5. Air Quality

5.1 Introduction

5.1.1 This chapter of the Environmental Statement (ES) reports the findings of an assessment of the likely significant effects on Air Quality as a result of the proposed Access to Witney development (hereafter referred to as the 'Proposed Development') in Oxfordshire.

5.1.2 The chapter reports a quantitative air quality assessment of public exposure and ecological sensitive receptors during operation, with a focus on nitrogen dioxide (NO_2), nitrogen oxides (NO_x) and particulates ($PM_{2.5}$ and PM_{10}). These are the pollutants that are most likely to give rise to pollutant levels near or above air quality objectives due to vehicle emissions. The assessment considers the impact of particulate matter ($PM_{2.5}$ and PM_{10}) and dust during the construction phase qualitatively. All other pollutants are scoped out of the assessment.

5.1.3 The potential for effect interactions of construction dust on a single receptor ('in-combination effects') and combined cumulative Air Quality effects ('cumulative effects') of the Proposed Development with other development schemes are discussed in *Chapter 16: Cumulative Effects* of this ES.

5.2 Legislation and planning policy context

5.2.1 This assessment has been undertaken taking into account relevant legislation and guidance set out in national, regional and local planning policy (summarised in the sections below). The legislation and policy requirements have informed the preparation of this ES chapter.

European Union Ambient Air Quality Directive

5.2.2 The Clean Air for Europe Programme (Ref 5-1) revisited the management of air quality within the European Union (EU) and replaced much of the existing air quality legislation with a single legal act called Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ref 5-2). This Directive repealed and replaced the EU Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management and its associated Daughter Directives 1999/30/EC (Ref 5-3), 2000/69/EC (Ref 5-4), 2002/3/EC (Ref 5-5), relating to limit values for ambient air pollutants and the Council Decision 97/101/EC (Ref 5-6) which established a reciprocal exchange of information and data within EU Member States.

5.2.3 Directive 2008/50/EC is transcribed into UK legislation by the Air Quality Standards Regulations 2010, which came into force on 11th June 2010 and as amended in 2016 (Ref 5-7). This sets binding limit values or objectives on pollutants with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment.

5.2.4 Air pollution limits set by the EU remain in UK law post Brexit, as EU legislation that applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16) (Ref 5-8). Section 4 of the Withdrawal Act 2018 ensures that any remaining EU rights and obligations, including directly effective rights within EU treaties, continue to be recognised and available in domestic law after exit. However, the EU will no longer have a role in enforcement.

National legislation

National Air Quality Strategy

5.2.5 The UK AQS was initially published in 2000 under the requirements of the Environment Act 1995 (Ref 5-9). A further revision of the Air Quality Strategy (AQS) (Ref 5-10) set objective values to help local authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality (England) Regulations 2000 (Ref 5-11) and later amendments (Ref 5-12).

5.2.6 The AQS objective values have been set down in regulation for the purposes of local air quality management (LAQM). Under the LAQM regime, local authorities have a duty to carry out regular assessments of air quality against the AQS objective values and if it is unlikely that the AQS objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. It is not unusual for the boundary of an AQMA to include within it relevant locations where air quality is not at risk of exceeding an AQS objective.

5.2.7 The AQS objective values for the pollutants of relevance to this assessment are presented in Table 5-1.

Table 5-1 Key National Air Quality Strategy Objectives

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances	Target Date
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3	N/A	31/12/2005
	Hourly Mean	200 µg/m^3	18 times per year	31/12/2005
Particulate Matter (PM_{10})	Annual Mean	40 µg/m^3	N/A	31/12/2004
	Daily Mean	50 µg/m^3	35 times per year	31/12/2004
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m^3	N/A	2020
Nitrogen Oxides (NO_x) for ecosystems	Annual Mean	40 µg/m^3	N/A	31/12/2000

5.2.8 The principal air quality legislation within the United Kingdom is the 2010 Air Quality Standards Regulations (as amended 2016) (Ref 5-13), which transposes relevant EU Air Quality Directives into national legislation.

Clean Air Strategy

5.2.9 In 2019, the UK government released its Clean Air Strategy 2019 (Ref 5-14), which is part of it's a Green Future: Our 25 Year Environment Plan to Improve the Environment (Ref 5-15). In recent years, air quality management has primarily focused on NO_2, and its principal source in the UK, i.e. road traffic. However, the Clean Air Strategy broadens the focus to other areas, including domestic emissions from wood burning stoves and from agriculture. This shift in emphasis is part of a longer-term goal to reduce the levels of $PM_{2.5}$ in the air to below the World Health Organisation (WHO) guideline level, which is far lower than the AQS objective value.

5.2.10 The Clean Air Strategy included the provision of a clear effective guidance on how AQMAs, Clean Air Zones (CAZ) and Smoke Control Areas interrelate and how they can be used by local government to tackle pollution. The UK Clean Air Strategy sets the following reduction targets:

- Nitrogen oxides (NO_x) - reduce emissions against the 2005 baseline by 55% by 2020 and by 73% by 2030.
- $PM_{2.5}$ - reduce emissions against the 2005 baseline by 30% by 2020 and 46% by 2030.

5.2.11 It is noted within the Clean Air Strategy document that the "*current legislative framework has not driven sufficient action at a local level*". New legislation will seek to shift the focus towards prevention of exceedances rather than tackling pollution when limits have been surpassed. The shift of focus encourages more of a proactive rather than reactive policy framework at regional and local levels for air quality.

National planning policy and guidance

National Planning Policy Framework (NPPF)

5.2.12 At a national level, the UK Government published the NPPF in 2012. The NPPF supersedes previous national planning policy guidance (PPGs) and planning policy statements (PPSs). The NPPF summarises in a single document the Government planning policies for England, and how these are expected to be applied. The NPPF was updated in July 2021 (Ref 5-16), superseding the previous version published in March 2012 and revised in February 2019.

5.2.13 Policies and objectives which are of particular relevance to air quality include:

- On conserving and enhancing the natural environment, Paragraph 174 states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: …

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality …"

- Air quality in the UK has been managed through the Local Air Quality Management regime using national objectives. Paragraph 186 of the NPPF states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. … 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."

National Planning Practice Guidance (PPG)

5.2.14 The PPG (Ref 5-17) was published on the 6 March 2014 to provide more in-depth guidance to the NPPF. The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. As such, the PPG was amended in July 2017 to reflect the updated EIA Regulations, and further updated in 2019.

5.2.15 Matters of relevance to the air quality assessment include:

- When deciding whether air quality is relevant to a planning application, the PPG states that the following criteria may be required to be taken into consideration:

"the 'baseline' local air quality, including what would happen to air quality in the absence of the development;

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

whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."

- On how detailed an air quality assessment needs to be, the PPG states:

"Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locationally specific, will depend on the Proposed Development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented."

A Green Future – Our 25 Year Plan to Improve the Environment

5.2.16 The 25 Year Environment Plan, published in January 2018, sets out the actions the UK Government will take to help the natural world regain and retain good health (Ref 5-15). This references several actions that are being taken to improve air quality, most notably the publication of the Clean Air Strategy and tighter controls on Medium Combustion Plant. Emphasis is also placed on the 'Future of Mobility', in the establishment of a flexible regulatory framework to encourage new modes of transport and encouraging opportunities to move toward zero emission transport.

5.2.17 The 25 Year Environment Plan reinforces the demand for high environmental standards for all new build development. Resilient buildings and infrastructure will more readily adapt to a changing climate, and by extension have a lesser impact on local air quality.

Local planning policy and guidance

West Oxfordshire Local Plan 2011-2031

5.2.18 The development plan for Eynsham is The West Oxfordshire Local Plan (Ref 5-18), within which the Proposed Development is located in. This was adopted on 27 September 2018 and sets out the overall planning framework for the district from 2011 to 2031.

5.2.19 Matters of relevance to the air quality assessment include:

- Policy EH8 (Environmental Protection) focuses on Air Quality and states that:

"The air quality within West Oxfordshire will be managed and improved in line with National Air Quality Standards, the principles of best practice and the Air Quality Management Area Action Plans for Witney and Chipping Norton. Where appropriate, developments will need to be supported by an air quality assessment".

- Policy OS3 (Prudent use of natural resources) states that:

"minimising waste and making adequate provision for the re-use and recycling of waste; and causing no deterioration and, where possible, achieving improvements in water or air quality".

- Policy T1 (Sustainable Transport) states that:

"Priority will be given to locating new development in areas with convenient access to a good range of services and facilities and where the need to travel by private car can be minimised, due to opportunities for walking, cycling and the use of public transport, particularly where this would help to reduce traffic congestion on the routes around Oxford and the Air Quality Management Areas at Witney and Chipping Norton".

- Policy T4 (Parking Provision) considers air quality when:

"The Council will work with partners to provide, maintain and manage an appropriate amount of off-street public car parking, particularly to support our town and village centres and to address issues of congestion and air quality".

- Policy EH3 (Biodiversity and Geodiversity) aims to protect and enhance biodiversity by:

"requiring a Habitats Regulations Assessment to be undertaken of any development proposal that is likely to have a significant adverse effect, either alone or in combination, on the Oxford Meadows SAC, particularly in relation to air quality and nitrogen oxide emissions and deposition".

