deposition (kg N/ha/yr) | Deposition Conversion Rate (kg N/ha/yr) |
|---|---|---|---|---|---|
| Wyboston Pits | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.1 | 0.14 (Grassland) |
| Croxton Park | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.7 | 0.14 (Grassland) |
| Elsworth (A428 to Common Farm) | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 17.1 | 0.14 (Grassland) |
| Elstow Pit | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 17.8 | 0.14 (Grassland) |
| Bunker's Hill | CWS | Non-Mediterranean dry acid and neutral closed grassland (E1.7) / Dry heaths (F4.2) | 10 | 15.4 | 0.14 (Grassland) |
| Carthagena Bridleway | CWS | Broadleaved deciduous woodland (G1) | 10 | 27.3 | 0.29 (Forest) |
| Cople Pits | CWS | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 15.7-16.8 | 0.14 (Grassland) |
| Sandy Disused Railway | CWS | Non-Mediterranean dry acid and neutral closed grassland (E1.7) | 10 | 15.4 | 0.14 (Grassland) |
| Stewartby Lake | CWS | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 17.2 | 0.14 (Grassland) |
| Beacon Course Green Lane | CWS | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 15.3 | 0.14 (Grassland) |
| Buckden Gravel Pits | CWS | Non-Mediterranean dry acid and neutral closed grassland (E1.7) | 10 | 16.7 | 0.14 (Grassland) |
| Ellington Brook Pollard Willows | CWS | Broadleaved deciduous woodland (G1) | 10 | 31.5 | 0.29 (Forest) |
| Heath Road / Street Way Green Lanes | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 15.3 | 0.14 (Grassland) |
| Hinchingbrooke Gravel Pits | CWS | Rich fens (D4.1) | 15 | 17.8 | 0.14 (Grassland) |
| Low Fen Drove Way Grassland and Hedges | CWS | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 19.9 | 0.14 (Grassland) |

| Site Name | Designation | Habitat Type (EUNIS code) | Critical load (kg N/ha/yr) | Background nitrogen deposition (kg N/ha/yr) | Deposition Conversion Rate (kg N/ha/yr) |
|---|---|---|---|---|---|
| Orwell Hill Roadside Verge | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 15.5 | 0.14 (Grassland) |
| Willow Pollards North of Wyton Pit | CWS | Broadleaved deciduous woodland (G1) | 10 | 30.4 | 0.29 (Forest) |
| King's Hedges Hedgerows | CiWS | Broadleaved deciduous woodland (G1) | 10 | 35 | 0.29 (Forest) |
| Milton Road Hedgerows | CiWS | Broadleaved deciduous woodland (G1) | 10 | 35 | 0.29 (Forest) |
| Scrub East of M11 Verge | CiWS | Broadleaved deciduous woodland (G1) | 10 | 28 | 0.29 (Forest) |
| Madingley Slip Road Roadside Verge | CWS | Sub-atlantic semi-dry calcareous grassland (E1.26) | 15 | 16.7 | 0.14 (Grassland) |
| Track Southwest of Catworth Gorse | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 18.2 | 0.14 (Grassland) |
| Castle Farm Dairy Meadows | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.9 | 0.14 (Grassland) |
| Everton Churchyard | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 15.8 | 0.14 (Grassland) |
| Everton Hill | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 15.4 | 0.14 (Grassland) |
| Sandy Cemetery | CWS | Non-Mediterranean dry acid and neutral closed grassland (E1.7) | 10 | 15.7 | 0.14 (Grassland) |
| The Pinnacle | CWS | Non-Mediterranean dry acid and neutral closed grassland (E1.7) | 10 | 15.7 | 0.14 (Grassland) |
| Grassland at the Vicarage | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.8 | 0.14 (Grassland) |
| Knapwell Roadside Verge | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 18.3 | 0.14 (Grassland) |
| Toseland Churchyard | CWS | Low and medium altitude hay meadows (E2.2) | 20 | 16.0 | 0.14 (Grassland) |
| Barton Orchard* | CWS | Broadleaved deciduous woodland (G1) | 10 | 28.0 | 0.29 (Forest) |
| Veteran elm tree | Veteran Tree | Broadleaved deciduous woodland (G1) | 10 | 16.7 | 0.29 (Forest) |

* This site is only within the local air quality study area for construction; not operation

## 5.7 Potential impacts

5.7.1 The scoping exercise identified that the introduction and/or modification of road infrastructure associated with the Scheme would potentially result in changes to existing air quality emission levels within the study area on sensitive receptors, during both the construction and operation phases in the following ways:

**Construction**

a. By increased emissions of dust during construction of the Scheme from dust-generating activities on-site.

b. By emissions associated with non-road mobile machinery (NRMM) undertaking construction works.

c. By changes in vehicle activity (flows, speeds and composition) during construction, as a result of temporary traffic management measures and/or additional vehicles travelling to and from the construction site transporting materials, plant and labour.

5.7.2 The types of activities with the potential to generate dust during the construction phase include:

a. Movement of vehicles.

b. Enabling works (for example verge clearance).

c. Earthworks.

d. Minor demolition (for example concrete bases and footings).

e. Excavation and installation of drains and communication ducts.

f. Construction of retaining walls.

g. Surfacing works.

h. Central reserve works.

i. Installation of verge furniture and planting of vegetation.

j. Stock piling and storage of materials.

