8 AIR QUALITY

8.1 INTRODUCTION

8.1.1 This chapter documents the assessment of the likely significant effects of the Proposed Development in terms of air quality.

8.1.2 The Proposed Development has the potential to adversely affect air quality for during both the construction phase and operational phase. The main air pollutants of concern related to construction are dust and fine particulate matter (PM_{10}), whilst for road traffic they are nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$). For habitats, the main pollutants of concern from road traffic emissions are oxides of nitrogen, with the consequential nitrogen and acid deposition. The suitability of the site for residential development has also been assessed.

8.1.3 This chapter describes: the assessment methodology; the baseline conditions at the Application Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; the likely residual effects after the mitigation measures have been employed, and the likely cumulative effects in conjunction with committed developments.

8.2 ASSESSMENT APPROACH

Methodology

Baseline Data Collection

8.2.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by Cherwell District Council (CDC). Background concentrations for the study area have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[1].

8.2.2 Existing nitrogen and acid deposition rates for habitats within the study area were determined from the Air Pollution Information System (APIS) website[2].

Construction

8.2.3 During construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.

8.2.4 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100m of sources. Intermediate particles (10-30 µm) can travel 200-500m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10 µm) are deposited slowly and may travel up to 1km; however, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

[1] Department of the Environment, Food and Rural Affairs (Defra) (2016). 2013 Based Background Maps for NO_x, NO_2, PM_{10} and $PM_{2.5}$. Available: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013.

[2] Air Pollution Information System (APIS) (2016).Available at: http://www.apis.ac.uk/

8.2.5 The Institute of Air Quality Management (IAQM)[3] has issued revised guidance on the assessment of dust from demolition and construction. The IAQM guidance recommends that the risk of dust generation is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.

8.2.6 In accordance with the IAQM 2014 guidance, the dust emission magnitude is defined as high, medium or low (**Table 8.1**) taking into account the general activity descriptors on site and professional judgement.

8.2.7 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2014 guidance (**Table 8.2**), taking into account professional judgement.

Table 8.1: Criteria for Dust Emission Magnitude

Dust Emission Magnitude	Activity
High	**Demolition** >50,000 m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000 m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000 m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100 m unpaved roads
Medium	**Demolition** 20,000 - 50,000 m^3 building demolished, dusty material (e.g. concrete) 10-20 m above ground level
	Earthworks 2,500 - 10,000 m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4 m – 8 m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000 m^3 building volume, on site concrete batching

[3] Institute of Air Quality Management (2014) Assessment of Dust from Demolition and Construction, IAQM, London

Dust Emission Magnitude	Activity
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 - 100 m unpaved roads
Low	**Demolition** <20,000 m^3 building demolished, non-dusty material, <10 m above ground level, work in winter
	Earthworks <2,500 m^2 site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved
	Construction <25,000 m^3, non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

Table 8.2: Area Sensitivity Definitions

Area Sensitivity	People and Property Receptors	Ecological Receptors
High	>100 dwellings, hospitals, schools, care homes within 50 m 10 – 100 dwellings within 20 m Museums, car parks, car showrooms within 50m PM_{10} concentrations approach or are above the daily mean objective.	National or Internationally designated site within 20 m with dust sensitive features / species present.
Medium	>100 dwellings, hospitals, schools, care homes within 100m 10 – 100 dwellings within 50 m Less than 10 dwellings within 20 m Offices/shops/parks within 20m PM_{10} concentrations below the daily mean objective.	National or Internationally designated site within 50 m with dust sensitive features / species present. Nationally designated site or particularly important plant species within 20 m
Low	>100 dwellings, hospitals, schools, care homes 100 – 350 m away 10 – 100 dwellings within 50 – 350 m Less than 10 dwellings within 20 – 350 m Playing fields, parks, farmland,	Nationally designated site or particularly important plant species 20 – 50 m. Locally designated site with dust sensitive features within 50 m.

Area Sensitivity	People and Property Receptors	Ecological Receptors
	footpaths, short term car parks, roads, shopping streets PM_{10} concentrations well below the daily mean objective.	

8.2.8 Based on the dust emission magnitude and the area sensitivity, the risk of dust impacts is then determined (**Table 8.3**), taking into account professional judgement.

Table 8.3: Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	High	**Medium**	**Low**
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

8.2.9 Based on the risk of dust impacts, appropriate mitigation is selected from the IAQM 2014 guidance using professional judgement.

Operation

8.2.10 Predictions have been carried out using the ADMS-Roads dispersion model (v3.2.4.0). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of heavy duty vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data suitable for the area of the study.

8.2.11 Existing Annual Average Daily Traffic (AADT) flows, and the proportions of Heavy Duty Vehicles (HDVs). Traffic data used in this assessment are summarised in **Appendix 8.2** in the ES.

8.2.12 Traffic data provided for the Proposed Development has been combined with 2015 emission factors and background concentrations to provide a conservative worst-case assessment. Meteorological data for 2015 from the Brize Norton monitoring station was used in the assessment, as it is considered suitable for this area.

8.2.13 Emissions were calculated using the recently released Emission Factor Toolkit (EFT) v7.0, which utilises NO_x emission factors taken from the European Environment Agency COPERT 4 (v11) emission tool. The traffic data were entered into the EFT, along with speed data to provide combined emission rates for each of the road links entered into the model.

8.2.14 Nitrogen deposition has been calculated from the predicted nitrogen dioxide concentrations using a deposition velocity of 1.5mm/s for grassland habitats.

Sensitive Locations – Human Health Receptors

8.2.15 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes, etc. When

identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links.

8.2.16 Based on the above criteria, 12 existing properties have been identified as receptors for the assessment. These locations are described in **Table 8.4** and shown in **Figure 8.1**. The locations of existing residential receptors were chosen to represent locations where impacts from road traffic related to the proposed development are likely to be the greatest, i.e. as a result of development traffic at junctions. Receptors were modelled at a height of 1.5 m representing ground floor exposure.

8.2.17 Concentrations have also been predicted at the roadside diffusion tubes located in close proximity to the Application Site, in order to verify the modelled results (see **Appendix 8.1** for further details on the verification method).

8.2.18 In addition, six receptors within the Site have been chosen as future residential receptors (PR1 – PR6), such proposed receptors were modelled at a height of 1.5m representing ground floor exposure (shown in **Figure 8.1**)

Table 8.4: Description of Receptor Locations

Receptor	Location
R1	The White House, A4260
R2	20 Bromeswell Close
R3	143 Freehold Street
R4	Cosie Cotte, Somerton Road
R5	Costwold Lodge, Orchard Lane
R6	1 Ardley Road
R7	Stonecroft, Station Road
R8	2 Jersey Cottages, Station Road
R9	Old Post Office, Heyford Road
R10	Bicester Road
R11	Ardley Road/Bicester Road jn
R12	West of Ardley Road
PR1	Proposed residential receptor close to Kirtlington Road
PR2	Proposed residential receptor close to Kirtlington Road
PR3	Proposed residential receptor close to Kirtlington Road/Camp Road
PR4	Proposed residential receptor close to Camp Road
PR5	Proposed residential receptor close to Camp Road
PR6	Proposed residential receptor close to Camp Road

Sensitive Locations – Ecological Receptors

8.2.19 The Ardley Cutting and Quarry (SSSI) is located adjacent to, and either side of the B430 Station Road north east of the Application Site.