West Oxfordshire Design Guide, 2019

5.2.20 Alongside the Local Plan, the West Oxfordshire Design Guide 2016 (Ref 5-19) contains a detailed analysis of both natural and man-made aspects of the District and detailed design advice. It was adopted by the Council in April 2016, and is a Supplementary Planning Document (SPD), so is a material consideration in planning decisions.

5.2.21 Matters of relevance to the air quality assessment include:

- Policy EH2 (Biodiversity) states:

"requiring a Habitats Regulation Assessment to be undertaken of any development proposal that is likely to have a significant adverse effect, either alone or in combination, on the Oxford Meadows SAC, particularly in relation to air quality and nitrogen oxide emissions and deposition".

South Leigh Neighbourhood Plan, 2017-2031

5.2.22 The South Leigh Neighbourhood Plan (Ref 5-20) considers the Environment as part of Policy SLT1 Traffic Management, which states:

"Any proposals which would result in a significant increase in the volume of traffic on roads in the Plan area will be assessed in terms of their potential impact upon the environment and amenities of the Parish. Where necessary, the Parish Council will work with West Oxfordshire District Council and Oxfordshire County Council to identify any appropriate traffic management measures that will serve to mitigate the negative impacts of additional traffic generation."

5.2.23 The South Leigh Neighbourhood Plan considers Climate Change as part of SLE8 Climate Change, which states:

"The incorporation of small scale domestic renewable energy systems in any new and existing developments will be positively supported, including solar heating systems, photovoltaic panels, biomass fuel and ground or air sourced heat pumps."

Other relevant policy, standards and guidance

Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality

5.2.24 The Highways England guidance *DMRB LA 105 Air quality* (Ref 5-21) outlines the methodology typically used for the dust emission and air quality modelling assessments for motorway and trunk road schemes. This recommends that modelling is limited to 200m from the Affected Road Network (ARN) and includes guidance on how all sensitive receptors (public exposure and designated ecological habitats) within 0-50m, 50-100m and 100-200m of all construction activity should be identified. This guidance also outlines the criteria for traffic screening, gap analysis, compliance risk assessment and provides advice on the evaluation of significance.

Local Air Quality Management Technical (LAQM) Guidance

5.2.25 LAQM Technical Guidance TG.16 (Ref 5-22) from Defra provides guidance to support local authorities in carrying out their duties under the Environment Act 1995 and subsequent regulations. In order to provide consistency with all UK local authorities own work on air quality, the guiding principles for air quality assessments, as set out in the latest LAQM guidance and associated tools have been utilised in this assessment.

5.3 Consultation

5.3.1 Consultation was held with West Oxfordshire District Council (WODC) to discuss the locations and timescale of the diffusion tube monitoring for the Proposed Development. The WODC Environmental Health Office agreed with the locations monitored and to also start the survey later than anticipated to wait for easing of COVID-19 restrictions.

5.3.2 An EIA Scoping Report (*ES Volume II, Appendix 2-A*) was submitted to the Authority to accompany a request for a formal EIA Scoping Opinion in June 2021. The Authority issued an EIA Scoping Opinion on 1st July 2021 and a copy of this response is included in *ES Volume II, Appendix 2-B*.

5.3.3 A summary of the air quality related response is included in Table 5-2. The full list of responses to the comments raised in the Scoping Opinion is provided in *ES Volume II, Appendix 2-C: EIA Scoping Opinion Response*.

Table 5-2 Comments raised in Scoping Opinion

Consultee	Comments Raised	Response Provided in the ES / Planning Application
WODC	*The EIA must consider potential impacts on proposed properties, including those within the adjacent Strategic Development Area (SDA) development.* (Page 5, para 1)	The air quality assessment includes selected representative receptors at existing sensitive locations (e.g., residential dwellings) as well as receptors at new committed developments including the SDA where the sites are within 200m of the affected road network. See Table 5-11 and Figure 5-2 for details of the selected public exposure receptors within the operational phase local air quality study area.
WODC	*The scheme is likely to impact traffic levels over the Witney town road network; therefore the assessment should be supported by appropriate traffic data from across the local network.* (Page 5, para 1)	The traffic data used in the air quality assessment are provided from the Oxfordshire Strategic Transport Model from Oxfordshire County Council (OCC) and includes traffic data from across Witney town. See paragraph 5.2.24 for more information on the road network within the study areas.
South Leigh Parish Council	*South Leigh Parish Council consider that the monitoring distance should be extended from 200m to 500m. Witney Town Council have also supported the extension of the air quality monitoring distance.* (Page 5, Para 2)	AECOM undertook diffusion tube monitoring at locations within 200m from the Proposed Development and along potentially affected routes, as well as at a background site away from pollutant sources. These data will supplement the local authority monitoring data within the area. Based on *DMRB LA 105*, as emissions from road sources drop off from the road, they are shown to contribute to concentrations up to a distance of 200m from a road. Monitoring at points that are located more than 200m from a road will be classed as background sites and will have a limited contribution from the road source. These can therefore not be used as part of the model verification exercise which is one of the primary reasons that monitoring data close to the road network is collected. See *ES Volume II Appendix 5-A* for more information on the verification exercise undertaken.
Witney Town Council	*In respect of the AQM the Council feels that quantitative data should be collected from the start of construction.* (Annex 1, Page 25)	Details of any monitoring that may be required during construction will be set out within a Construction Environmental Management Plan (CEMP) and/or dust management plan. The requirement for any monitoring will be based on the outcome of the construction dust assessment which will consider the risk and size of the works as well as numbers of sensitive receptors at distances up to 200m from construction activities.

5.4 Assessment Methodology

5.4.1 This section of this ES chapter presents the following:

- Information sources that have been consulted throughout the preparation of this chapter;
- The methodology behind the assessment of air quality effects, including the criteria for the determination of sensitivity of receptor and magnitude of change from the existing of ‘baseline’ condition;
- An explanation as to how the identification and assessment of potential air quality effects has been reached; and

- The significance criteria and terminology for the assessment of air quality residual effects.

5.4.2 The detailed plans and elevations that define the Proposed Development have been reviewed and form part of the basis of the assessment of likely significant effects on air quality.

Information sources

5.4.3 This air quality assessment has been undertaken based on the following guidance:

- *DMRB LA 105 Air quality* (Ref 5-21); and
- *Defra's LAQM Technical Guidance LAQM.TG (16*) (Ref 5-22).

5.4.4 Based on *DMRB LA 105 Air quality*, a detailed level of assessment is required due to the size of the Proposed Development and the risk potential of the project and that there are receptors within 50m of roads triggering the traffic screening criteria (see paragraph 5.4.15).

Methodology for determining baseline conditions and sensitive receptors

5.4.5 This section presents the methodology used to assess the potential effects on air quality during the construction phase and the operational phase of the Proposed Development.

5.4.6 This section explains the methods used to assess the potential effect of:

- Fugitive emissions of particulate matter from the construction activities;
- Traffic associated with the construction activities representing peak activities; and
- Emissions from vehicles in the operational phase of the Proposed Development.

5.4.7 The methods used to determine the significance of effects associated with air quality impacts are described in the 'Significance Criteria' sub-section of this report.

5.4.8 The Proposed Development will improve access to Witney and Cogges and reduce the amount of traffic needing to make unnecessary westbound journeys through the town centres.

5.4.9 Public exposure receptors potentially sensitive to air quality have been identified through review of mapping and aerial photography of the area surrounding the Proposed Development, whereas, designated ecological receptors have been identified using nationally and locally assigned ecological site shapefiles in GIS, the Air Pollution Information System (APIS) (Ref 5-23) and the Ancient Tree Inventory (Ref 5-24). More information on the sensitive receptors assessed is provided in section 5.5 of this ES chapter.

Methodology for determining construction effects

Construction phase dust assessment

5.4.10 The potential impacts from construction dust emissions generated during the construction phase of the Proposed Development follow *DMRB LA 105 Air quality* i.e. to consider sensitive receptors within bandings up to 200m of where construction activity and identify these in a constraints plan. The locations of any sensitive receptors such as housing, schools, hospitals or special ecological sites within 200m of the red line boundary were identified such that mitigation measures to reduce dust emissions can be applied.

5.4.11 To determine whether the Proposed Development has a large or small construction dust risk potential the following tables (Table 5-3 and Table 5-4) as presented in *DMRB LA 105 Air quality* have been followed.

Table 5-3 Construction dust risk potential

Risk	Examples of types of projects
Large	Large smart motorway projects, bypass and major motorway junction improvements.
Small	Junction congestion relief project i.e. small junction improvements, signalling changes. short smart motorway projects.

Table 5-4 Receiving environment sensitivity to construction dust

Construction dust risk potential	Distance from construction activities		
	0-50m	50- 100m	100-200m
Large	High	High	Low
Small	High	Low	Low

5.4.12 Mitigation measures to be included in a CEMP for the Proposed Development have been identified where required. Mitigation measures are based on those presented in the Institute of Air Quality Management (IAQM) guidance on the assessment of demolition and construction dust (Ref 5-25).