5.7.3 There is the potential for adverse effects during the construction of the Scheme in relation to construction dust, NRMM, and vehicle emissions. However, any effects on human health related to air quality would be temporary (i.e. during the period of the construction works only) and could be suitably minimised by the application of industry standard mitigation measures.

**Operation**

5.7.4 The Scheme has the potential to affect air quality during operation (positively or negatively), in the following ways:

a. By changes in vehicle activity (flows, speeds and composition) as a result of the Scheme in proximity to air quality sensitive receptors.

b. By changes in the separation distances between road sources of emissions and air quality sensitive receptors.

5.7.5 On the basis of the available information, including existing monitored concentrations in the wider study area, exceedances of the annual mean $NO_2$ UK AQO have the potential to occur at limited locations within the local air quality assessment study area. Significant effects prior to mitigation being implemented could therefore occur should air quality worsen in these areas with the Scheme.

## 5.8 Design, mitigation and enhancement measures

**Embedded mitigation**

5.8.2 Through the design development process, the Scheme has been designed, as far as possible, to avoid effects on air quality through option identification, appraisal, selection and refinement, as described in **Chapter 3**, **Assessment of alternatives** of the Environmental Statement **[TR010044/APP/6.1]**.

5.8.3 Mitigation measures have been integrated (embedded) into the Scheme for the purpose of minimising effects on air quality. These measures are described in **Chapter 2, The Scheme** of the Environmental Statement **[TR010044/APP/6.1]** and in summary comprise the following:

a. The Scheme has been designed to maintain or increase the distances between properties and traffic, where possible, thus reducing the risks of air quality impacts.

b. The Scheme has been designed to maintain traffic flows on the A1 and A421 through Black Cat Junction and the surrounding road network.

c. The Scheme has been designed to remove traffic from the existing A428 onto the new dual carriageway.

**Essential mitigation**

*Construction*

5.8.4 Measures have been identified which would be implemented by the Principal Contractor to reduce the impacts and effects that construction of the Scheme is likely to have on air quality.

5.8.5 Construction of the Scheme would be subject to measures and procedures as defined within the First Iteration EMP **[TR010044/APP/6.8]**.

5.8.6 The First Iteration EMP **[TR010044/APP/6.8]** includes a range of 'Best Practicable Means' associated with mitigating potential environmental impacts. The measures would be developed into a Second Iteration EMP by the Principal Contractor, which would be implemented during the construction phase.

5.8.7 The Second Iteration EMP would include a range of industry standard good practice construction phase dust mitigation measures which would be applied during all works undertaken based on the level of construction dust risk at sensitive receptors.

*Operation*

5.8.8 No essential mitigation measures are required for the operational phase of the Scheme.

**Enhancement measures**

5.8.9 No enhancement measures relating to air quality have been incorporated into the design of the Scheme.

## 5.9 Assessment of significant effects

5.9.1 In accordance with *LA 104 Environmental Assessment and monitoring* (Ref 5-32), the prediction of impacts and the assessment of effects (and their significance) on air quality associated with construction and operation of the Scheme has taken account of effectiveness of both embedded and essential mitigation measures.

**Construction dust assessment**

5.9.2 The construction dust risk potential is considered 'large' due to the large scale of the works proposed. The sensitivity to potential dust effects is considered to be 'High' for receptors located within 100 metres of the construction activity and low for receptors located between 100 metres and 200 metres.

5.9.3 All sensitive receptors within the construction dust assessment study area are shown in **Figure 5.5** of the Environmental Statement **[TR010044/APP/6.2]** along with their identified sensitivity.

5.9.4 As the risk potential is identified as 'high', the best practice mitigation measures presented in the First Iteration EMP **[TR010044/APP/6.8]** that are suitable for this level of risk would be followed, as outlined in *LA 105 Air quality* (Ref 5-33).

**Local air quality assessment - construction**

*Public exposure*

5.9.5 Predicted annual mean $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations and changes in concentrations attributable to the Scheme construction are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]** for every receptor modelled.

5.9.6 All receptors are predicted to experience concentrations of $NO_2$ under the relevant AQOs in the modelled construction scenarios. Therefore, the conclusion of the local air quality assessment for the construction of the Scheme is that it is not significant for air quality.

*Designated habitats*

5.9.7 A summary of the results for each designated habitat is provided in

5.9.8 Table 5-9. Full results are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]** for every transect point modelled.

**Table 5-9: Summary of predicted nitrogen deposition rates at designated habitats for construction**

| Ecological site | Closest point to ARN road | | | | Critical load (kg N/ha/yr) | Distance from road where change in nitrogen deposition rate ≤1.0% critical load (m) |
|---|---|---|---|---|---|---|
| | Distance from road edge (m) | DM nitrogen deposition rate (kg N/ha/yr) | DS nitrogen deposition rate (kg N/ha/yr) | Change in nitrogen deposition rate (kg N/ha/yr) | | |
| Lords Wood Ancient Woodland / CWS 1 | 3 | 28.8 | 28.9 | **+0.1** | 10 | **Site edge** |
| Cople Pits CWS 1 | 9 | 17.3 | 17.3 | **<0.1** | 10 | **Site edge** |
| Cople Pits CWS 2 | 11 | 16.1 | 16.1 | **<0.1** | 10 | **Site edge** |
| Cople Pits CWS 3 | 74 | 16.8 | 16.8 | **<0.1** | 10 | **Site edge** |
| Sandy Cemetery CWS | 5 | 16.0 | 16.0 | **<0.1** | 10 | **Site edge** |
| Knapwell Roadside Verge CWS | 105 | 18.9 | 19.0 | <0.1 | 20 | Site edge |
| Barton Orchard CWS 1 | 5 | 30.4 | 30.5 | **+0.2** | 10 | **20** |
| Barton Orchard CWS 2 | 10 | 29.7 | 29.8 | **+0.1** | 10 | **20** |