8.2.20 Concentrations of nitrogen oxides are predicted, and deposition calculated, at a range of receptors at increasing distances from the B430 (**Figure 8.1**) in order to indicate whether or not the critical level and critical loads are being exceeded in the habitat.

8.2.21 The Critical Load Function Tool available from APIS was used to determine whether the acid deposition critical loads are exceeded.

Assessment of Significance

Construction

8.2.22 The construction impact significance criteria are based on the IAQM 2014 guidance. The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.

8.2.23 With appropriate mitigation in place, the residual effect of construction impacts on air quality is assessed as not significant.

Operation

Human Health Receptors - Significance

8.2.24 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by Environmental Protection UK and the Institute of Air Quality Management's guidance document on Planning and Development Control[4] has therefore been used.

8.2.25 The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective.

8.2.26 **Table 8.5** sets out the impact magnitude descriptors, whilst **Table 8.6** sets out the impact descriptors.

Table 8.5: Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude	Annual Mean NO_2 and PM_{10}	Annual Mean $PM_{2.5}$	Number of Days with PM_{10} >50µg/m^3
Large	> 4µg/m^3	> 2.5µg/m^3	> 4 days
Medium	2 – 4µg/m^3	1.25 – 2.5 µg/m^3	3 – 4 days
Small	0.4 – < 2µg/m^3	0.25 – < 1.25µg/m^3	1 – 2 days
Imperceptible	< 0.4µg/m^3	< 0.25µg/m^3	< 1 day

[4] Moorcroft and Barrowcliffe et al. (2015). Land-use Planning & Development Control: Planning For Air Quality. Institute of Air Quality Management, London

Table 8.6: Impact Descriptor for Changes in Concentrations at a Receptor

Absolute concentration with the development in relation to Objective/Limit Value	**Change in concentration**		
	Small	**Medium**	**Large**
Above objective/limit value (a)	Slight	Moderate	Substantial
Just below objective/limit value (b)	Slight	Moderate	Moderate
Below objective/limit value (c)	Negligible	Slight	Slight
Well below objective/limit value (d)	Negligible	Negligible	Slight

Where the Impact Magnitude is **Imperceptible**, the Impact Descriptor is **Negligible**. Where there is an increase in concentrations, the absolute concentration relates to the 'with development' air quality. Where there is a decrease in concentrations, the absolute concentration relates to the 'without development' air quality. Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
(a) Above: >40 µg/m^3 annual mean NO_2 or PM_{10}, or >25 µg/m^3 annual mean $PM_{2.5}$, or >35 days PM_{10} >50 µg/m^3
(b) Just below: 36 – 40 µg/m^3 annual mean NO_2 or PM_{10}, or 22.5 – 25 µg/m^3 annual mean $PM_{2.5}$, or 32 – 35 days PM_{10} > 50 µg/m^3
(c) Below: 30 – <36 µg/m^3 annual mean NO_2 or PM_{10}, or 18.75 – <22.5 µg/m^3 of annual mean $PM_{2.5}$, or 26 – <32 days PM_{10} > 50 µg/m^3
(d) Well below: < 30 µg/m^3 annual mean NO_2 or PM_{10}, or <18.75 µg/m^3 annual mean $PM_{2.5}$, or < 26 days PM_{10} >50 µg/m^3

8.2.27 The guidance states that the assessment of significance should be based on professional judgement, taking into account the following factors, with the overall air quality effects of the scheme described as either 'not significant', or of 'minor', 'moderate' or 'major' significance:

- Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance;
- The magnitude of the changes and the descriptions of the impacts at the receptors i.e. **Tables 8.5** and **8.6** findings;
- Whether or not an exceedance of an objective or limit value is predicted to arise in the study area where none existed before or an exceedance area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedance is removed or the exceedance area is reduced;
- Uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent to which an objective or limit value is exceeded.

Ecological Receptors – Significance

8.2.28 Where critical loads are already exceeded, an increase of more than 1% of the critical load is an indication of potentially significant effects which would trigger the need for further, more detailed assessment. It should be noted that an increase in deposition of more than 1% is not, per se, an indication that a significant effect exists, only the possibility of one. Depending on a more detailed assessment which would take account of the actual ecological conditions at the location under consideration, an increase of more than 1% may be acceptable.

Legislative and Policy Framework

The Air Quality Strategy

8.2.29 The Air Quality Strategy (2007)[5] establishes the policy framework for ambient air quality management and assessment in the UK. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.

8.2.30 Part IV of the Environment Act 1995[6] introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000[7] and the Air Quality (Amendment) (England) Regulations 2002[8].

8.2.31 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

8.2.32 The Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16))[9] issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM_{10}) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure.

EU Limit Values

8.2.33 The Air Quality Standards Regulations 2010[10] implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for nitrogen dioxide (NO_2). These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO_2 EU Limit Value was 1 January 2010, five years later than the date for the NAQO.

8.2.34 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.

[5] Department of the Environment, Transport and the Regions (DETR, 2007) in Partnership with the Welsh Office, Scottish Office and Department of the Environment for Northern Ireland (2007). The Air Quality Strategy for England, Scotland, Wales, Northern Ireland, HMSO, London

[6] Environmental Act 1995, Part IV.

[7] Statutory Instrument 2000, No 921, 'The Air Quality (England) Regulations 2000' HMSO, London.

[8] Statutory Instrument 2002, No 3034, 'The Air Quality (England) (Amendment) Regulations 2002' HMSO, London.

[9] Department of the Environment, Food and Rural Affairs (Defra) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2016). 'Local Air Quality Management Technical Guidance, LAQM.TG(16)'. HMSO, London.

[10] Statutory Instrument 2010, No. 1001, The Air Quality Standards Regulations 2010, HMSO, London

8.2.35 Despite many areas of the UK not being compliant with the annual average NO_2 limit value, the UK has decided not to seek an extension to the compliance date for this pollutant. This was on the basis that it could not be guaranteed that the UK would be compliant by the latest date allowable under the Directive (1 January 2015).

8.2.36 The Directive limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation;
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

Habitats

8.2.37 European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) requires member states to introduce a range of measures for the protection of habitats and species. The Conservation of Habitats and Species Regulations (2010) [11] transposes the Directive into law in England and Wales. The Regulations require the Secretary of State to provide the European Commission with a list of Sites which are important for the habitats or species listed in the Directive. The Commission then designates worthy Sites as Special Areas of Conservation (SACs). The Regulations also require the compilation and maintenance of a register of European Sites, to include SACs and Special Protection Areas (SPAs); with these classified under the Council Directive 2009/147/EC on the Conservation of Wild Birds. These Sites form a network termed "Natura 2000."

8.2.38 The Regulations primarily provide measures for the protection of European Sites and European Protected Species, but also require local planning authorities to encourage the management of other features that are of major importance for wild flora and fauna.