Construction Phase Local Air Quality Assessment

5.4.13 Construction phase traffic emissions follows *DMRB LA 105 Air quality* to consider the impact of construction activities on vehicle movements. The guidance focuses on considering construction traffic impacts for programmes of more than two years.

5.4.14 The construction programme for the Proposed Development is due to last 41 weeks, therefore these emissions have been scoped out as significant effects are not expected.

Methodology for determining operational effects

Operational phase local air quality assessment

5.4.15 The operational phase local air quality impact assessment considers the impact of pollutant concentrations on sensitive receptors within 200m of the ARN once the Proposed Development is complete and operational.

5.4.16 The ARN is defined by applying the traffic scoping criteria to all roads within the traffic reliability area (TRA) (i.e. the area within which traffic data is considered to be suitable for use in environmental assessments by the traffic team). The traffic scoping criteria are change based (determined under two-way road traffic conditions), where the change is based on the difference in opening year traffic data between the Do-Minimum (DM; without the Proposed Development) and Do-Something (DS; with the Proposed Development). If one or more of the following criteria are met, then the road is considered to be part of the ARN:

- Road alignment changed by 5m or more; or
- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more; or
- Heavy duty vehicle (HDV) flows will change by 200 AADT or more; or
- A change in speed band.

5.4.17 The final local air quality ARN has taken account of the extent of reliable coverage of the traffic model but has excluded road sections where there are no receptors within 200m of the road.

5.4.18 Representative sensitive receptors were selected within 200m of the ARN and then all roads in the TRA within 200m of the receptors were included in the modelled road network. The air quality study area is described in more detail in section 5.5.

5.4.19 As the baseline year of the traffic model is 2018, air quality model predictions for the same baseline year were made for verification purposes. Base year results have been compared with the results of representative air quality monitoring and model adjustment factors have been determined and applied.

5.4.20 Model predictions have also been made for the DM and DS for the 2024 opening year. On the basis of these predictions, the change in NO_2 and PM_{10} at public exposure receptors as a result of the Proposed Development has been established. The assessment of $PM_{2.5}$ is not a requirement of *DMRB LA 105 Air quality*. This is because the UK currently meets its legal requirements for the achievement of the $PM_{2.5}$ air quality thresholds. The assessment has utilised the modelling of PM_{10} to demonstrate that the Proposed Development does not impact on the $PM_{2.5}$ air quality objective (i.e. 25 µg/m³).

5.4.21 For designated ecological sites sensitive to nitrogen deposition within 200m of the ARN, the effect of the Proposed Development on air quality has been considered in line with *DMRB LA 105 Air quality*. Comparison of results has been made against the NO_x objective value and the Critical Loads for nitrogen deposition (the latter varies according to designation). The air quality implications for designated sites have been considered separately to the air quality assessment as part of the biodiversity assessment (refer to *Chapter 6: Biodiversity*).

5.4.22 The outputs of the air quality modelling have informed the compliance risk assessment and the local air quality assessment (impact of the Proposed Development on human and designated sites) to determine whether the Proposed Development leads to a significant air quality effect.

5.4.23 A key element of the local air quality impact assessment is the rate of improvement in air quality over time as cleaner vehicles enter the national vehicle fleet. The methodology outlined within *DMRB LA 105 Air quality* on the assessment of future NO_x and NO_2 projections has been considered for this assessment. The method considers Defra's advice on long term trends (LTT) related to roadside NO_2 concentrations which suggests that there is a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends.

5.4.24 The methodology, known as 'Gap Analysis', involves the application of adjustment factors which take into consideration the assumed roadside rates of reduction in NO_x and NO_2 by Defra's modelling tools compared to observed roadside monitoring trend i.e. the gap between the predicted reductions and those observed. The adjusted results from this Gap Analysis have been presented here using the LTT_{E6} projection. These results are considered to present a realistic worst-case scenario, as only a portion of the full anticipated improvements in air quality by Defra guidance are assumed to occur in the Gap Analysis results by the future opening year.

5.4.25 Results have been presented in tabular format showing air quality concentrations at discrete representative sensitive receptors, together with interpretative text. Concentration values have been reported to no more than one decimal place.

Traffic Data

5.4.26 Traffic data have been provided for the following scenarios:

- 2018 Baseline – existing situation;
- 2024 DM – future base without the Proposed Development traffic and future committed developments; and
- 2024 DS – future base with the Proposed Development traffic and future committed developments.

Road Modelling and Vehicle Emissions Factors

5.4.27 This operational phase local air quality assessment has used the latest version dispersion modelling software 'ADMS-Roads' version 5.0.0.1. 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. Details of general model conditions set up in ADMS-Roads are provided in *ES Volume II, Appendix 5-A*.

5.4.28 Predicted results from an air quality dispersion model may differ from measured concentrations for a number of reasons, including uncertainties associated with traffic flows and emissions factors,

meteorology and limitations inherent to the modelling software. In light of this, and in accordance with advice in LAQM.TG(16) for roads-based air quality assessments it is best-practice to perform a comparison of modelled results with local monitoring data to minimise these modelling uncertainties. This provides a verification factor, by which the output of the ADMS-Roads model is adjusted, to gain greater confidence in the final results. The verification of the modelling output was carried out as prescribed in Chapter 7 of LAQM.TG(16) and presented in *ES Volume II Appendix 5-A* and is summarised below.

5.4.29 Existing NO_2 monitoring data from six WODC monitoring sites (site codes; NAS1, NAS2, NAS3, NAS5, NAS6 and NAS7) as well as seven sites form scheme specific monitoring were used in the model verification for the baseline year of 2018.

5.4.30 The ARN was divided into two zones, with the verification factors as below:

- WODC diffusion tubes provided an adjustment factor of 1.18 with an uncertainty value; root mean square error (RMSE) of 5.7 µg/m^3. This was used to adjust road links within Witney; and
- AECOM diffusion tubes provided an adjustment factor of 2.03 with an RMSE of 4.6 µg/m^3, which was applied to the remainder of the road network.

Sensitivity of receptor

5.4.31 There are two types of receptors that are considered in the local operational air quality assessment:

- Public Exposure Receptors - these are sensitive locations where relevant exposure for the air quality criteria being assessed could occur, e.g. residential properties or schools. These locations are defined by LAQM.TG(16); and
- Designated ecological habitats such as Sites of Special Scientific Interest (SSSIs) , Special Areas of Conservation (SACs) , Special Protection Areas (SPAs) and sites listed under the Convention on Wetlands and Wildfowl (Ramsar), Local Nature Reserves (LNRs), Local Wildlife Sites (LWS), Nature Improvement Areas, ancient woodland and veteran trees.

5.4.32 The AQS objectives (as set out in the Air Quality Standards Regulations 2010) have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered when setting the objectives and therefore no additional subdivision of public exposure receptors on the basis of building or location type is necessary.

Public Exposure Receptors

5.4.33 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 Proposed Development are expected to be greatest. Model predictions are made at 1.5m height to be representative of public exposure.

5.4.34 Receptor locations were identified using Ordnance Survey Mastermap (Ref 5-26), Ordnance Survey Addressbase Plus (Ref 5-27), and Google Earth (Ref 5-28) mapping and imagery.

5.4.35 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 that 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 *ES Volume II, Appendix 5-A*.

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

- Adjustment factors derived via model were applied to bring modelled concentrations into line with monitored concentrations.
- Road contribution NO_X concentrations as outputted by ADMS-Roads were converted to NO_2 concentrations using Defra's NO_X to NO_2 Calculator (Ref 5-29) for comparison against the air quality objectives for NO_2.

- 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 concentrations.

5.4.37 The modelled annual average pollutant concentrations are presented in *ES Volume II, Appendix 5-B*. These were compared against the relevant objective values to identify any predicted exceedances.

5.4.38 Where a receptor is predicted to experience concentrations of NO_2 below the objective values in both the DM and the DS scenario, it does not inform the judgement of significance.

5.4.39 Where annual mean concentrations of NO_2 at receptors are predicted to exceed the annual mean objective of 40 µg/m^3 in the DM and/or DS scenario, magnitude of change descriptors are applied in line with *DMRB LA 105 Air quality* as shown below.

- **Large** – where the change in concentration of NO_2 between DM and DS is greater than 4.0 µg/m^3 (>10% of the objective).
- **Medium** – where the change in concentration of NO_2 between DM and DS is greater than 2.0 µg/m^3 but less than or equal to 4.0 µg/m^3 (5-10% of the objective); or
- **Small** – where the change in concentration of NO_2 between DM and DS is greater than 0.4 µg/m^3 but less than or equal to 2.0 µg/m^3 (1-5% of the objective);
- **Imperceptible** – where the change in concentration of NO_2 between DM and DS is less than or equal to 0.4 µg/m^3 (≤1% of the objective).

5.4.40 Receptors can reside within more than one magnitude of change category e.g. a receptor with a greater than 4 µg/m^3 change also resides within the medium and small categories to ensure the aggregated number of properties are compared to the guideline bands.