**Bold** indicates where change is above the critical load

5.9.9 The change in nitrogen deposition due to the construction of the Scheme is 1.0% of the critical load or under (and therefore not significant) at all sites apart from Barton Orchard. The impact of the increase in nitrogen deposition at Barton Orchard has been assessed in **Chapter 8, Biodiversity** of the Environmental Statement **[TR010044/APP/6.1]** and has been found to be non-significant.

### Local air quality assessment – operation

*Public exposure*

5.9.10 Predicted annual mean $NO_2$ concentrations and changes in concentrations attributable to the Scheme operation, and baseline annual mean concentrations of $PM_{10}$ and $PM_{2.5}$ are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]** for every receptor modelled.

5.9.11 All receptors are predicted to experience concentrations of $PM_{10}$ and $PM_{2.5}$ under the relevant AQOs in the baseline scenario. Therefore, annual mean concentrations and changes in $PM_{10}$ and $PM_{2.5}$ have not been considered for the opening year as there will be no impact on the achievement of these objectives as a result of the Scheme.

5.9.12 Seven receptors are predicted to experience concentrations of $NO_2$ over the relevant AQO in either the DM or the DS year. Results for these receptors have been assigned a magnitude of change band, as shown in **Table 5-10**.

**Table 5-10: Predicted annual mean $NO_2$ concentrations and magnitude of change bands at public exposure receptors used to inform the judgement of significance**

| Receptor ID | 2025 DM total $NO_2$ concentration ($\mu g/m^3$) | 2025 DS total $NO_2$ concentration ($\mu g/m^3$) | 2025 change in total $NO_2$ concentration ($\mu g/m^3$) | Magnitude of change band |
|---|---|---|---|---|
| R221 | 57.3 | 57.5 | +0.2 | Imperceptible |
| R222 | 58.0 | 58.3 | +0.2 | Imperceptible |
| R272 | 58.0 | 58.2 | +0.2 | Imperceptible |
| R273 | 57.9 | 58.2 | +0.2 | Imperceptible |
| R274 | 57.8 | 58.1 | +0.2 | Imperceptible |
| R284 | 52.8 | 53.0 | +0.2 | Imperceptible |
| R286 | 52.5 | 52.7 | +0.2 | Imperceptible |
| Concentrations and changes in reported concentrations reported to 1 decimal place. | | | | |

5.9.13 These receptors are located at Sandy (see **Figure 5.4** of the Environmental Statement **[TR010044/APP/6.2]**), consisting of a row houses fronting the A1, between the junctions with St Neots Road and Carter Street. An increase in annual mean concentration of $NO_2$ is predicted with the Scheme in place, due to an increase in traffic flow on the A1 (+274 AADT, of which +125 are HDVs across both carriageways, +439 AADT, of which +40 are HDVs on southbound carriageway). The magnitude of change is predicted to be imperceptible ($\leq 0.4 \mu g/m^3$) at all seven receptors.

5.9.14 At all other modelled receptors, concentrations in both the DM and the DS scenario are under the AQO for annual mean $NO_2$. Therefore, changes in air quality at these receptors are not significant.

5.9.15 The largest (non-significant) increase in $NO_2$ concentration is +1.1 µg/m$^3$, at R94 in Cambourne. This increase is caused by the additional traffic (approximately 12,000 vehicles) on the existing A428 in this location due to the Scheme, and results in a concentration of 14.9 µg/m$^3$, which remains very low. Increases in $NO_2$ concentration are also predicted in locations close to the new Scheme itself, where the Scheme is a new emissions source.

5.9.16 Increases are also predicted in other locations close to the existing A428 between Caxton Gibbet and Hardwick. These increases are at receptors on the A1303 near Coton, at locations close to the A421, at locations close to the A1 between Tempsford and Wyboston, and at locations close to the B1428 through Eaton Socon. These increases are attributed to increases in traffic numbers on these roads, because traffic is drawn to the Scheme along these routes.

5.9.17 In total there were 23 increases which were not imperceptible of more than 0.4µg/m$^3$ in annual mean $NO_2$ concentrations at sensitive receptors. Even with these small increases in $NO_2$ concentrations are predicted to remain under the AQO at these receptors.

5.9.18 The largest (non-significant) decrease in $NO_2$ concentration is -8.6 µg/m$^3$, at R168 in Wintringham. This decrease is caused by traffic migrating from the existing A428 on which this receptor is located, to the new dual carriageway. The decrease in traffic on the existing A428 is approximately 26,000 vehicles per day.