8.2.39 The Habitats Directive (as implemented by the Regulations) requires the competent authority, which in this case will be the planning authority, to firstly evaluate whether the development is likely to give rise to a significant effect on the European Site. Where this is the case, it has to carry out an 'appropriate assessment' in order to determine whether the development will adversely affect the integrity of the Site.

8.2.40 Sites of national nature and geological conservation importance may be designated as Sites of Special Scientific Interest (SSSIs). SSSIs have been re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs (in England and Wales) were introduced by the Countryside and Rights of Way (CROW) Act 2000. If a development is "likely to damage" a SSSI, the CROW act requires that a relevant conservation body (i.e. Natural England) is consulted. The CROW act also provides protection to local nature conservation Sites, which can be particularly important in providing 'stepping stones' or 'buffers' to SSSIs and European Sites. In addition, the Environment Act (1995) and the Natural Environment and Rural Communities Act (2006) both require the conservation of biodiversity.

[11] Statutory Instrument 2010, No. 490, 'The Conservation of Habitats and Species Regulations 2010' HMSO, London.

Assessment Criteria

Human Health Criteria

8.2.41 The NAQOs for NO_2 and particulate matter (PM_{10}) set out in the Air Quality Regulations (England) 2000[12] and the Air Quality (England) (Amendment) Regulations 2002[13], are shown in **Table 8.7**.

Table 8.7: Nitrogen Dioxide and PM_{10} Objectives

Pollutant	Time Period	Objective
Nitrogen dioxide (NO_2)	1-hour mean	200 µg/m^3 not to be exceeded more than 8 times a year
	Annual mean	40 µg/m^3
Particulate Matter (PM_{10})	24-hour mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40 µg/m^3
Particulate Matter ($PM_{2.5}$)	Annual mean	25 µg/m^3

8.2.42 The objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Analysis of long term monitoring data suggests that if the annual mean nitrogen dioxide concentration is less than 60µg/m^3 then the one-hour mean nitrogen dioxide objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved[14].

8.2.43 The Air Quality Strategy 2007[15] includes an exposure reduction target for smaller particles known as $PM_{2.5}$. These are an annual mean target of 25 µg/m^3 by 2020 and an average urban background exposure reduction target of 15% between 2010 and 2020.

8.2.44 The ambient air quality and cleaner air for Europe directive (2008/50/EC) was adopted in May 2008, and includes a national exposure reduction target, a target value and a limit value for $PM_{2.5}$, shown in **Table 8.8**. The UK Government transposed this new directive into national legislation in June 2010.

[12] Statutory Instrument 2000, No 921, The Air Quality (England) Regulations 2000, HMSO, London
[13] Statutory Instrument 2002, No 3034, The Air Quality (England) (Amendment) Regulations 2002, HMSO, London
[14] Defra, 2016. Local Air Quality Management Technical Guidance LAQM.TG(16).
[15] Department of the Environment, Transport and the Regions (DETR, 2007) in Partnership with the Welsh Office, Scottish Office and Department of the Environment for Northern Ireland (2007). The Air Quality Strategy for England, Scotland, Wales, Northern Ireland, HMSO, London

Table 8.8: $PM_{2.5}$ Objectives

	Time Period	Objective/Obligation	To be Achieved by
UK Objectives	Annual mean	25 µg/m^3	2020
	3 year running annual mean	15% reduction in concentrations measured at urban background sites	Between 2010 and 2020
European obligations	Annual mean	Target value of 25 µg/m^3	2010
	Annual mean	Limit value of 25 µg/m^3	2015
	Annual mean	Stage 2 indicative Limit value of 20µg/m^3	2020
	3 year Average Exposure Indicator (AEI) (a)	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
	3 year Average Exposure Indicator (AEI)	Exposure concentration obligation of 20 µg/m^3	2015

(a) The 3 year annual mean or AEI is calculated from the $PM_{2.5}$ concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

Ecological Criteria

8.2.45 Objectives for the protection of vegetation and ecosystems have been set by the UK Government and were to have been achieved by 2000. They are summarised in **Table 8.9** and are the same as the EU limit values. The objectives only strictly apply a) more than 20km from an agglomeration (about 250,000 people), and b) more than 5km from Part A industrial sources, motorways and built up areas of more than 5,000 people. However, Natural England has adopted a more precautionary approach and applies the objective to all internationally designated conservation sites and SSSIs. For the assessment of road schemes, Highways England[16] follows this approach and requires an assessment of the impacts of roads traffic emissions on conservation sites (Designated Sites) within 200 m of a road. When pollutant concentrations exceed a critical level it is considered that there is a risk of harmful effects

Table 8.9: Vegetation and Ecosystem Objectives (Critical Levels)

Pollutant	Time Period	Objective
Nitrogen Oxides (expressed as NO_2)	Annual Mean	30µg/m^3

8.2.46 Critical loads for nitrogen deposition onto sensitive ecosystems have been specified by United Nations Economic Commission for Europe (UNECE). They are defined as the amount of pollutant deposited to a given area over a year, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Exceedance of a critical load is used as an indication of the potential for harmful effects to occur.

[16] The Highways Agency (2007). 'Design Manual for Roads and Bridges, Volume 11, Section 3, Part I, HA 207/07 Air Quality'. Available at: http://www.standardsforhighways.co.uk/dmrb/vol11/section3/ha20707.pdf

8.2.47 **Table 8.10** below shows the habitats most likely to be affected by road traffic emissions from Station Road in the Ardley Cutting and Quarry SSSI and describes the critical loads for each habitat.

Table 8.10: Deposition and Site Relevant Critical Loads

Habitat	Critical Load	
	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)
Calcareous grassland (Bromus erectus-Brach podium pinnatum lowland calcareous grassland)	15 - 25	0.856 – 4.856
Calcareous grassland (Bromus erectus-lowland calcareous grassland)	15 - 25	0.856 – 4.856
Hamearis Lucina – Duke of Burgundy[a]	-	-
Invertebrate assemblage – Invertebrate Assemblage[b]	-	-

[a] No critical load for nitrogen deposition or acid deposition has been assigned for this habitat. Information retrieved from the Air Pollution Information System (APIS) website (2016).
[b] The habitat is sensitive to nitrogen deposition and acid deposition, however there is no comparable habitat with established critical load estimate available or acid class.

Planning Policy

National Policy

8.2.48 The National Planning Policy Framework was published in March 2012. This sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

> **"The planning system should contribute to and enhance the natural and local environment by…. preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."**

8.2.49 Paragraph 124, also states that:

> **"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."**

8.2.50 Paragraph 203 goes on to say:

> **"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."**

8.2.51 New National Planning Practice Guidance (NPPG) was published and updated in March 2014 to support the NPPF. Paragraph 001, Reference 32-001-20, of the NPPG provides a summary as to why air quality is a consideration for planning:

> **"...Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit....The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date....If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan.....Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive.....Odour and dust can also be a planning concern, for example, because of the effect on local amenity."**

8.2.52 Paragraph 002, Reference 32-002-20140306, of the NPPG concerns the role of Local Plans with regard to air quality:

> **"....Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider:**
>
> - **The potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;**
> - **The impact of point sources of air pollution..; and**
> - **Ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."**

8.2.53 Paragraph 005, Reference 32-005-20140306, of the NPPG identifies when air quality could be relevant for a planning decision:

> **"....When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:**
>
> - **Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in**

construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.