5.4.41 Where necessary, the number of receptors assigned to 'small', 'medium' and 'large' change descriptors has been determined, for both a worsening and an improvement in air quality. This is illustrated in Table 5-5 which 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. 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.

5.4.42 As set out in *DMRB LA 105 Air quality*, annual mean PM_{10} concentrations are presented for the base year to demonstrate that pollutant concentrations are well below the objective value and therefore there is no risk of exceedance of these thresholds due to the Proposed Development.

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

Magnitude of change in annual mean NO_2 (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

5.4.43 Where the total number of receptors falls within the guideline bands above in any of the magnitude categories (Large, Medium or Small), the following criteria is considered to inform the judgement of significance:

- the absolute concentration at each receptor i.e. is the modelled concentration greater than 40 µg/m^3 or 60 µg/m^3;

- how many receptors are there in each of the magnitude of change criteria i.e. does the project create more worsening than improvements; and
- the magnitude of change in concentration at each receptor e.g. a modelled change in concentration of 1.8 µg/m^3 would carry more weight than a change of 0.6 µg/m^3 despite both falling within the 'small' magnitude of change category.

Designated ecological sites

5.4.44 As well as impacts on public exposure, some air pollutants also have an effect on vegetation. Concentrations of pollutants in air and deposition of particles can damage vegetation directly or affect plant health and productivity. Deposition of pollutants to the ground and vegetation can alter the characteristics of the soil, affecting the pH and nitrogen availability that can then affect plant health, productivity and species composition.

5.4.45 Internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as designated sites) have been considered in the operational phase assessment.

5.4.46 The pollutant of most concern for sensitive vegetation near roads is NO_X with a set level of 30 µg/m^3 (annual mean) forming the critical load for designated ecological sites. Furthermore, critical loads for the deposition of Nitrogen (N) representing the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem have been established for certain habitats. The critical loads are expressed in deposition units of kg N ha/year.

5.4.47 At each designated site, annual mean NO_X concentrations were predicted along a transect, at 10m intervals up to 200m from the ARN. For each point along the transect, the road NOx concentrations have been predicted for the baseline year, DM and DS in the opening year. The road NO_x concentration is converted to road NO_2 concentrations and then converted to dry nutrient N deposition rate (kg N/ha/yr) using conversion rates outlined in the *DMRB LA 105*. The habitat of each ecological receptor was identified using APIS and Multi-Agency Geographic Information for the Countryside (MAGIC) (Ref 5-30). The road N deposition rate is added to background N deposition rates derived from APIS to determine total N deposition rates. These rates have then been compared to the critical loads for each designated site.

5.4.48 The process for assessing the significance of air quality effects at designated ecological sites from *DMRB LA 105 Air quality* 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 *Chapter 6: Biodiversity*.

Compliance risk assessment

5.4.49 A compliance risk assessment was carried out in accordance with *DMRB LA 105 Air quality* to evaluate the effect of the Proposed Development on the UK's ability to comply with the Air Quality Directive.

5.4.50 All road links which are part of the Defra 2018 pollution climate mapping (PCM) model (Ref 5-31) and within the ARN were identified. Receptors were chosen alongside the links in question in the following locations:

- at 'qualifying features' at worst-case exposure within 15m of the running lanes of a road/kerbside (but not within 25m of a junction), for example footpaths that run parallel to the road; and
- at 'validation points' 4m from the road edge at a height of 2m, for comparison with PCM modelled concentrations.

5.4.51 The concentrations of NO_2 at these points were modelled in the same manner as for public exposure receptors with the exception that Highways England LTT_{E6} projection factors are not applied to the modelled concentrations. This is to ensure the compliance risk assessment is consistent with Defra's reporting on compliance with the EU Limit Values.

5.4.52 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 the opening year, 2024. Where there are significant differences between the two (i.e. greater than 10%) then the model is reviewed to ensure that the outputs of the project traffic and air quality modelling are robust.

5.4.53 *DMRB LA 105 Air quality* 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 in the shortest timescale possible where:

- there are no modelled exceedances of the air quality thresholds for any PCM link; or
- there are modelled exceedances of the air quality thresholds for any PCM link, but the change in annual mean NO_2 concentrations between the DM and DS is less than or equal to +/-0.4 $\mu g/m^3$.

5.4.54 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

5.4.55 The overall significance of the Proposed Development with respect to air quality is determined for the construction phase and the operation phase.

5.4.56 In each case, the assessment of significance is informed by:

- the effects on human health (as determined by the significance of the local air quality assessment for public exposure receptors);
- the effects on designated habitats (as determined by the significance of the local air quality assessment for designated ecological sites); and
- the outcomes of the compliance risk assessment.

Limitations and assumptions

5.4.57 The following limitations and assumptions are relevant to the air quality assessment:

- Model verification has been carried out to minimise, where possible, uncertainties in the modelling and adjustment of the model output has been undertaken to account for local factors unable to be represented in the modelling.
- The air quality modelling uses a traffic dataset consisting of the most likely forecast traffic flows. Uncertainty associated with traffic data has been minimised by using validated traffic models.
- The traffic model assumes that the A40 Smart Corridor (the HIF2 Project) is a committed development. The impacts of this Proposed Development are included in both the DM and the DS scenarios.
- The use of the latest version of the Defra background concentrations and tools available when the assessment was undertaken has also minimised the uncertainty associated with the air quality predictions presented.
- Uncertainties associated with vehicle emissions data have been minimised by using the speed-band emission factors described within *DMRB LA 105 Air quality*, which is based on version 10.1 of Defra's Emissions Factors Toolkit (EFT). Speed bands are assigned on a link by link basis as informed by the pivoted speeds provided by the project traffic consultant.
- The forecasting method used to predict future NO_2 concentrations is the gap analysis methodology as described in *DMRB LA 105 Air quality*. The gap analysis is the application of adjustment factors that take into consideration the assumed roadside rates of reduction in NO_X and NO_2 by Defra's modelling tools compared to observed roadside trends. This prediction methodology is more conservative than the projections used by Defra.
- The construction air quality assessment is based on the construction information that is currently available. As with all construction air quality assessments, the exact details of construction activities will not be known before a specific contractor is appointed to complete the works. Once appointed, the contractor would determine their exact construction methods and programme during the detailed design stage.

5.5 Study area

5.5.1 The study area for the air quality assessment has been determined and finalised by the traffic and air quality competent experts.

5.5.2 In line with the general approaches within *DMRB LA 105 Air quality*, the study area for the operational phase local air quality assessment focuses on 200m either side of road carriageway centrelines of the local air quality ARN. This is because the effect of pollutants from road traffic reduces with distance from the point of release, and beyond 200m these pollutants are likely to have reduced to a concentration equivalent to background concentrations.

5.5.3 For the construction dust assessment, all sensitive receptors (human and designated habitats) within 0 – 50m, 50 – 100m and 100 – 200m of all construction activity within the Proposed Development boundary has been identified on a constraints plan (refer to Figure 5-3) in line with the general approaches outlined within *DMRB LA 105 Air quality*.

5.6 Baseline conditions

5.6.1 The air quality baseline informs the air quality assessment by gathering information including local monitoring data, local air quality management reports, PCM model data and Defra background concentrations (Ref 5-32) as outlined in *DMRB LA 105 Air quality* (Ref 5-21). The air quality baseline is presented below for the Proposed Development as a whole.

5.6.2 Baseline air quality monitoring data for close to the Proposed Development have been gathered from the following sources:

- WODC 2020 Annual Status Report (ASR) (for 2016 to 2020 monitoring information) (Ref 5-33); and
- AECOM monitoring in 2017/2018 for verification and 2021 for recent context.

5.6.3 The Witney AQMA (Ref 5-33) is approximately 1.6km northwest of the Proposed Development. This was declared by WODC in 2005 for exceedances of the AQS objective for annual mean NO_2 concentrations.

5.6.4 Annual mean background concentrations for the local operational air quality assessment study area have been obtained from Defra modelled background data based from 1km x 1km grid squares. The background concentrations are used in local modelling assessments to represent sources not explicitly modelled. The baseline traffic data for the Proposed Development is for 2018 and to align with this the baseline, background pollutant concentrations have been taken for 2018. Background concentrations for the opening year of 2024 were used for the Proposed Development modelling (Ref 5-32).

5.6.5 Table 5-6 shows that the background concentrations for the area around the Proposed Development for 2018 and 2024 are well below the relevant annual AQS objectives.