5.9.19 Decreases in $NO_2$ concentration are predicted at further locations along the existing A428 from Eaton Socon to Caxton Gibbet, as well as on the A1 between Wyboston and Eaton Socon, and on Barford Road, because East-West traffic will no longer have to use these routes to travel between the A421 and the existing A428.

5.9.20 Decreases in $NO_2$ concentration are also predicted close to other East-West routes in the area, as traffic will preferentially use the new dual carriageway. This includes the local road ‘High Street’ through Toseland and Yelling, and the B1042.

5.9.21 In total there were 47 decreases of more than 0.4µg/m$^3$ in $NO_2$ concentration at sensitive receptors resulting in improved air quality. $NO_2$ concentrations are predicted to remain under the AQO at these receptors.

5.9.22 There are five AQMAs within the study area. Receptors at worst-case exposure (i.e. receptors closest to the road) have been modelled as part of the local air quality assessment for the operational phase to identify the impacts at AQMAs. At Bedford Town Centre AQMA, Brampton AQMA, Huntingdon AQMA, and the A14 Corridor AQMA, DS concentrations of $NO_2$ were predicted to be well within the annual mean AQO, and the changes caused by the Scheme are predicted to be imperceptible (less than 0.4µg/m$^3$). These results are presented in **Table 5-11**.

5.9.23 At AQMA No 4 Sandy, there are seven receptors predicted to exceed the annual mean AQO; these are the receptors presented in **Table 5-10** and discussed in paragraphs 5.9.11-5.9.12. At the remaining receptors within this AQMA, DS concentrations of $NO_2$ were predicted to be well within the annual mean AQO. The changes caused by the Scheme are predicted to be imperceptible (less than 0.4µg/m$^3$) at 17 of the remaining receptors with perceptible decreases in $NO_2$ concentration at R250 and R279 on the B1042 Bedford Road, close to the junction with the A1 and the A603.

**Table 5-11: Summary of predicted annual mean $NO_2$ concentrations at public exposure receptors within AQMAs**

| AQMA | Receptors modelled | Range of 2025 DS total $NO_2$ concentrations ($\mu g/m^3$) | Range of 2025 changes in total $NO_2$ concentration ($\mu g/m^3$) |
|---|---|---|---|
| Bedford Town Centre AQMA | R23, R277, R278, R283, S18 | 17.2 to 23.2 | +0.1 to +0.3 |
| AQMA No 4 Sandy | R220 - R222, R224, R249, R250, R272 - R274, R279, R281, R282, R284 - R297 | 16.6 to 58.3 | -0.7 to +0.2 |
| Brampton AQMA | R65 | 15.4 | <0.1 |
| Huntingdon AQMA | R62, R71 | 18.6 to 18.8 | -0.1 |
| A14 Corridor AQMA | H12, R29 - R36, R61, R62, R71, R116, R189, R190, S6, S21, S22 | 13.0 to 28.1 | -0.3 to +0.3 |

5.9.24 As the annual mean concentrations of $NO_2$ are below 60µg/$m^3$ at all receptors in both the DM and the DS scenario, it is concluded that the hourly average $NO_2$ AQO is unlikely to be exceeded in either scenario.

5.9.25 As the magnitude of change band is imperceptible at all sensitive receptors where an exceedance of the AQO for annual mean $NO_2$ is predicted, a conclusion of no likely significant air quality effect for human health is recorded, in line with paragraph 2.90 of *LA 105 Air quality* (Ref 5-33). **Table 5-12** summarises the properties affected by the Scheme.

**Table 5-12: Matrix to inform a judgement of significant air quality effects**

| Magnitude of change in annual mean $NO_2$ or $PM_{10}$ ($\mu g/m^3$) | Total number of receptors with: | |
|---|---|---|
| | Worsening of an air quality objective already above the objective or the creation of a new exceedance | Improvement of an air quality objective already above the objective or the removal of an existing exceedance |
| Large (>4) | 0 | 0 |
| Medium (>2) | 0 | 0 |
| Small (>0.4) | 0 | 0 |

*Designated habitats*

5.9.26 Predicted $NO_x$ concentrations and nitrogen deposition rates, and changes in $NO_x$ concentrations and nitrogen deposition rates attributable to the Scheme operation are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]** for every ecological transect point modelled.