- **Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.**

- **Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.**

- **Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.**

- **Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."**

8.2.54 Paragraph 007, Reference 32-007-20140306, of the NPPG provides guidance on how detailed an assessment needs to be:

> **"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."**

8.2.55 Paragraph 008, Reference 32-008-20140306, of the NPPG provides guidance on how an impact on air quality can be mitigated:

> **"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact….Examples of mitigation include:**
>
> - **The design and layout of development to increase separation distances from sources of air pollution;**
>
> - **Using green infrastructure, in particular trees, to absorb dust and other pollutants;**
>
> - **Means of ventilation;**
>
> - **Promoting infrastructure to promote modes of transport with low impact on air quality;**
>
> - **Controlling dust and emissions from construction, operation and demolition; and**

- **Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."**

8.2.56 Paragraph 009, Reference 32-009-20140306, of the NPPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment:

> **"Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations." If Yes:**
>
> **"Consider how proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused."**

Local Policy

8.2.57 The Cherwell Local Plan (2011 – 2031)[17], adopted in 2016, sets out the local development policies for the Council. It considers Policy ESD 10 'Protection and Enhancement of Biodiversity and the Natural Environment', which states:

> **"Development which would result in damage to or loss of a site of biodiversity or geological value of national importance will not be permitted unless the benefits of the development clearly outweigh the harm it would cause to the site and the wider national network of SSSI's, and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity…Air quality assessments will also be required for development proposals that would be likely to have a significantly adverse impact on biodiversity by generating an increase in air pollution"**

8.2.58 The Draft Planning Obligations SPD provides guidance on the level of contribution which will be required in order to compensate for loss or damage created by a development, or to mitigate a development's impact. It sets out the range of mitigation measures which may be required, as well as the means of calculating financial contributions towards measures or monitoring, based on the cost of Air Quality Action Plan measures. An AQMA comprising North Bar Street, Horse Fair Street, South Bar, Oxford Street, High Street, Bloxham Road, Warwick Road and Southam Road was declared 29th October 2014; Cherwell District Council has not yet prepared an Air Quality Action Plan for its existing AQMAs (Hennef Way and North Bar/Horse Fair/South Bar Street). None of the mentioned AQMAs are in close proximity to the Application Site.

Scoping Criteria

8.2.59 The scope of work of the assessment is:

- Identifying existing locations which are sensitive to changes in air quality;
- Quantitatively assessing the potential traffic impacts at existing and future receptors using the ADMS Roads detailed dispersion model. The model will

[17] Available at: http://www.cherwell.gov.uk/index.cfm?articleid=11344

be verified against local monitoring data from Ardley, Camp Road and Middleton Stoney;

- Quantitatively assessing the potential traffic impacts on ecological receptors at Ardley Cutting and Quarry (SSSI) using the ADMS Roads detailed dispersion model;
- Qualitative assessment of construction dust impacts;
- Identifying mitigation for the operational phase, if required, and appropriate construction mitigation measures based on the identified risk;
- Residual impact assessment; and
- Cumulative impact assessment.

Limitations to the Assessment

8.2.60 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

8.2.61 A disparity between the national road transport emission projections and measured annual mean concentrations of nitrogen oxides and NO_2 has been identified in recent years[18]. Whilst projections suggest that both annual mean nitrogen oxides and nitrogen dioxide concentrations from road traffic emissions should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase. The monitoring carried out by Cherwell District Council shows relatively stable concentrations in Ardley during the 2009-2013 period; the fact that concentrations have not fallen as rapidly as was previously anticipated means that a conservative approach needs to be adopted regarding future air quality predictions.

8.2.62 The future year road traffic modelling has been based on 2019 emission factors and background concentrations, whilst utilising future traffic flows for the year 2021. The model has been verified against 2015 monitoring data. This is considered to provide conservative assessment taking into account the uncertainties regarding future vehicle emission factors.

8.3 BASELINE CONDITIONS

Application Site Description and Context

8.3.1 The assessment covers the air quality impacts at existing properties along the links provided in **Appendix 8.2** that might be affected by an increase in road traffic. It also covers impacts on ecological receptors at Ardley Cutting and Quarry (SSSI).

8.3.2 The construction study area extends to 350m from the Application Site boundary.

8.3.3 The operational study area extends to where there are significant changes in traffic (more than 500 vehicle movements per day outside of an AQMA, and more than 100 vehicle movements per day within an AQMA). These two study areas are shown on **Figure 8.1**.

[18] Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. Trends in NO_x and NO_2 emissions and ambient measurements in the UK. Available at: http://uk-air.defra.gov.uk/library/reports?report_id=645

Baseline Survey Information

LAQM

8.3.4 Cherwell District Council (CDC) has investigated air quality within its area as part of its responsibilities under the LAQM regime. To date, three Air Quality Management Areas (AQMAs) have been declared within the district. None of them are in close proximity to the Application Site, the closest being located approximately 16km away.

Monitoring

Nitrogen Dioxide

8.3.5 CDC operates an automatic monitoring station alongside Hennef Way, which is not in close proximity to the Application Site. The Council also deploys nitrogen dioxide diffusion tubes at a number of locations. The closest monitoring locations are presented in **Table 8.11** and **Figure 8.1.**

Table 8.11: Measured Nitrogen Dioxide Concentrations, 2011-2015

Site ID	Site Type	Within AQMA	Annual Mean (µg/m³)				
			2011	2012	2013	2014	2015
Camp Road	Roadside	N	-	-	-	15.8	14.1
Ardley (B430)	Roadside	N	31.2	30.9	26.9	30.7	29.6
Middleton	Roadside	N	-	-	-	34.1	32.4
Objective			**40**				

2011– 2015 Data taken from the 2015 Air Quality Progress Report Cherwell District Council

8.3.6 The measured concentrations of nitrogen dioxide have been below the objectives at all locations during the 2011-2015 period. Concentrations have reduced at all locations between 2014 and 2015.

PM_{10} and $PM_{2.5}$

8.3.7 There is no PM_{10} or $PM_{2.5}$ monitoring carried out in close proximity to the Application Site.

Background Concentrations

8.3.8 In addition to measured concentrations, estimated background concentrations for the Application Site have been obtained from the national maps published by Defra (**Table 8.12**). The background concentrations are all well below the relevant objectives in 2015.