Table 5-6 Gridded background concentrations, 2018 and 2024

Local Authority	Grid Square (X, Y)	2018			2024		
		NO_x (µg/m³)	**NO_2 (µg/m³)**	PM_{10} (µg/m³)	**NO_x (µg/m³)**	**NO_2 (µg/m³)**	PM_{10} (µg/m³)
WODC	441500, 214500	10.4	8.0	14.2	8.3	6.5	13.0
WODC	442500, 214500	10.6	8.2	14.8	8.5	6.7	13.6
WODC	443500, 214500	11.9	9.1	15.1	9.8	7.6	13.8
WODC	439500, 213500	9.8	7.6	13.6	7.8	6.2	12.5
WODC	440500, 213500	10.1	7.8	14.2	8.1	6.3	13.1
WODC	441500, 213500	10.4	8.0	14.5	8.4	6.6	13.3
WODC	443500, 213500	10.6	8.2	14.6	8.5	6.7	13.5
WODC	438500, 212500	10.0	7.7	14.1	8.0	6.3	12.9
WODC	439500, 212500	10.0	7.7	13.9	8.0	6.3	12.7
WODC	441500, 212500	10.3	8.0	14.1	8.3	6.5	12.9
WODC	443500, 212500	10.5	8.1	14.7	8.4	6.6	13.5

Local Authority	Grid Square (X, Y)	2018			2024		
		NO_x (µg/m³)	**NO_2 (µg/m³)**	PM_{10} (µg/m³)	**NO_x (µg/m³)**	**NO_2 (µg/m³)**	PM_{10} (µg/m³)
WODC	437500, 211500	10.0	7.8	15.1	8.0	6.3	13.9
WODC	441500, 211500	10.3	8.0	14.7	8.3	6.5	13.6
WODC	443500, 211500	10.8	8.3	14.3	8.6	6.8	13.1
WODC	433500, 210500	13.3	10.1	15.5	10.8	8.3	14.3
WODC	434500, 210500	10.8	8.3	15.0	8.7	6.8	13.8
WODC	435500, 210500	11.6	8.9	15.1	9.4	7.3	13.8
WODC	436500, 210500	11.6	8.9	15.0	9.3	7.3	13.8
WODC	437500, 210500	11.0	8.5	15.5	8.8	6.9	14.3
WODC	439500, 210500	10.2	7.9	15.7	8.0	6.3	14.5
WODC	440500, 210500	10.3	8.0	15.7	8.2	6.4	14.6
WODC	442500, 210500	10.8	8.3	14.3	8.6	6.8	13.1
WODC	443500, 210500	11.3	8.7	15.3	9.0	7.0	14.1
WODC	445500, 210500	13.1	10.0	14.9	10.6	8.2	13.7
WODC	432500, 209500	9.9	7.7	14.5	7.9	6.3	13.3
WODC	433500, 209500	10.4	8.1	14.7	8.4	6.6	13.6
WODC	435500, 209500	12.5	9.6	14.9	10.1	7.8	13.6
WODC	436500, 209500	11.7	9.0	14.8	9.4	7.3	13.6
WODC	437500, 209500	10.8	8.3	15.1	8.5	6.7	13.9
WODC	442500, 209500	11.4	8.8	15.1	9.2	7.2	13.9
WODC	443500, 209500	12.9	9.8	15.0	10.4	8.0	13.8
WODC	434500, 208500	11.3	8.7	15.1	9.2	7.2	13.9
WODC	435500, 208500	12.1	9.2	15.4	9.6	7.5	14.3
WODC	436500, 208500	10.9	8.4	16.0	8.7	6.8	14.8
WODC	435500, 207500	10.5	8.1	14.9	8.4	6.6	13.8
Objective Value		**n/a**	**40**	**40**	**n/a**	**40**	**40**

5.6.6 During 2019 and 2020, WODC had no automatic monitoring locations but had 27 NO_2 passive diffusion tube locations in 2019. Over the last five to six years, measured annual mean concentrations across the authority have had a general overall decreasing trend despite fluctuations between years.

5.6.7 The closest local authority automatic monitoring station is around 14km from the modelled road network. There is therefore no PM_{10} monitoring data available within the air quality study area. There are nine NO_2 diffusion tube locations within 200m of the Proposed Development.

5.6.8 Recent NO_2 concentrations at these sites are shown in Table 5-7. Of these sites, in recent years, NAS1, 2 and 3 exceeded the AQS annual mean objective of 40µg/m³ in 2018. Whilst in 2019 only NAS1 and 3 were in exceedance of the AQS annual mean objective. All of these monitoring locations are located in the Witney AQMA. There were no exceedances in 2020 due to a reduction in road traffic flows during the Covid-19 pandemic.

Table 5-7 Annual mean NO_2 concentrations from selected local authority monitoring sites within 3km of the Proposed Development

Local Authority	Site ID	Grid Reference (X,Y)	Monitor Type	Site Type	2020 Data Capture (%)	Annual mean NO_2 concentration (µg/m³)				
						2016	**2017**	**2018**	**2019**	**2020**
WODC	NAS1	435860, 210285	DT	Roadside	92.0	**55.7**	**49.9**	**48.2**	**44.8**	36.8
WODC	NAS2	435821, 210243	DT	Roadside	92.0	-	**40.6**	**40.5**	37.1	27.5
WODC	NAS3	435849, 210280	DT	Roadside	92.0	**51.5**	**43.9**	**41.8**	**41.9**	32.2

Local Authority	Site ID	Grid Reference (X,Y)	Monitor Type	Site Type	2020 Data Capture (%)	Annual mean NO_2 concentration (µg/m^3)				
						2016	2017	2018	2019	2020
WODC	NAS4	435682, 210195	DT	Roadside	92.0	33.8	34.4	31.9	33.9	26.2
WODC	NAS5	435897, 210324	DT	Roadside	92.0	-	33.9	35.5	33.1	25.9
WODC	NAS6	435940, 210351	DT	Roadside	92.0	-	33.9	34.4	35.5	26.6
WODC	NAS7	435946, 210326	DT	Roadside	92.0	-	35.8	34.5	34.3	27.0
WODC	NAS8	439304, 210260	DT	Roadside	84.3	-	-	-	31.4	23.9
WODC	NAS9	440082, 210435	DT	Roadside	92.0	-	-	-	18.7	14.9

Note 1: Numbers in bold exceed the annual mean AQS objective of 40µg/m^3. Note 2: "DT" = diffusion tube, "-" = not measured.

5.6.9 To supplement the local authority monitoring sites, previous scheme-specific monitoring conducted for the Eynsham Park & Ride and Bus Lane Scheme during 2017-2018 was used in the assessment as this includes sites on the A40 itself as well as one site (DT4) selected to provide local background data. The locations and concentrations for these tubes, annualised and bias adjusted for 2017 and 2018, are given in Table 5-8. Site DT6, which exceeded the AQS annual mean objective of 40µg/m3 in 2017, is within the Oxford City AQMA.

Table 5-8: Annual mean NO_2 concentrations from AECOM site specific diffusion tube sites, 2017-2018

Site ID	Grid Reference (X, Y)	NO_2 Annual Mean Concentration 2017 (µg/m^3)	NO_2 Annual Mean Concentration 2018 (µg/m^3)
DT1	440826, 210392	30.9	29.3
DT2	442390, 210018	20.5	19.4
DT3	443311, 209997	15.2	14.4
DT4	443524, 209633	11.6	11.0
DT5	445069, 210385	23.2	22.0
DT6	449259, 210340	**40.2**	38.1

Note1: Numbers in bold exceed the annual mean AQS objective of 40µg/m^3. Note 2: 2017 data bias adjustment factor of 0.88 and annualisation factor of 1.1. 2018 data bias adjustment factor of 0.88 and annualisation factor of 1.05. Automatic monitors used were: Oxford St Ebbes, Reading New Town and London Hillingdon.

5.6.10 In addition, a monitoring survey was carried out by AECOM from March 2021 to September 2021 to provide supplementary information to inform the assessment and provide an indication of the current baseline conditions. This data was not collected specifically for verification given the difference in years between the traffic baseline of 2018 and the present year of 2021. The location and initial adjusted annual mean concentrations to 2020 at these tubes are shown in Table 5-9.

Table 5-9 AECOM site specific diffusion tube site survey, 2021

Site ID	Grid Reference (X, Y)	Location	Type	NO_2 Annual Mean Concentration adjusted to 2020 (µg/m^3)
AW1	437534, 209534	Shores Green	Roadside	20.2
AW2	436609, 209277	1 Hollis Close	Roadside	14.9
AW3	436834, 209967	83 Jubilee Way	Roadside	18.3
AW4	436367, 208719	A40 Westbound Layby	Roadside	**42.9**
AW5	436994, 209043	A40 Eastbound Layby	Roadside	29.9

AW6	437679, 209054	High Cogges	Background	7.5

Note1. 6 month survey (March -September 2021) annualised and bias adjusted to 2020 annual mean. Note 2 Numbers in bold exceed the annual mean AQS objective of 40µg/m^3.

5.6.11 The diffusion tube monitoring locations from both AECOM and the local authority networks close to the Proposed Development are indicated in Figure 5-1. The figure also indicates relevant AQMAs and PCM links.

5.6.12 Compliance risks have been considered in accordance with *DMRB LA 105 Air quality* to establish whether the Proposed Development would influence the UK's ability to comply with the Air Quality Directive.

5.6.13 There are a number of road links in the Defra's PCM network that are located within the ARN, including roads on the outskirts of Oxford and within and close to Witney. All PCM links are already expected to have annual mean NO_2 concentrations that comply with the EU Limit Value (see Table 5-10). It is noted that the PCM links are for NO_2 only.