5.9.27 A summary of the results for each ecological site is provided in **Table 5-13**.

## Table 5-13: Summary of predicted nitrogen deposition rates at designated habitats for operation

| Ecological site | Closest point to ARN road | | | | Critical load (kg N/ha/yr) | Distance from road where change in nitrogen deposition rate ≤1.0% critical load (m) |
|---|---|---|---|---|---|---|
| | Distance from road edge (m) | DM nitrogen deposition rate (kg N/ha/yr) | DS nitrogen deposition rate (kg N/ha/yr) | Change in nitrogen deposition rate (kg N/ha/yr) | | |
| Madingley Wood SSSI / Ancient Woodland 1 | 126 | 29.3 | 29.3 | **+0.1** | 15 | **Site edge** |
| Madingley Wood SSSI / Ancient Woodland 2 | 8 | 29.8 | 30.1 | **+0.2** | 15 | **20** |
| St Neots Common SSSI | 2 | 18.4 | 18.3 | -0.1 | 20 | Site edge |
| Great Stukeley Railway Cutting SSSI 1 | 141 | 17.7 | 17.7 | **<0.1** | 15 | **Site edge** |
| Great Stukeley Railway Cutting SSSI 2 | 1 | 19.5 | 19.4 | **<0.1** | 15 | **Site edge** |
| Great Stukeley Railway Cutting SSSI 3 | 0 | 20.1 | 20.1 | **<0.1** | 15 | **Site edge** |
| Wilbraham Fens SSSI | 45 | 16.0 | 16.0 | **<0.1** | 15 | **Site edge** |
| Newmarket Heath SSSI | 9 | 18.9 | 18.9 | **+0.1** | 15 | **Site edge** |
| Lords Wood Ancient Woodland / CWS 1 | 3 | 28.8 | 28.6 | **-0.1** | 10 | **10** |
| Lords Wood Ancient Woodland / CWS 2 | 23 | 27.6 | 27.6 | **<0.1** | 10 | **Site edge** |
| White Wood Ancient Woodland / CWS | 3 | 28.1 | 27.9 | **-0.1** | 10 | **10** |
| Gilrags Wood Ancient Woodland / CWS | 183 | 31.0 | 31.0 | **<0.1** | 10 | **Site edge** |
| Little Barford CWS | 2 | 16.4 | 16.315.8 | -0.1 | 20 | Site edge |

| Ecological site | Closest point to ARN road | | | | Critical load (kg N/ha/yr) | Distance from road where change in nitrogen deposition rate ≤1.0% critical load (m) |
|---|---|---|---|---|---|---|
| | Distance from road edge (m) | DM nitrogen deposition rate (kg N/ha/yr) | DS nitrogen deposition rate (kg N/ha/yr) | Change in nitrogen deposition rate (kg N/ha/yr) | | |
| Wyboston Pits CWS 1 | 0 | 18.3 | 17.8 | -0.5 | 20 | 20 |
| Wyboston Pits CWS 2 | 0 | 18.8 | 18.2 | -0.7 | 20 | 20 |
| Croxton Park CWS | 4 | 18.1 | 17.1 | -1.0 | 20 | 50 |
| Elsworth (A428 to Common Farm) CWS | 61 | 17.5 | 17.7 | +0.1 | 20 | Site edge |
| Elstow Pit CWS | 69 | 18.0 | 18.0 | <0.1 | 20 | Site edge |
| Bunker's Hill CWS | 6 | 15.6 | 15.6 | **<0.1** | 10 | **Site edge** |
| Carthagena Bridleway CWS | 193 | 27.2 | 27.2 | **<0.1** | 10 | **Site edge** |
| Cople Pits CWS 1 | 9 | 17.3 | 17.3 | **<0.1** | 15 | **Site edge** |
| Cople Pits CWS 2 | 11 | 16.1 | 16.1 | **<0.1** | 15 | **Site edge** |
| Cople Pits CWS 3 | 74 | 16.9 | 16.9 | **<0.1** | 15 | **Site edge** |
| Sandy Disused Railway CWS | 43 | 15.4 | 15.4 | **<0.1** | 10 | **Site edge** |
| Stewartby Lake CWS | 72 | 17.8 | 17.8 | **<0.1** | 15 | **Site edge** |
| Beacon Course Green Lane CWS | 35 | 17.1 | 17.1 | **<0.1** | 15 | **Site edge** |
| Buckden Gravel Pits CWS 1 | 0 | 18.6 | 18.6 | **-0.1** | 10 | **Site edge** |
| Buckden Gravel Pits CWS 2 | 0 | 19.3 | 19.2 | **-0.1** | 10 | **Site edge** |
| Ellington Brook Pollard Willows CWS | 20 | 33.8 | 33.7 | **<0.1** | 10 | **Site edge** |
| Heath Road / Street Way Green Lanes CWS | 196 | 16.5 | 16.5 | <0.1 | 20 | Site edge |
| Hinchingbrooke Gravel Pits CWS | 2 | 19.8 | 19.7 | **<0.1** | 15 | **Site edge** |

| Ecological site | Closest point to ARN road | | | | Critical load (kg N/ha/yr) | Distance from road where change in nitrogen deposition rate ≤1.0% critical load (m) |
|---|---|---|---|---|---|---|
| | Distance from road edge (m) | DM nitrogen deposition rate (kg N/ha/yr) | DS nitrogen deposition rate (kg N/ha/yr) | Change in nitrogen deposition rate (kg N/ha/yr) | | |
| Low Fen Drove Way Grassland and Hedges CWS | 7 | 22.9 | 22.9 | **<0.1** | 15 | **Site edge** |
| Orwell Hill Roadside Verge CWS 1 | 0 | 16.5 | 16.4 | -0.1 | 20 | Site edge |
| Orwell Hill Roadside Verge CWS 2 | 0 | 16.6 | 16.4 | -0.1 | 20 | Site edge |
| Willow Pollards North of Wyton Pit CWS | 90 | 31.9 | 31.9 | **<0.1** | 10 | **Site edge** |
| King's Hedges Hedgerows CiWS | 99 | 35.9 | 36.0 | **<0.1** | 10 | **Site edge** |
| Milton Road Hedgerows CiWS | 9 | 38.0 | 38.0 | **<0.1** | 10 | **Site edge** |
| Scrub East of M11 Verge CiWS | 4 | 32.1 | 32.2 | **+0.1** | 10 | **20** |
| Madingley Slip Road Roadside Verge CWS 1 | 0 | 19.3 | 19.8 | **+0.5** | 15 | **-** |
| Madingley Slip Road Roadside Verge CWS 2 | 0 | 17.8 | 17.9 | **+0.2** | 15 | **-** |
| Madingley Slip Road Roadside Verge CWS 3 | 0 | 17.6 | 17.7 | **+0.1** | 15 | **Site edge** |
| Track Southwest of Catworth Gorse CWS | 45 | 18.8 | 18.8 | <0.1 | 20 | Site edge |
| Castle Farm Dairy Meadows CWS | 3 | 18.2 | 18.2 | +0.1 | 20 | Site edge |
| Everton Churchyard CWS | 131 | 15.8 | 15.8 | <0.1 | 20 | Site edge |
| Everton Hill CWS | 173 | 15.3 | 15.3 | <0.1 | 20 | Site edge |
| Sandy Cemetery CWS | 5 | 16.0 | 16.0 | **<0.1** | 10 | **Site edge** |