Table 8.12: Estimated Annual Mean Background Concentrations (µg/m³)

Grid Square	NO_x*		NO_2		PM_{10}		$PM_{2.5}$	
	2015	2019**	2015	2019**	2015	2019**	2015	2019**
454_227	24.1	18.5	16.9	13.4	18.0	17.4	12.2	11.7
451_225	14.7	11.9	10.7	8.9	15.3	14.8	10.7	10.2
446_225	14.2	11.6	10.4	8.6	15.2	14.7	10.6	10.2

Grid Square	NO_x*		NO_2		PM_{10}		$PM_{2.5}$	
	2015	2019**	2015	2019**	2015	2019**	2015	2019**
449_224	15.0	12.3	10.9	9.1	15.6	15.1	10.8	10.4
449_225	14.9	12.2	10.9	9.1	14.7	14.1	10.3	9.9
453_223	16.7	13.3	12.1	9.8	15.3	14.8	10.6	10.1
454_226	25.5	19.6	17.8	14.1	18.6	18.0	12.5	11.9
453_226	16.2	13.0	11.8	9.6	14.9	14.4	10.4	10.0
Objective	**30***		**40**		**40**		**25**	

* NO_x objective in relation to ecological receptors only

** 2019 background data used for 2021 assessment

Baseline Deposition – Ecological Receptors

8.3.9 The three-year Average (2012 – 2014) nitrogen and acid deposition rates for Ardley Cutting and Quarry (SSSI) sensitive to either nitrogen or acid deposition are presented in **Table 8.13**; data have been taken from the APIS website. The APIS data does not include future year predictions and therefore in a conservative basis, the APIS baseline is assumed constant for the future year assessments.

Table 8.13: Baseline Deposition Rates

Habitat	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition	
		keqN/ha/yr	keqS/ha/yr
Calcareous grassland (Bromus erectus- Brach podium pinnatum lowland calcareous grassland)	22.3	1.59	0.26
Calcareous grassland (Bromus erectus- lowland calcareous grassland)	22.3	1.59	0.26

Predicted Baseline Concentrations – Human Health Receptors

Existing Receptors

8.3.10 The ADMS-Roads model has been run to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations at each of the existing receptor locations identified in **Table 8.4** for baseline years of 2015 and 2021. The results are presented in **Table 8.14**.

Table 8.14: Predicted Baseline Concentrations of NO_2, PM_{10} and $PM_{2.5}$ in 2015 and 2021

Receptor	Baseline 2015			Future Baseline 2021		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]
R1	26.2	17.3	12.0	19.7	16.6	11.3
R2	14.9	16.1	11.1	11.9	15.6	10.7
R3	15.1	16.2	11.2	12.0	15.6	10.7
R4	15.5	15.2	10.7	12.4	14.7	10.3
R5	13.1	14.9	10.5	10.6	14.4	10.1
R6	32.7	17.7	12.2	24.7	17.1	11.6
R7	27.7	19.7	13.3	21.6	19.1	12.7
R8	27.3	19.6	13.2	21.3	19.1	12.7
R9	26.3	17.3	11.9	20.2	16.7	11.3
R10	28.9	17.5	12.0	21.8	16.9	11.4
R11	**41.0**	18.8	12.9	30.9	18.1	12.2
R12	24.3	16.9	11.6	18.7	16.3	11.1
Obj[b]	**40**	**40**	**25**	**40**	**35**	**25**

[a] Annual mean expressed in µg/m^3
[b] Obj=Objective

8.3.11 The annual mean objective for nitrogen dioxide is predicted to be met at 11 receptors in 2015, with an exceedance at R11. This location has not been identified by CDC as exceeding the annual mean objective which may indicate that the model is overpredicting. The objective is not predicted to be exceeded at any of the existing receptor locations (including R11) in 2021. Predicted baseline concentrations of PM_{10} and $PM_{2.5}$ are well below the objectives for both years.

Predicted Baseline Concentrations – Ecological Receptors

8.3.12 Predicted concentrations and deposition rates for the baseline years 2015 and 2021 are presented in **Table 8.15**.

Table 8.15: Predicted Baseline Concentrations at Ecological Receptors in 2015 and 2021

Receptor and Distance in Habitat	Distance from kerb (m)	Total NO_x (µg/m^3)		Nitrogen Deposition (kgN/ha/yr)		Acid Deposition (keqN/ha/yr)	
		2015	2021	2015	2021	2015	2021
Ardley Cutting and Quarry SSSI Transect E1							
E1 0m	0	**33.2**	25.5	**22.8**	**22.7**	1.628	1.620

Receptor and Distance in Habitat	Distance from kerb (m)	Total NO_x (µg/m^3)		Nitrogen Deposition (kgN/ha/yr)		Acid Deposition (keqN/ha/yr)	
		2015	2021	2015	2021	2015	2021
E1 5m	5	**33.7**	25.9	**22.8**	**22.7**	1.630	1.622
E1 10m	10	**34.1**	26.2	**22.9**	**22.7**	1.632	1.623
E1 15m	15	**34.2**	26.2	**22.9**	**22.7**	1.633	1.624
E1 20m	20	**34.0**	26.1	**22.9**	**22.7**	1.632	1.623
E1 30m	30	**33.5**	25.7	**22.8**	**22.7**	1.630	1.621
E1 40m	40	**32.9**	25.3	**22.8**	**22.7**	1.626	1.619
E1 50m	50	**32.3**	24.8	**22.7**	**22.6**	1.624	1.616
E1 75m	75	**31.2**	24.0	**22.6**	**22.6**	1.618	1.612
E1 100m	100	**30.4**	23.4	**22.6**	**22.5**	1.613	1.608
E1 125m	125	29.8	22.9	**22.5**	**22.5**	1.610	1.606
E1 150m	150	29.4	22.6	**22.5**	**22.5**	1.608	1.604
E1 175m	175	29.0	22.3	**22.5**	**22.4**	1.606	1.603
E1 200m	200	28.7	22.1	**22.5**	**22.4**	1.605	1.602
Critical Level /Load		**30**		**15 - 25**		**0.856 – 4.856**	
Ardley Cutting and Quarry SSSI Transect E2							
E2 0m	0	**32.3**	24.8	**22.7**	**22.6**	1.623	1.616
E2 5m	5	**31.9**	24.5	**22.7**	**22.6**	1.621	1.615
E2 10m	10	**31.7**	24.3	**22.7**	**22.6**	1.620	1.613
E2 15m	15	**31.4**	24.1	**22.7**	**22.6**	1.619	1.612
E2 20m	20	**31.1**	23.9	**22.6**	**22.6**	1.617	1.611
E2 30m	30	**30.5**	23.5	**22.6**	**22.5**	1.614	1.609
E2 40m	40	**30.0**	23.1	**22.6**	**22.5**	1.612	1.607
E2 50m	50	29.6	22.8	**22.5**	**22.5**	1.609	1.605
E2 75m	75	28.9	22.2	**22.5**	**22.4**	1.605	1.602

Receptor and Distance in Habitat	Distance from kerb (m)	Total NO_x (µg/m^3)		Nitrogen Deposition (kgN/ha/yr)		Acid Deposition (keqN/ha/yr)	
		2015	2021	2015	2021	2015	2021
E2 100m	100	28.4	21.8	**22.4**	**22.4**	1.603	1.600
E2 125m	125	18.7	14.9	**22.4**	**22.4**	1.602	1.599
E2 150m	150	18.5	14.7	**22.4**	**22.4**	1.601	1.598
E2 175m	175	18.3	14.5	**22.4**	**22.4**	1.600	1.597
E2 200m	200	18.1	14.4	**22.4**	**22.4**	1.599	1.597
Critical Level /Load		**30**		**15 - 25**		**0.856 – 4.856**	

Exceedances in bold

8.3.13 Transect E1 predicted nitrogen and acid deposition to the east of Station Road (see **Figure 8.1**). The NO_x critical level is predicted to be exceeded from 0m up to 100m from Station Road in 2015, whilst in 2021 the NO_x critical level is not predicted to be exceeded. The nitrogen deposition critical load is predicted to be exceeded at all locations modelled in 2015 and 2021. There are no predicted exceedances of the critical loads of acid deposition within the habitat in 2015 or 2021.