Table 5-10 Summary of PCM modelled NO_2 concentrations in the base year and opening year

PCM Link Census ID	Road Name	Annual Mean NO_2 Concentrations (µg/m^3) in 2018	Annual Mean NO_2 Concentrations (µg/m^3) in 2024
802007878	Ducklington Lane	18.9	13.7
802017037	A4095	13.4	9.9
802077524	A415	20.3	14.5

Summary of sensitive receptors

Public exposure receptors

5.6.14 There are residential properties located in close proximity to the Proposed Development and surrounding road network which could be affected by changes in air quality in and around Witney and along the A40, as well as local schools and a care home.

5.6.15 The air quality assessment considered a total of 55 selected public exposure receptors which included existing residential properties and schools. These locations are shown in Figure 5-2 and in *ES Volume II, Appendix 5-B* and provided in Table 5-11.

Table 5-11 Designated public exposure receptors within the operational phase local air quality study area

ID	X	Y	Class Type	Name	Local Authority
R1	442727	209931	Residential	142 Spareacre Lane, Eynhsam	WODC
R2	442378	210145	Residential	Evenlode Farm, Freeland Road, Eynsham	WODC
R3	440835	210440	Residential	Barnard Gate Farm, Barnard Gate	WODC
R4	439258	210269	Residential	Whitehouse Cottage, Main Road, Barnard Gate	WODC
R5	443515	210045	Residential	Wytham View, Eynsham	WODC
R6	441601	214187	Residential	3A Witney Road, Witney	WODC
R7	434862	208691	Education	Little Treasures Academy, Witney	WODC
R8	442639	214303	Residential	131A Main Road, Long Hanborough	WODC
R9	442084	214088	Education	Hanborough Manor CE School, Long Hanborough	WODC
R10	436699	208958	Residential	3 Eton Close, Witney	WODC

ID	X	Y	Class Type	Name	Local Authority
R11	435809	210252	Residential	7 Bridge Street, Witney	WODC
R12	436160	210223	Residential	Newland House Residential Care Home, Witney	WODC
R13	437283	210458	Residential	23 Larkspur Grove, Witney	WODC
R14	441939	213762	Residential	79 Church Road, Long Hanborough	WODC
R15	435843	210291	Residential	21 Bridge Street, Witney	WODC
R16	435840	210270	Residential	18 Bridge Street, Witney	WODC
R17	441075	213319	Residential	85 Wroslyn Road, Freeland	WODC
R18	435233	208000	Residential	2 Beanhill Close, Ducklington	WODC
R19	443454	211867	Residential	New Barn Farm, Eynsham	WODC
R20	443362	210590	Residential	New Wintles Farm, Eynsham	WODC
R21	443556	214371	Residential	Hanborough Lodge, Long Hanborough	WODC
R22	438735	212399	Residential	Belclose Cottage, North Leigh	WODC
R23	439185	212776	Residential	12 A Ladywell Close, North Leigh	WODC
R24	435191	208901	Residential	31 Mallard Drive, Witney	WODC
R25	441400	211369	Residential	Willow Dene, Eynhsam Road, Witney	WODC
R26	437231	209684	Residential	Clements Field Farm, Oxford Hill, Witney	WODC
R27	436860	210037	Residential	43 Larch Lane, Witney	WODC
R28	436529	209900	Residential	Oxford Hill, Witney	WODC
R29	437309	210714	Residential	42 Cheery Tree Way, Witney	WODC
R30	435933	209364	Residential	8 St Mary's Mead, Witney	WODC
R31	437717	209365	Residential	Ladymead Cottage, High Cogges	WODC
R32	437543	209598	Residential	The Paddock, Oxford Hill, Shores Green	WODC
R33	437521	209640	Residential	Oxford Hill, Shores Green	WODC
R34	437569	209661	Residential	Wuthering Heights, Oxford Hill, Shores Green	WODC
R35	435855	209961	Residential	Waine Rush View, Witney	WODC
R36	437893	211658	Residential	Yonder Wood, North Leigh	WODC
R37	435222	210276	Residential	Burford Road, Witney	WODC
R38	436872	209823	Residential	Constables Close, Oxford Hill, Witney	WODC
R39	435573	210261	Residential	16 Riverside Gardens, Witney	WODC
R40	435006	208860	Residential	158 Colwell Drive, Witney	WODC
R41	437161	211037	Residential	8 Madley Brook Lane, Witney	WODC

ID	X	Y	Class Type	Name	Local Authority
R42	440506	213744	Residential	Kiln Cottage, Witney Road, Freeland	WODC
R43	434808	210290	Residential	39 Burford Road, Witney	WODC
R44	434238	210290	Residential	117 Burford Road, Witney	WODC
R45	433564	210433	Residential	Flat, West Witney Sports and Social Club	WODC
R46	441871	211090	Residential	Cuckoo Wood Farm, Eynsham Road, Witney	WODC
R47	439921	213467	Residential	Goreslands Hall, Boddington Lane, North Leigh	WODC
R48	443355	212737	Residential	College Road, Church Hanborough, Witney	WODC
R49	441472	212633	Residential	176 Wrosyln Road, Freeland, Witney	WODC
R50	435808	209581	Residential	98 Langdale Gate, Witney	WODC
R51	434224	208786	Residential	493 Thorney Leys, Witney	WODC
R52	433334	209070	Residential	12 Mott Close, Witney	WODC
R53	432578	209139	Residential	Peashell Farm Cottage, Downs Road, Witney	WODC
R54	435554	207543	Residential	5 Lovell Close, Ducklington	WODC
R55	435430	208573	Residential	15 Lakeside, Ducklington Lane	WODC

5.6.16 To make a judgement of significant effects, modelling was conducted at 63 additional public exposure receptors within the Witney AQMA, namely within the High Street, Bridge Street and some receptors on surrounding roads: Newland, Woodgreen, B4022 and Mill Street.

5.6.17 These locations are shown in Figure 5-2 in *ES Volume II, Appendix 5-B* and details are provided in Table 5-12 below.

Table 5-12 Additional Witney AQMA public exposure receptors

ID	X	Y	Class Type	Street Canyon?	Local Authority
W1	435738	210189	Residential	N	WODC
W2	435755	210086	Residential	N	WODC
W3	435809	210252	Residential	Y	WODC
W4	435818	210264	Residential	Y	WODC
W5	435726	210067	Residential	N	WODC
W6	435738	210087	Residential	N	WODC
W7	435862	210311	Residential	Y	WODC
W8	435841	210272	Residential	Y	WODC
W9	435838	210268	Residential	Y	WODC
W10	435865	210298	Residential	Y	WODC
W11	435866	210314	Residential	Y	WODC
W12	435826	210274	Residential	Y	WODC
W13	435847	210278	Residential	Y	WODC
W14	435851	210283	Residential	Y	WODC

ID	X	Y	Class Type	Street Canyon?	Local Authority
W15	435971	210383	Residential	N	WODC
W16	435739	210180	Residential	N	WODC
W17	435747	210125	Residential	N	WODC
W18	435737	210078	Residential	N	WODC
W19	435850	210299	Residential	N	WODC
W20	435742	210166	Residential	Y	WODC
W21	435821	210243	Residential	Y	WODC
W22	435792	210209	Residential	Y	WODC
W23	435908	210332	Residential	Y	WODC
W24	435871	210318	Residential	Y	WODC
W25	435939	210361	Residential	N	WODC
W26	435722	210059	Residential	N	WODC
W27	435747	210118	Residential	N	WODC
W28	435882	210313	Residential	Y	WODC
W29	435815	210236	Residential	Y	WODC
W30	435900	210368	Residential	N	WODC
W31	435859	210292	Residential	Y	WODC
W32	435717	210049	Residential	N	WODC
W33	435855	210287	Residential	Y	WODC
W34	435843	210291	Residential	Y	WODC
W35	435853	210303	Residential	Y	WODC
W36	435911	210369	Residential	N	WODC
W37	435835	210282	Residential	Y	WODC
W38	435962	210344	Residential	N	WODC
W39	435830	210278	Residential	Y	WODC
W40	435783	210199	Residential	Y	WODC
W41	435763	210159	Residential	N	WODC
W42	435805	210247	Residential	Y	WODC
W43	435757	210092	Residential	N	WODC
W44	435737	210083	Residential	N	WODC
W45	435835	210264	Residential	Y	WODC
W46	435813	210257	Residential	Y	WODC
W47	435921	210356	Residential	N	WODC
W48	435949	210331	Residential	N	WODC
W49	435857	210307	Residential	Y	WODC
W50	435732	210038	Residential	N	WODC
W51	435717	210049	Residential	N	WODC
W52	435788	210227	Residential	Y	WODC
W53	435759	210096	Residential	N	WODC
W54	435870	210317	Residential	Y	WODC
W55	435804	210222	Residential	Y	WODC
W56	435955	210361	Residential	N	WODC

ID	X	Y	Class Type	Street Canyon?	Local Authority
W57	435796	210236	Residential	Y	WODC
W58	435753	210078	Residential	N	WODC
W59	435827	210253	Residential	Y	WODC
W60	435959	210347	Residential	N	WODC
W61	435880	210324	Residential	Y	WODC
W62	435980	210388	Residential	N	WODC
W63	435984	210392	Residential	N	WODC

Ecological receptors

5.6.18 There are three ancient woodlands and seven locally designated sites located within 200m of the ARN, as well as ancient and veteran trees. One of the locally designated sites additionally holds a national designation. In total 10 locally designated ecological sites and two trees were assessed, as shown in Figure 5-2 in *ES Volume II, Appendix 5-B* and in Table 5-13.