| Ecological site | Closest point to ARN road | | | | Critical load (kg N/ha/yr) | Distance from road where change in nitrogen deposition rate ≤1.0% critical load (m) |
|---|---|---|---|---|---|---|
| | Distance from road edge (m) | DM nitrogen deposition rate (kg N/ha/yr) | DS nitrogen deposition rate (kg N/ha/yr) | Change in nitrogen deposition rate (kg N/ha/yr) | | |
| The Pinnacle CWS | 91 | 15.8 | 15.8 | **<0.1** | 10 | **Site edge** |
| Grassland at the Vicarage CWS | 12 | 18.3 | 18.4 | <0.1 | 20 | Site edge |
| Knapwell Roadside Verge CWS | 105 | 18.9 | 19.0 | +0.1 | 20 | Site edge |
| Toseland Churchyard CWS | 23 | 16.0 | 15.9 | <0.1 | 20 | Site edge |
| Veteran Elm Tree | 37 | 29.2 | 29.8 | **+0.6** | 10 | - |

**Bold** indicates where change is above the critical load
- indicates change greater than or equal to 1.0% at all modelled points

5.9.28 The change in nitrogen deposition due to the operation of the Scheme is 1.0% of the critical load or under (and therefore not significant) at a majority of sites. Where increases in nitrogen deposition exceed this level (at Madingley Wood SSSI and Ancient Woodland, Veteran Elm Tree, Scrub East of M11 Verge CiWS, and Madingley Slip Road Roadside Verge CWS), the impact of the increase in nitrogen deposition has been assessed in **Chapter 8, Biodiversity** of the Environmental Statement **[TR010044/APP/6.1]** and has been found to be non-significant at all sites.

5.9.29 Therefore, a conclusion of no likely significant air quality effect at designated ecological sites is recorded.

**Compliance risk assessment**

*Construction*

5.9.30 No compliance risks were identified as part of the review of the key risk areas for the construction phases.

5.9.31 There are two additional PCM links located on wider parts of the construction phase ARN. These are on the A600 in Bedford and the A1303 in Cambridge. The PCM model concentrations for these links in 2023 are 17.8 µg/m$^3$ and 20.1 µg/m$^3$ respectively. These concentrations are well below the EULVs.

5.9.32 Therefore, it is concluded that the construction of the Scheme does not affect the UK's reported ability to comply with the *Air Quality Directive* (Ref 5-1) in the shortest timescales possible.

*Operational*

5.9.33 Three PCM links were identified as intersecting with the ARN for the operational local air quality assessment and thus comprise the compliance risk assessment for the operation of the Scheme.

5.9.34 A validation process has been undertaken by comparing the modelled annual mean $NO_2$ concentrations at 4 metre validation points with those from the PCM model. The results indicate that the concentrations differed by -24% to +61%. Following this, the air quality model has been thoroughly reviewed and is considered robust.

5.9.35 The results of the compliance risk assessment are summarised in **Table 5-14**. No exceedances of the EULV have been identified at any qualifying features, with or without the Scheme.

5.9.36 Full results are presented in **Appendix 5.4** of the Environmental Statement **[TR010044/APP/6.3]**.

**Table 5-14: Summary of compliance risk assessment**

| PCM Link Census ID | 2025 PCM model $NO_2$ concentration ($\mu g/m^3$) | Range of 2025 DM $NO_2$ concentrations ($\mu g/m^3$) at qualifying features | Range of 2025 DS $NO_2$ concentrations ($\mu g/m^3$) at qualifying features | Range of 2025 $NO_2$ concentration changes ($\mu g/m^3$) at qualifying features |
|---|---|---|---|---|
| 802048300 | 19.9 | 15.7 – 22.6 | 15.6 – 22.6 | <0.1 to -0.1 |
| 802077214 | 17.6 | 15.6 – 20.6 | 15.8 – 21.0 | +0.2 to +0.4 |
| 802077251 | 19.5 | 16.0 – 24.8 | 15.9 – 24.7 | -0.1 |
| 802006079 | 20.6 | 15.7 – 37.1 | 15.7 – 37.2 | <0.1 to +0.1 |

5.9.37 As the EULV is not predicted to be exceeded, there is no risk to the reported date of compliance with the *Air Quality Directive* (Ref 5-1).