8.3.14 For Transect E2, the NO_x critical level is predicted to be exceeded from 0m up to 40m from Station Road in 2015, whilst in 2021 the NO_x critical level is not predicted to be exceeded. The nitrogen deposition critical load is predicted to be exceeded at all distances from Station Road in 2015 and 2021. There are no predicted exceedances of the critical loads of acid deposition within the habitats in 2015 and 2021.

8.3.15 The decrease in concentrations and deposition between 2015 and 2021 is a result of vehicle emissions reducing at a greater rate than baseline traffic levels increase over the same time period.

8.4 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction Effects – Human Health Receptors

8.4.1 The main potential effects during construction are dust deposition and elevated PM_{10} concentrations. The following activities have the potential to cause emissions of dust:

- site preparation including delivery of construction material, erection of fences and barriers;
- demolition of existing buildings on site;
- earthworks including digging foundations and landscaping;
- materials handling such as storage of material in stockpiles and spillage;
- construction and fabrication of units; and
- disposal of waste materials off-site.

8.4.2 Typically, the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension

of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

8.4.3 Based on the IAQM criteria (**Table 8.1**), the dust emission magnitude is considered to be high. The study area is considered to be of medium sensitivity (**Table 8.2**). Appropriate mitigation corresponding to a medium risk site is therefore required during the construction phase (**Table 8.3**).

Construction Effects- Ecological Receptors

8.4.4 Ardley Cutting and Quarry SSSI is located approximately 3.5km from the Proposed Development Site. Given the large distance between the Site and the ecological habitats there are no foreseen construction dust effects on the SSSI.

Effect Significance

8.4.5 In accordance with the IAQM criteria, with mitigation in place, the effect of construction phase dust is not significant.

Road Traffic Effects – Human Health Receptors

Existing Receptors

8.4.6 Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing receptors in 2021 both without and with the development in place are presented in **Table 8.16.**

Table 8.16: Predicted Concentrations of NO_2, PM_{10} and $PM_{2.5}$ for Existing Receptors

Receptor	Without Development			With Development		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]
R1	19.7	16.6	11.3	19.8	16.6	11.3
R2	11.9	15.6	10.7	12.0	15.6	10.7
R3	12.0	15.6	10.7	12.1	15.6	10.7
R4	12.4	14.7	10.3	12.6	14.8	10.3
R5	10.6	14.4	10.1	10.7	14.4	10.1
R6	24.7	17.1	11.6	25.1	17.1	11.6
R7	21.6	19.1	12.7	22.0	19.2	12.8
R8	21.3	19.1	12.7	21.7	19.2	12.7
R9	20.2	16.7	11.3	20.4	16.7	11.3
R10	21.8	16.9	11.4	22.0	16.9	11.4

Receptor	Without Development			With Development		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]	Annual Mean[a]
R11	30.9	18.1	12.2	31.4	18.2	12.2
R12	18.7	16.3	11.1	19.0	16.4	11.1
Obj[b]	**40**	**40**	**25**	**40**	**40**	**25**

[a] Annual mean expressed in µg/m^3
[b] Obj=Objective

8.4.7 The changes in annual mean concentrations are presented in **Table 8.17**, based on unrounded numbers.

Table 8.17: Change in Predicted Concentrations brought about by the Development

Receptor	NO_2	PM_{10}	$PM_{2.5}$
	Annual Mean (µg/m^3)	Annual Mean (µg/m^3)	Annual Mean (µg/m^3)
R1	0.1	0.0	0.0
R2	0.1	0.0	0.0
R3	0.1	0.0	0.0
R4	0.2	0.0	0.0
R5	0.1	0.0	0.0
R6	0.4	0.1	0.0
R7	0.4	0.1	0.1
R8	0.4	0.1	0.0
R9	0.2	0.0	0.0
R10	0.2	0.0	0.0
R11	0.5	0.1	0.1
R12	0.3	0.0	0.0

8.4.8 Based on the impact magnitude descriptors in **Table 8.6**, the changes in annual mean nitrogen dioxide concentrations range from imperceptible to small with the development in place, and the changes in PM_{10} and $PM_{2.5}$ concentrations are all imperceptible.

8.4.9 Using the criteria set out in **Table 8.7**, the impact on PM_{10} and $PM_{2.5}$ concentrations is therefore described as negligible. The impacts on annual mean nitrogen dioxide concentrations are described as negligible, apart from one Receptor (R11), where the impact is described as slight adverse.

Proposed Receptors

8.4.10 Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at proposed residential receptors within the Site in 2021 are presented in **Table 8.18**.

Table 8.18: Predicted Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at Proposed Receptors

Receptor	NO_2	PM_{10}	$PM_{2.5}$
	Annual Mean ($\mu g/m^3$)	**Annual Mean ($\mu g/m^3$)**	**Annual Mean ($\mu g/m^3$)**
PR1	9.4	14.8	10.2
PR2	9.7	14.9	10.3
PR3	12.3	15.4	10.6
PR4	12.4	15.4	10.6
PR5	12.2	15.4	10.6
PR6	11.9	15.3	10.5
Objective	**40**	**40**	**25**

8.4.11 Predicted Concentrations at worst case proposed receptor locations are well below the objectives and therefore the whole site is considered suitable for future residents of the Proposed Development.

Effect Significance

8.4.12 The air quality effects of road traffic generated by the Proposed Development are considered to be not significant as there are no predicted exceedances at any of the assessed receptor locations in the assessment year (2021). This judgement is made based on the assessment criteria set out in **paragraph 8.2.26**, in particular, that a conservative assessment has been carried out.

Road Traffic Effects – Ecological Receptors

8.4.13 Predicted concentrations and deposition rates without and with the development in place are contained in **Table 8.19**.