5.6.19 The authors of the biodiversity assessment confirmed that all these sites are sensitive to nitrogen deposition and therefore were considered in the operational phase local air quality assessment.

Table 5-13 Designated ecological sites within the operational phase local air quality study area

Site ID	Site Name	Designation	Critical load (kg N/ha/yr)	Background Nitrogen deposition (kg N/ha/yr)	Deposition conversion rate (kg N/ha/yr)
T1	Pedunculate Oak	Ancient tree	15	15.59	0.29
T2	Pedunculate Oak	Ancient tree	10	28.9	0.29
E1	Eynsham Wood	LWS	10	29.54	0.29
E2	Blenheim Park	SSSI	15	29.664	0.29
E3	Pinsley Wood	AW &LWS	10	29.54	0.29
E4a	Witney Lake and Meadows	LWS	5	15.68	0.14
E4b	Witney Lake and Meadows	LWS	5	15.68	0.14
E5	Lower Windrush Valley	LWS	5	15.68	0.14
E6	Cogges Wood	AW	10	29.68	0.29
E7	Eynsham Hall Park Wychwood and Lower Evenlode	AW & LWS	10	29.68	0.29
E8	Grimes Meadow and Little Grimes	LWS	5	18.62	0.14
E9	Langel Common	LWS	5	18.62	0.14
E10	Upper Windrush	LWS	5	17.08	0.14

Note: SSSI = Site of Special Scientific Interest; AW = Ancient Woodland; LWS = Local Wildlife Site

5.7 Environmental design and management

Proposed Development design

5.7.1 Environmental considerations have been accounted for during the development of the Proposed Development, to avoid and reduce potential impacts upon nearby sensitive receptors.

5.7.2 No specific air quality mitigation measures have been incorporated into the design. However, the design aims to maintain or increase the distances between properties and traffic, where possible, thus reducing the risks of air quality impacts.

Construction

5.7.3 The Proposed Development would be subject to measures and procedures as defined within the CEMP. These would include a range of Best Practicable Means (BPM) associated with mitigating potential environmental impacts. The measures detailed within the CEMP would be developed by the selected construction contractor and would be implemented for the duration of the construction phase.

5.7.4 The CEMP would include a range of industry standard good practice construction phase dust mitigation measures required during all works undertaken based on the level of construction dust risk at sensitive receptors.

Operation

5.7.5 There are no specific enhancement or mitigation measures proposed for air quality during the operation of the Proposed Development.

5.8 Assessment of effects and significance

Effects during construction

5.8.1 The Proposed Development has the potential to affect air quality during construction, in the following ways:

- by increased emissions of dust during construction of the Proposed Development from dust-generating activities on site;
- by emissions associated with Non-Road Mobile Machinery (NRMM) undertaking construction works; and
- 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.

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

- movement of vehicles;
- enabling works (e.g. verge clearance);
- earthworks;
- minor demolition (e.g. concrete bases and footings);
- excavation and installation of drains and communication ducts;
- construction of retaining walls etc;
- surfacing works;
- central reserve works;
- installation of verge furniture and planting of vegetation; and
- stock piling and storage of materials.

5.8.3 As the Proposed Development comprises an improvement to a junction, the construction dust risk potential is considered to be Small.

5.8.4 There is potential for adverse effects during the construction of the Proposed Development in relation to construction dust and plant equipment (e.g. NRMM). However, any impacts on public exposure and ecological receptors related to air quality would be temporary (i.e. during the period of the construction works only).

5.8.5 There are a number of sensitive receptors located within the 200m of the site boundary. For a small scheme, sensitivity to potential dust effects is considered to be high for receptors within 0-100m of the construction activity and low for receptors located between 100m and 200m. There are four residential properties within 50m, a further four within 100m and a further 29 residential properties located within

200m of the site boundary. The sensitivity for the Proposed Development is High for properties up to 50m and Low for properties between 50-200m.

5.8.6 The potential dust effects could be suitably minimised by the application of industry standard mitigation measures and a specific dust management plan, therefore it is anticipated that construction dust would result in a not significant effect.

5.8.7 There is potential for adverse effects during construction as a result of construction traffic, predominantly from Heavy Goods Vehicle (HGV) movements. The construction compound is expected to be located off the A40 close to the B4022 and haul routes will be designated along the A40, B4022 and Southleigh Road.

Effects once the Proposed Development is complete and operational

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

- by causing changes in vehicle activity (flows, speeds and composition) as a result of the Proposed Development in proximity to air quality sensitive receptors; and
- by causing changes in the separation distances between road sources of emissions and air quality sensitive receptors.

5.8.9 The Proposed Development aims to improve access to east Witney for eastbound traffic on the A40 and to reduce journey times for residents in Cogges to reach the A40 westbound. The scheme is forecast to reduce traffic flow through Witney town centre thereby leading to benefits for air pollution (Ref 5-34).

Summary of overall effects (Pre-mitigation of the Proposed Development)

5.8.10 Predicted baseline annual mean NO_2 and PM_{10} concentrations attributable to the Proposed Development operation were made at 118 public exposure receptors. Opening year NO_2 concentrations were also predicted with and without the Proposed Development including the changes in concentrations at receptors. NO_x concentrations and nitrogen deposition rates were predicted at 10 ecological habitats (across 11 transects) and at two ancient trees.

5.8.11 A summary of the results at these selected representative public exposure receptors in key areas are provided in Table 5-14 for NO_2. A full set of results are presented at all modelled receptor locations in *ES Volume II, Appendix 5-B*. Predicted NO_2 concentrations and changes in concentration with the Proposed Development are presented in Figure 5-4 in *ES Volume II, Appendix 5-B.*

Table 5-14: Selected Results of Annual Mean NO_2 Concentrations in Main Areas

Area	Receptor ID	2018 Base NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DM NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DS NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 NO_2 Change ($\mu g/m^3$)
Witney (Bridge Street)	W10	**52.9**	**44.9**	**42.3**	-2.6
Witney (Mill Street)	W1	37.9	37.2	30.5	-6.8
Witney (High Street)	W2	**40.8**	35.6	33.8	-1.8
Witney (Woodgreen Hill)	W15	37.9	33.0	32.7	-0.4
Oxford Hill	R26	17.9	20.5	26.8	+6.3
Eynsham	R1	21.0	24.1	20.8	-3.3
Long Harborough	R6	19.3	18.8	20.2	+1.4

Area	Receptor ID	2018 Base NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DM NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DS NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 NO_2 Change ($\mu g/m^3$)
Burwell Fields	R52	20.8	19.1	19.6	+0.5
Ducklington	R18	15.8	13.8	13.9	+0.1

Note: Numbers in bold exceed the annual mean AQS objective of 40$\mu g/m^3$

5.8.12 Annual mean concentrations of PM_{10} are predicted to be below the annual mean objective at all receptors in the base year with a maximum concentration of 20.1 $\mu g/m^3$ at R4, situated close to the A40. Consequently, $PM_{2.5}$ concentrations, as a subset of the PM_{10} size fraction, will also be below the annual mean objective of 25 $\mu g/m^3$. Therefore, these pollutants did not need to be assessed further.

5.8.13 Under the DM scenario, modelled annual mean NO_2 concentrations range from 7.7 $\mu g/m^3$ to 44.2 $\mu g/m^3$, with two receptors predicted to exceed the annual mean objective (R15 and R16). R15 and R16 are on Bridge Street within the Witney AQMA.

5.8.14 Annual mean concentrations of NO_2 at the initial 55 public exposure receptors (R1-R55) are predicted to range from 7.9 $\mu g/m^3$ to 41.6 $\mu g/m^3$ under the 2024 DS scenario, with one receptor (R16) predicted to exceed the annual mean objective for NO_2.

5.8.15 A further assessment was conducted within the Witney AQMA to make a judgement of the significance of these air quality effects. Modelling was conducted at all relevant buildings within the Witney AQMA; a total of 63 additional receptors.

5.8.16 Within the Witney AQMA, annual mean NO_2 concentrations are predicted to exceed the annual mean objective at many receptors, both with and without the Proposed Development. Under the 2024 DM scenario, 23 receptors modelled within the Witney AQMA are anticipated to experience annual mean NO_2 concentrations in breach of the objective. Comparatively, under the 2024 DS scenario, the number of receptors predicted to exceed the objective decreases to 12. No receptors are expected to experience a new exceedance of the objective as a result of the Proposed Development.