**Overall significance of effects**

5.9.38 The conclusion of the operational local air quality assessment is that there is no likely significant air quality effect for human health or designated habitats during the operation of the Scheme.

5.9.39 The conclusion of the construction local air quality assessment and construction dust assessment is that there is no likely significant air quality effect for human health or designated habitats during the construction of the Scheme.

5.9.40 The conclusion of the compliance risk assessment is that the Scheme would not affect the UK's reported ability to comply with the *Air Quality Directive* (Ref 5-1) in the shortest timescale possible due to either the construction or the operation of the Scheme. Therefore, an overall evaluation of 'not significant' has been assigned to the Scheme for air quality. Additionally, the Scheme is consistent with relevant planning policy and air quality action plans.

## 5.10 Monitoring

### Construction effects

5.10.2 As the air quality assessment has concluded that construction of the Scheme would not generate significant air quality effects, no monitoring of the Scheme's effects would be required.

5.10.3 The First Iteration EMP **[TR010044/APP/6.8]** sets out the construction site monitoring activities that would be undertaken by the Principal Contractor during the construction stage to ensure that the mitigation measures embedded in the Scheme design, and those considered essential to mitigate the impacts of activities associated with the Scheme are appropriately implemented. Such activities would include undertaking visual checks and inspections, and monitoring of dust deposition.

### Operational effects

5.10.4 The assessment has concluded that there would be no significant adverse or beneficial effects arising from the operation of the Scheme. Accordingly, no monitoring of operational effects would be required.

## 5.11 References

Ref 5-1 Council Directive on Ambient Air Quality and Cleaner Air for Europe (2008/50/EC). European Parliament and Council of the European Union (2008). https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32008L0050

Ref 5-2 The Air Quality Standards Regulations 2010. The Stationery Office (2010). http://www.legislation.gov.uk/uksi/2010/1001/contents/made

Ref 5-3 Environment Act 1995. The Stationery Office (1995). https://www.legislation.gov.uk/ukpga/1995/25/contents

Ref 5-4 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1). Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland (2007). https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1

Ref 5-5 Clean Air Strategy 2019. Department for Environment, Food and Rural Affairs (2019). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf

Ref 5-6 Air Pollution in the UK 2018 Compliance Assessment Summary. Department for Environment, Food and Rural Affairs (2019). https://uk-air.defra.gov.uk/library/annualreport/assets/documents/annualreport/air_pollution_uk_2018_Compliance_Assessment_Summary_Issue1.pdf

Ref 5-7 National Policy Statement for National Networks. Department for Transport (2014). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf

Ref 5-8 Overarching National Policy Statement for Energy (EN-1). Department of Energy & Climate Change (2011). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

Ref 5-9 National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4). Department of Energy & Climate Change (2011). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37049/1941-nps-gas-supply-oil-en4.pdf

Ref 5-10 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47857/1941-nps-gas-supply-oil-en4.pdf

Ref 5-11 National Planning Policy Framework. Ministry of Housing, Communities & Local Government (2019).

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Ref 5-12 Planning Practice Guidance: Air quality. Ministry of Housing, Communities & Local Government (2019). https://www.gov.uk/guidance/air-quality--3

Ref 5-13 UK plan for tackling roadside nitrogen dioxide concentrations: detailed plan. Department for Environment, Food and Rural Affairs (2017). https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

Ref 5-14 2020 $NO_2$ and PM projections data (2018 reference year). Department of Environment, Food and Rural Affairs (2020). https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data

Ref 5-15 The 2020 AQMA dataset. Department of Environment, Food and Rural Affairs (2020). https://uk-air.defra.gov.uk/aqma/maps/

Ref 5-16 Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations. Department for Environment, Food and Rural Affairs (2018). https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

Ref 5-17 Air quality plan for tackling roadside nitrogen dioxide concentrations in Eastern (UK0029). Department for Environment, Food and Rural Affairs (2017). https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0029.pdf

Ref 5-18 Our strategy to improve air quality. Highways England (2017). https://www.gov.uk/government/publications/highways-england-air-quality-strategy

Ref 5-19 Air Quality Action Plan for the Bedford Borough Council. Bedford Borough Council (2008). https://bbcdevwebfiles.blob.core.windows.net/webfiles/Files/Air_Quality_Action_Plan_Amended_as_of_July_2008.pdf

Ref 5-20 Air Quality Action Plan 2019 – 2024. Central Bedfordshire Council (2019). https://centralbedfordshire.app.box.com/s/3fnwcveo6d2jtl5gnkta222palueg73h

Ref 5-21 Air Quality Action Plan for the Cambridgeshire Growth Areas. Cambridge City Council, Huntingdonshire District Council and South Cambridgeshire District Council (2009). https://www.scambs.gov.uk/media/6727/air-quality-action-plan.pdf

Ref 5-22 Design Manual for Roads and Bridges: Volume 11. Highways England (1993 – 2019) [WITHDRAWN].

Ref 5-23 Interim Advice Note 125/15: Environmental Assessment Update (2015) [WITHDRAWN].