Table 8.19: Predicted Concentrations at Ecological Receptors in 2021 without and with the Development

Receptor and Distance in Habitat	Without Development			With Development		
	Total NO_x ($\mu g/m^3$)	**Nitrogen Deposition (kgN/ha/yr)**	**Acid Deposition (keqN/ha/yr)**	**Total NO_x ($\mu g/m^3$)**	**Nitrogen Deposition (kgN/ha/yr)**	**Acid Deposition (keqN/ha/yr)**
Ardley Cutting and Quarry SSSI Transect E1						

Receptor and Distance in Habitat	Without Development			With Development		
	Total NO_x ($\mu g/m^3$)	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)	Total NO_x ($\mu g/m^3$)	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)
E1 0m	25.5	**22.7**	1.620	25.8	**22.7**	1.621
E1 5m	25.9	**22.7**	1.622	26.2	**22.7**	1.624
E1 10m	26.2	**22.7**	1.623	26.5	**22.8**	1.625
E1 15m	26.2	**22.7**	1.624	26.6	**22.8**	1.626
E1 20m	26.1	**22.7**	1.623	26.5	**22.8**	1.625
E1 30m	25.7	**22.7**	1.621	26.1	**22.7**	1.623
E1 40m	25.3	**22.7**	1.619	25.6	**22.7**	1.620
E1 50m	24.8	**22.6**	1.616	25.1	**22.7**	1.618
E1 75m	24.0	**22.6**	1.612	24.2	**22.6**	1.613
E1 100m	23.4	**22.5**	1.608	23.6	**22.5**	1.609
E1 125m	22.9	**22.5**	1.606	23.1	**22.5**	1.607
E1 150m	22.6	**22.5**	1.604	22.8	**22.5**	1.605
E1 175m	22.3	**22.4**	1.603	22.5	**22.4**	1.604
E1 200m	22.1	**22.4**	1.602	22.3	**22.4**	1.602
Critical Level /Load	**30**	**15 - 25**	**0.856 – 4.856**	**30**	**15 - 25**	**0.856 – 4.856**
Ardley Cutting and Quarry SSSI Transect E2						
E2 0m	24.8	**22.6**	1.616	25.1	**22.6**	1.618
E2 5m	24.5	**22.6**	1.615	24.8	**22.6**	1.616
E2 10m	24.3	**22.6**	1.613	24.6	**22.6**	1.615
E2 15m	24.1	**22.6**	1.612	24.4	**22.6**	1.614
E2 20m	23.9	**22.6**	1.611	24.1	**22.6**	1.612
E2 30m	23.5	**22.5**	1.609	23.7	**22.5**	1.610
E2 40m	23.1	**22.5**	1.607	23.3	**22.5**	1.608

Receptor and Distance in Habitat	Without Development			With Development		
	Total NO_x ($\mu g/m^3$)	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)	Total NO_x ($\mu g/m^3$)	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keqN/ha/yr)
E2 50m	22.8	**22.5**	1.605	23.0	**22.5**	1.606
E2 75m	22.2	**22.4**	1.602	22.4	**22.4**	1.603
E2 100m	21.8	**22.4**	1.600	22.0	**22.4**	1.601
E2 125m	14.9	**22.4**	1.599	15.0	**22.4**	1.600
E2 150m	14.7	**22.4**	1.598	14.8	**22.4**	1.599
E2 175m	14.5	**22.4**	1.597	14.6	**22.4**	1.598
E2 200m	14.4	**22.4**	1.597	14.5	**22.4**	1.597
Critical Level /Load	**30**	**15 - 25**	**0.856 – 4.856**	**30**	**15 - 25**	**0.856 – 4.856**

Exceedances in bold

8.4.14 The changes in the total NO_x nitrogen deposition and acid deposition brought about by the Proposed Development are presented in **Table 8.20**.

Table 8.20: Predicted Proposed Development Contribution in 2021

Receptor and Distance in Habitat	2021 Proposed Development Contribution					
	Total NO_x ($\mu g/m^3$)		Nitrogen Deposition (kgN/ha/yr)		Acid Deposition (keqN/ha/yr)	
	NO_x	%	N Deposition	%	Acid Deposition	%
Ardley Cutting and Quarry SSSI Transect E1						
E1 0m	0.3	1.1	0.02	0.2	0.002	0.0
E1 5m	0.3	1.1	0.03	0.2	0.002	0.0
E1 10m	0.4	1.2	0.03	0.2	0.002	0.0
E1 15m	0.4	1.2	0.03	0.2	0.002	0.0
E1 20m	0.4	1.2	0.03	0.2	0.002	0.0
E1 30m	0.3	1.1	0.03	0.2	0.002	0.0
E1 40m	0.3	1.0	0.02	0.2	0.002	0.0
E1 50m	0.3	1.0	0.02	0.1	0.002	0.0
E1 75m	0.2	0.8	0.02	0.1	0.001	0.0

Receptor and Distance in Habitat	2021 Proposed Development Contribution					
	Total NO_x ($\mu g/m^3$)		Nitrogen Deposition (kgN/ha/yr)		Acid Deposition (keqN/ha/yr)	
	NO_x	%	N Deposition	%	Acid Deposition	%
E1 100m	0.2	0.7	0.02	0.1	0.001	0.0
E1 125m	0.2	0.6	0.01	0.1	0.001	0.0
E1 150m	0.2	0.6	0.01	0.1	0.001	0.0
E1 175m	0.2	0.5	0.01	0.1	0.001	0.0
E1 200m	0.1	0.5	0.01	0.1	0.001	0.0
Ardley Cutting and Quarry SSSI Transect E2						
E2 0m	0.3	1.0	0.02	0.2	0.002	0.0
E2 5m	0.3	0.9	0.02	0.1	0.002	0.0
E2 10m	0.3	0.9	0.02	0.1	0.001	0.0
E2 15m	0.3	0.8	0.02	0.1	0.001	0.0
E2 20m	0.2	0.8	0.02	0.1	0.001	0.0
E2 30m	0.2	0.7	0.02	0.1	0.001	0.0
E2 40m	0.2	0.7	0.01	0.1	0.001	0.0
E2 50m	0.2	0.6	0.01	0.1	0.001	0.0
E2 75m	0.1	0.5	0.01	0.1	0.001	0.0
E2 100m	0.1	0.4	0.01	0.1	0.001	0.0
E2 125m	0.1	0.4	0.01	0.1	0.001	0.0
E2 150m	0.1	0.3	0.01	0.1	0.001	0.0
E2 175m	0.1	0.3	0.01	0.0	0.001	0.0
E2 200m	0.1	0.3	0.01	0.0	0.001	0.0

8.4.15 For both transects E1 and E2, the nitrogen deposition critical load is predicted to be exceeded at all distances from Station Road both and without the development in place. The increase in nitrogen deposition is less than 1% and is therefore insignificant. There are no predicted exceedances of the NO_x critical level or acid deposition critical load within either of the transects in 2021 with the development in place.

8.4.16 The assessment has been undertaken assuming that background deposition rates remain unchanged from current rates. Future reductions in vehicle emissions are expected to reduce background deposition rates.

Effect Significance

8.4.17 The air quality effects on human health of road traffic generated by the Proposed Development are considered to be not significant as there are no predicted exceedances at any of the assessed human health receptor locations in 2021. This judgement is made based on the assessment criteria set out in **paragraph 8.2.27**, in particular, that a conservative assessment has been carried out.

8.4.18 The air quality effects on ecological habitats of road traffic generated by the Proposed Development are considered to be not significant as the increase of nitrogen deposition is less than 1% at all of the assessed ecological receptor locations. This judgement is made based on the assessment criteria set out in **paragraph 8.2.40**, in particular, that a conservative assessment has been carried out.