5.8.17 In line with *DMRB LA 105 Air quality,* the significance of impact has been determined against the guideline bands reported in Table 5-5. There are predicted small improvements in annual mean NO_2 concentrations at two receptors and medium improvements at 21 receptors exceeding the annual mean objective and of these, concentrations at 11 receptors are predicted to no longer exceed the objective with the Proposed Development. This is a beneficial improvement in air quality, but as the total number of receptors are not greater than the upper guideline band in the medium or small magnitude categories, this does not constitute a significant effect.

5.8.18 Outside of the AQMA, there are no predicted exceedances of the annual mean NO_2 objective at any of the selected receptors. Increases in annual mean NO_2 concentrations as a result of the Proposed Development have been predicted at 31 receptors. These increases range from 0.1 $\mu g/m^3$ to 6.3 $\mu g/m^3$ (at receptor R26 which is located close to the junction with A40) with concentrations ranging from 7.9 $\mu g/m^3$ to 26.8 $\mu g/m^3$ under the 2024 DS scenario.

5.8.19 The outcome of the local air quality assessment is that no significant effects at public exposure receptors due to the Proposed Development are expected but there are medium beneficial air quality impacts within the Witney AQMA.

5.8.20 A compliance risk assessment has been undertaken for the three PCM links within the ARN. Concentrations were not predicted to exceed the EU Limit Value with or without the Proposed Development. Therefore, the results of the compliance risk assessment show that there is no reported risk to compliance.

5.8.21 Annual mean NOx concentrations are predicted to be above the annual mean value of 30 $\mu g/m^3$ at several habitats close to affected routes, and the lower nitrogen deposition critical load is exceeded at all 10 selected ecological habitats, across all transects and all scenarios. However, of these sites, improvements are predicted at the majority of the habitats. For example, there is a reduction in NO_x concentrations due to the Proposed Development at E1 (Eynsham Wood) due to a predicted reduction in traffic flow on the A40. Increases above 1% of the critical load due to the Proposed Development are only predicted at locally designated sites; E4 (Witney Lane and Meadows), E5 (Lower Windrush Valley) and E7 (Eynsham Hall Park and Wychwood and Lower Evenlode). The results of the ecosystem assessment show that the results are not significant.

5.8.22 Further information on impacts at ecological sites are provided in *Chapter 6: Biodiversity* and *ES Volume II, Appendix 6-J: Air Quality and Ecology Report*.

5.9 Mitigation and monitoring

5.9.1 Based on the assessment, this section outlines the mitigation measures proposed that are over-and-above the environmental design and management measures described previously. Where appropriate, future monitoring and/ or environmental design and management measures required to verify the predictions and/ or fine tune mitigation measures, or ensure potential effects are adequately controlled, are also outlined.

Mitigation and monitoring during construction

5.9.2 The CEMP would include a range of industry standard good practice construction phase dust mitigation measures required during all works undertaken based on the level of construction dust risk at sensitive receptors. This includes measures focused on preparing and maintaining the site such as screens, vegetating stockpiles, specifying the type of machinery used, surfacing of haul routes, wheel washing, as well as specific or additional measures within a Dust Management Plan, potentially including dust monitoring. Adoption of these mitigation measures have the potential to reduce the magnitude of impacts, so they are not significant.

5.9.3 Monitoring of particulates or dust may be required close to dusty activities during construction as part of the CEMP (to be defined in the Dust Management Plan).

Mitigation once the Proposed Development is complete and operational

5.9.1 Increases in annual mean NO_2 concentrations do not occur at receptors where there is an existing breach of the annual mean NO_2 objective, nor do any increases generate new exceedances of the annual mean NO2 objective. Based on *DMRB LA 105 Air quality*, a conclusion of no significant air quality impacts is made with the operation of the Proposed Development. Therefore, specific air quality monitoring or mitigation is not considered to be required.

5.10 Residual effects and conclusions

5.10.1 There are no residual effects resulting from the Proposed Development as summarised in Table 5-15.

Table 5-15 Air Quality Summary of Potential Effects

Description of Effect	Sensitivity of Receptor	Nature of Effect / Geographic Scale	Magnitude of Impact	Initial Classification of Effect (with embedded mitigation)	Additional Mitigation	Residual Effect Significance
Construction						
Effect of dust pollution on local residents from demolition and construction activities	High	Temporary (Short Term) and Local	High up to 50m. Low from 50-200m.	Not Significant	CEMP and Dust Management Plan	Not Significant
Complete and Operational						
Effect of operational emissions	High	Permanent and Local	Imperceptible to medium beneficial. At the 23 public exposure receptors exceeding the objective in the DM, there are small improvements at two sites, and medium improvements at 21 sites.	Not Significant	None	Not Significant

Overall summary of the residual effects of the Proposed Development

5.10.2 There are no residual effects of the Proposed Development.

Likely significant environmental effects

5.10.3 There are no likely significant environmental effects of the Proposed Development.

5.11 References

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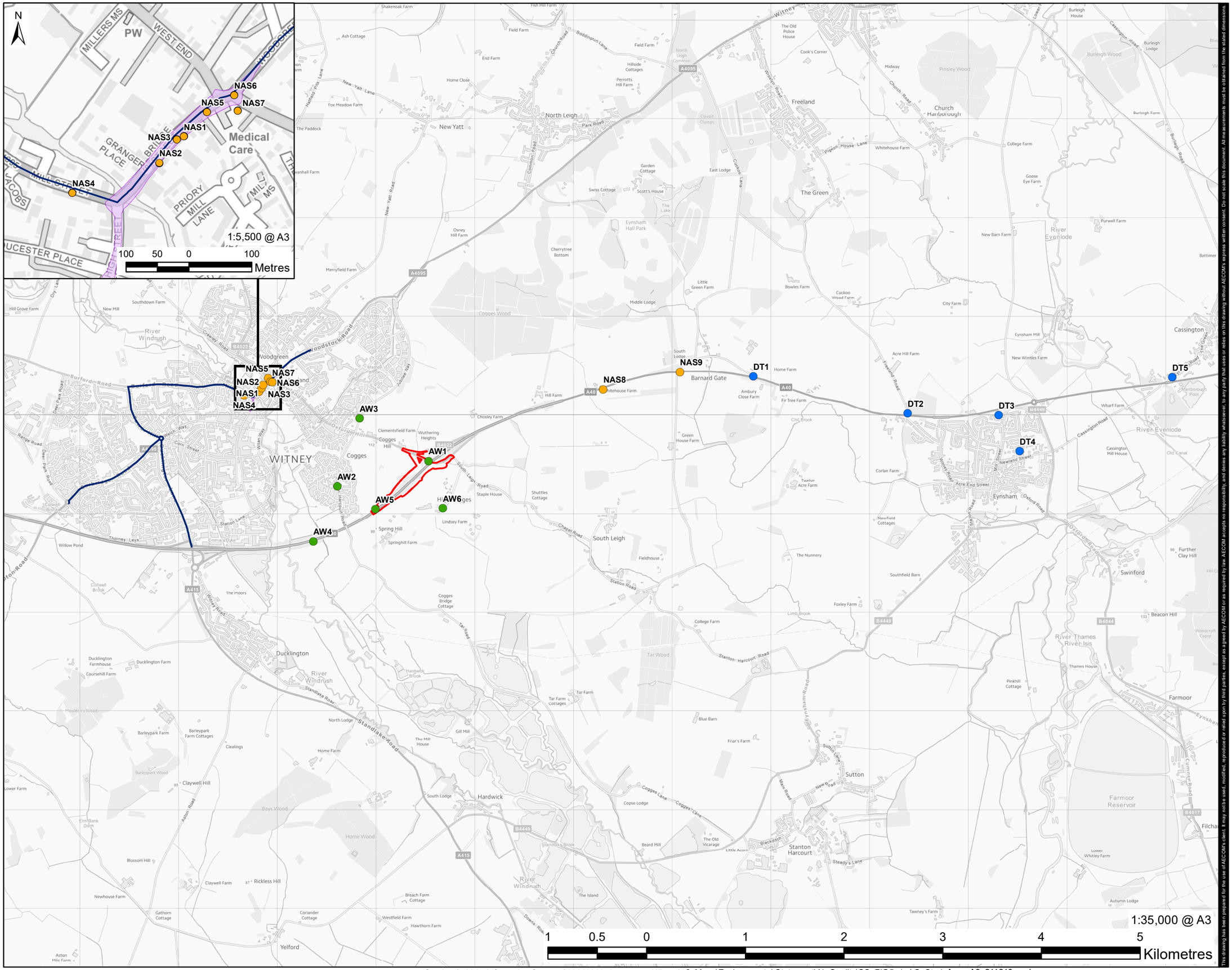
Drawn: SB Checked: JW Approved: AS Date: 24/02/2022

Revision: 01



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AECOM

PROJECT

Access to Witney

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LEGEND

- AECOM Diffusion Tube Locations 2017/2018
- AECOM Diffusion Tube Locations 2021
- Local Authority Diffusion Tube Locations
- PCM Road Network
- Air Quality Management Area (AQMA)
- Site Boundary

NOTES

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER

60611611

SHEET TITLE

Diffusion Tube Monitoring Locations

SHEET NUMBER

Figure 5-1