Ref 5-24 A428 Black Cat to Caxton Gibbet: Environmental Scoping Report. Highways England (2019). https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010044/TR010044-000006-BCCG%20-%20Scoping%20Report.pdf

Ref 5-25 Design Manual for Roads and Bridges. Highways England (2019 – 2020). http://www.standardsforhighways.co.uk/dmrb

Ref 5-26 2019 Air Quality Annual Status Report. Bedford Borough Council (2019). https://bbcdevwebfiles.blob.core.windows.net/webfiles/Environmental%20Issues/Noise%20Nuisances%20and%20Pollution/2019%20Air%20Quality%20Annual%20Status%20Report.pdf

Ref 5-27 2019 Air Quality Annual Status Report. Cambridge City Council (2019). https://www.cambridge.gov.uk/media/7417/air-quality-annual-status-report-2019.pdf

Ref 5-28 2019 Air Quality Annual Status Report. Central Bedfordshire Council (2019). https://centralbedfordshire.app.box.com/s/oyira9vywse74vsajh3z94ji6hecq3rx

Ref 5-29 2019 Air Quality Annual Status Report. East Cambridgeshire District Council (2019). https://www.eastcambs.gov.uk/sites/default/files/asr2019.pdf

Ref 5-30 Air Quality Annual Status Report for 2018. Huntingdonshire District Council (2019). https://laqm.defra.gov.uk/assets/asr2019huntingdonshiredistrictcouncil.pdf

Ref 5-31 Air Quality Annual Status Report for 2018. South Cambridgeshire District Council (2019). https://www.scambs.gov.uk/media/15558/2019-air-quality-annual-status-report-asr-june-2019.pdf

Ref 5-32 Design Manual for Roads and Bridges: LA 104 Environmental assessment and monitoring (Revision 1). Highways England (2020). https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true

Ref 5-33 Design Manual for Roads and Bridges: LA 105 Air quality (Revision 0). Highways England (2019). https://www.standardsforhighways.co.uk/dmrb/search/10191621-07df-44a3-892e-c1d5c7a28d90

Ref 5-34 Local Air Quality Management Technical Guidance (TG16). Department for Environment, Food and Rural Affairs (2018). https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

Ref 5-35 ADMS-Roads version 5.0. Cambridge Environmental Research Consultants Ltd (2020).

Ref 5-36 $NO_X$ to $NO_2$ Calculator. Department for Environment, Food and Rural Affairs (2019). https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc

Ref 5-37 Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites. Laxen and Marner (2003). https://uk-air.defra.gov.uk/assets/documents/reports/cat06/1hr_NO2_rpt_Final_b.pdf

Ref 5-38 Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedances of the 1-hour mean AQS objective. AEAT (2008). https://laqm.defra.gov.uk/documents/NO2relationship_report.pdf

Ref 5-39 Multi-Agency Geographic Information for the Countryside. Natural England (2020). https://magic.defra.gov.uk/home.htm.

Ref 5-40 Air Pollution Information System. UK Centre for Ecology and Hydrology (2020). http://www.apis.ac.uk/

Ref 5-41 Emissions Factors Toolkit v9.0. Department for Environment, Food and Rural Affairs (2019). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Ref 5-42 2016 Air Quality Annual Status Report. Bedford Borough Council (2016). [Weblink unavailable].

Ref 5-43 2016 Air Quality Annual Status Report. Cambridge City Council (2016). [Weblink unavailable].

Ref 5-44 2016 Air Quality Annual Status Report. Central Bedfordshire Council (2016). https://www.centralbedfordshire.gov.uk/migrated_images/air-quality-report_tcm3-21181.pdf

Ref 5-45 2016 Air Quality Annual Status Report. East Cambridgeshire District Council (2016). https://www.eastcambs.gov.uk/sites/default/files/ASR_2016%20Signed%20Off%20Final%20Draft.pdf

Ref 5-46 Air Quality Annual Status Report for 2015. Huntingdonshire District Council (2017). https://www.huntingdonshire.gov.uk/media/2748/air-quality-annual-status-report-for-2015.pdf

Ref 5-47 2017 Air Quality Annual Status Report. South Cambridgeshire District Council (2017). https://www.scambs.gov.uk/media/1499/annual_status_report_2017.pdf

Ref 5-48 Personal communication (email) from Highways England Safety, Engineering and Standards. Highways England (2020).

Ref 5-49 2017-based background maps for $NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$. Department for Environment, Food and Rural Affairs (2019). https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2017

Ref 5-50 Data selector. Department for Environment, Food and Rural Affairs (2020). https://uk-air.defra.gov.uk/data/data_selector

Ref 5-51 $NO_2$ Adjustment for $NO_X$ Sector Removal Tool v7.0. Department for Environment, Food and Rural Affairs (2019). https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxsector

Ref 5-52 2020 $NO_2$ and PM projections data (2018 reference year). Department of Environment, Food and Rural Affairs (2020). https://uk-air.defra.gov.uk/library/no2ten/2020-no2-pm-projections-from-2018-data

Ref 5-53 Natural England Open Data Geoportal. Natural England (2020). https://naturalengland-defra.opendata.arcgis.com/

Ref 5-54 Non-Statutory Designated Site Shapefiles for A428 Black Cat to Caxton Gibbet Scheme. Bedfordshire and Luton Biodiversity Recording and Monitoring Centre (2020).

Ref 5-55 Data Search, A428, Cambridgeshire. Cambridgeshire and Peterborough Environmental Records Centre (2020).