8.5 MITIGATION AND ENHANCEMENT

Construction

8.5.1 The following standard low risk mitigation measures from the IAQM 2014 guidance are recommended. These should be included within a Construction Environmental Management Plan (CEMP) and agreed with Local Authority. With these mitigation measures in place, the significance of construction effects is insignificant.

Communication

- Develop and implement a stakeholder communications plan;
- Display the name and contact details of persons accountable on the site boundary;
- Display the head or regional office information on the site boundary.

Management

- Develop and implement a dust management plan;
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions;
- Record exceptional incidents and action taken to resolve the situation;
- Carry out regular site inspections to monitor compliance with the dust management plan and record results;
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken;
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible;
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site run off of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove potentially dusty materials from site as soon as possible;
- Cover, seed or fence stockpiles to prevent wind whipping;

- Ensure all vehicles switch off engines when stationary;
- Avoid the use of diesel or petrol powered generators where possible;
- Only use cutting, grinding and sawing equipment with dust suppression equipment;
- Ensure an adequate supply of water on site for dust suppressant;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate;
- Ensure equipment is readily available on site to clean up spillages of dry materials; and
- No on-site bonfires and burning of waste materials on site.

Demolition

- Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Ensure water suppression is used during demolition operation;
- Avoid explosive blasting, using appropriate manual and mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Ensure sand and other aggregates are stored in bonded areas and are not allowed to dry out, unless required for a particular process.

Trackout

- Use water assisted dust sweepers on the site access and local roads;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials;
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable;
- Install hard surfaced haul routes which are regularly damped down; and
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.

Operation

8.5.2 The effects of development traffic for the Proposed Development are judged to be not significant given the conservative nature of the assessment. No additional traffic mitigation is therefore proposed.

8.5.3 Mitigation summary is presented in **Table 8.21** below.

Table 8.21: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
1	Construction Phase Mitigation in CEMP			X

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
2	Operational Phase Mitigation	X		

8.6 CUMULATIVE AND IN-COMBINATION EFFECTS

Construction

8.6.1 It is possible that the Proposed Development may overlap with other committed developments in the area. Cumulative construction phase dust effects are unlikely due to the effect of the wind blowing dust in one direction only from adjacent sites. In addition, it is likely that other developments being constructed in the area simultaneously will also implement best practice construction mitigation methods as set out in the IAQM 2014 guidance. With these mitigation measures in place, no significant construction cumulative effects are predicted, alone or in combination.

Operation

8.6.2 The future year traffic data utilised within the assessment includes a number of committed developments in the area. These include the following planning applications:

- Residential development of 1075 units plus employment use (10/01642/OUT).
- 60 residential units (13/01811/OUT)
- 43 residential units (16/00263/F)

8.6.3 The assessment has therefore predicted the cumulative concentrations arising from committed developments in the area.

8.7 SUMMARY

8.7.1 The air quality effects associated with the construction and operation of the Proposed Development have been assessed.

Baseline Conditions

8.7.2 There are no Air Quality Management Areas in the vicinity of the Application Site and monitored nitrogen dioxide (NO_2) concentrations in the study area are well below the relevant objective.

8.7.3 For the Ardley Cutting and Quarry SSSI there are predicted exceedances of the NOx critical level and nitrogen deposition critical loads in 2015, and of the nitrogen deposition critical load only in 2021 without the development in place. There are no predicted exceedances of the acid deposition critical loads within the assessed habitats.

Likely Significant Effects

8.7.4 During construction the main potential effects are dust annoyance and locally elevated concentrations of fine particulate matter (PM_{10}). The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when construction activities coincide with dry, windy conditions, and where people are located downwind and close to the activity being undertaken.

8.7.5 The assessment has considered the activities that will be undertaken and the risk that these pose to identify the mitigation measures that will need to be put in place. With the mitigation measures in place, construction dust effects are not significant.

8.7.6 The main operational effects of the development will arise from road traffic emissions. Pollutant concentrations have been modelled at locations adjacent to the road network where the effects are likely to be greatest.

8.7.7 In addition, pollutant concentrations have been modelled at proposed locations within the Proposed Development Site. It is considered that the entire Site is suitable for residential development without the need for mitigation.

8.7.8 Overall, the air quality effects of road traffic generated by the Proposed Development, taking account the committed developments set out above, are considered to be not significant, as there are no predicted exceedances of the European Limit Values or UK Air Quality Strategy Objectives for Nitrogen Dioxide or fine particulate matter (PM_{10} and $PM_{2.5}$).

8.7.9 For the Ardley Cutting and Quarry SSSI, the NOx critical level is not predicted to be exceeded in 2021 with or without the development in place. The nitrogen deposition critical load is predicted to be exceeded within the Ardley Cutting and Quarry SSSI both with and without the development in place. There are no exceedances of the acid deposition critical load.

8.7.10 The increase in nitrogen deposition is less than 1% therefore can be regarded as insignificant.

8.7.11 Overall, considering the conservative nature of the assessment, no significant adverse effect is predicted at the Ardley Cutting and Quarry SSSI.

Mitigation

8.7.12 Construction dust and fine particulate matter mitigation measures have been identified to be included within a Construction Environmental Management Plan (CEMP) to be agreed with the Local Authority.

8.7.13 The effects of the development traffic for the Proposed Development are judged to be not significant. No additional traffic mitigation is therefore required overall above embedded mitigation.

Conclusions

8.7.14 There are no air quality constraints to the Proposed Development.

Table 8.22 provides a summary of the effects, mitigation and residual effects in terms of Air Quality.

Table 8.22: Summary of Effects, Mitigation and Residual Effects (Air Quality)

Likely Significant Effect	Nature of Effect (P[a]/ T[b]/ None)	Receptor/ Sensitivity Value	Magnitude of Effects	Mitigation / Enhance Measures	Geographical Importance* (I, UK, E, R, C, B & L)	Significance of Effects	Residual Effects (Major/ Moderate/ Minor) (Beneficial/ Adverse/ Negligible)
Construction							
Dust and PM_{10} emissions	Temporary	Human Receptors	Medium Risk	Standard medium risk mitigation measures from the IAQM 2014 guidance to be applied	L	Not significant with the mitigation measures in place	Negligible
Operation							
Emissions of NO_2 from operational traffic	Permanent	Human Receptors	Negligible to slight adverse	No traffic mitigation is required	L	Not significant	Negligible overall
Emissions of PM_{10} from operational traffic	Permanent	Human Receptors	Negligible	No traffic mitigation is required	L	Not significant	Negligible
Emissions of $PM_{2.5}$ from operational traffic	Permanent	Human Receptors	Negligible	No traffic mitigation is required	L	Not significant	Negligible
Likely Significant	**Nature of Effect**	**Receptor/ Sensitivity**	**Magnitude of Effects**	**Mitigation / Enhance**	**Geographical Importance***	**Significance of Effects**	**Residual Effects (Major/**

Effect	**(P/ T/ None)**	**Value**		**Measures**	**(I, UK, E, R, C, B & L)**		**Moderate/ Minor) (Beneficial/ Adverse/ Negligible)**
Emissions of NO_x from operational traffic – ecological	Permanent	Ecological Receptors	Negligible	No traffic mitigation is required	L	Not significant	Negligible