

3 Air quality

Introduction

- 3.1 This chapter has been prepared by WSP Environmental (WSPE) and considers the potential air quality effects associated with the proposed development both during and post-construction. The type, source and significance of potential impacts are identified and the mitigation measures to be employed to minimise these impacts are described.
- 3.2 This chapter reviews chapter 12 (air quality) of the original environmental statement (ES) (October 2006) and considers the potential air quality effects associated with providing an additional 100 residential units within the proposed development site (achieved by increasing the density of development), taking into account the 1,585 residential units consented under the outline planning application and the 46 residential units consented on the reserved school site (herein referred to as the consented development).
- 3.3 This chapter (and its associated figures and technical appendix C) are not intended to be read as a stand-alone assessment and reference should be made to the front end of this ES (chapters 1-2) and chapter 6 (traffic and transport).
- 3.4 A glossary of terms used is provided in chapter 9.

Legislation and policy

Legislative framework

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

- 3.5 The government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007⁽¹⁾. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.
- 3.6 The AQS sets standards and objectives for nine main air pollutants to protect health, vegetation and ecosystems. These are benzene (C₆H₆), 1,3 butadiene (C₄H₆), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), particulate matter (PM₁₀ and PM_{2.5}), sulphur dioxide (SO₂), ozone (O₃), and polycyclic aromatic hydrocarbons (PAHs).

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) (July 2007).

- 3.7 The air quality standards define concentration limits, which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). Above these limits sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.
- 3.8 The air quality objectives are medium term policy based targets set by the government that take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.
- 3.9 For some pollutants, (e.g. NO₂), there is both a long term (annual mean) standard and a short-term standard. In the case of NO₂, the short term standard is for a 1-hour averaging period, whereas for PM₁₀ it is for a 24-hour averaging period. These periods reflect the varying effects on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.
- 3.10 The AQS contains a framework for considering the effects of a finer group of particles known as PM_{2.5} as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM₁₀. For PM_{2.5} the objectives will take the form of a limit value ('backstop objective') and an 'exposure reduction' target. Although a target for PM_{2.5} is included in the AQS, these objectives have not yet been incorporated into the Regulations. Consequently there is currently no requirement for local authorities to assess this pollutant as part of their statutory obligations.
- 3.11 Of the pollutants included in the AQS, NO₂ and PM₁₀ will be particularly relevant to this assessment as road traffic is a major source and concentrations of these pollutants tend to be close to air quality objectives in locations such as the proposed development site. Local authorities undertaking review and assessments of air quality are finding that, where road traffic is the dominant source of air pollution, the objectives for these pollutants are likely to be the most difficult to achieve. It is also generally considered that, where concentrations of NO₂ and PM₁₀ meet their respective objectives, and there are no other local sources of air pollution, such as from industrial processes, objectives for the other pollutants included in the regulations will also be achieved.

Air Quality (England) Regulations

- 3.12 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000⁽²⁾ and the Air Quality (England)

² The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

(Amendment) Regulations 2002⁽³⁾ for the purpose of Local Air Quality Management (LAQM).

- 3.13 The standards and objectives for each pollutant in the AQS and the Regulations are given in technical appendix C.1.

Local Air Quality Management (LAQM)

- 3.14 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Air Quality Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

- 3.15 The Department for Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their review and assessment work⁽⁴⁾. This guidance, referred to in this chapter as LAQM.TG(09), has been used where appropriate in the assessment presented herein.

The Environmental Protection Act 1990

- 3.16 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

- “Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance”
- “Any accumulation or deposit which is prejudicial to health or a nuisance”

- 3.17 Following this, Section 80 states that, where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and, if necessary, the local authority may abate the nuisance and recover expenses.

- 3.18 There are no statutory limit values for dust deposition above which ‘nuisance’ is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

³ The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

⁴ Department for Environment, Food and Rural Affairs (DEFRA): *Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09)* (Feb 2009).

Planning policy

National planning policy

National Planning Policy Framework

3.19 The National Planning Policy Framework⁽⁵⁾ (NPPF) sets out the government's planning policies for England and how these are expected to be applied. It promotes sustainable development and opportunities for local communities to engage in plan making at a neighbourhood level. The core underpinning principle of the framework is the presumption in favour of sustainable development, defined as: *“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”* One of the 12 core planning principles in the NPPF is that planning should *“contribute to conserving and enhancing the natural environment and reducing pollution.”* In relation to air quality, the document 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”*
- *“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 soils, air, water, or noise pollution”*
- *“In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity values, where consistent with other policies in this Framework”*
- *“..local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities”*
- *“Local planning authorities should consider where otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only*

⁵ Communities and Local Government (March 2012) *National Planning Policy Framework*.

be used where it is not possible to address unacceptable impacts through a planning condition”

Regional planning policy

Regional Spatial Strategy for the South East, The South East Plan (2009)

3.20 On 6 July 2010, the government revoked all regional spatial strategies under Section 79(6) of the Local Democracy, Economic Development and Construction Act 2009. This action was challenged in the High Court by Cala Homes, and the decision concluded that Section 79 powers could not be used to revoke all regional strategies in their entirety. Regional policies of relevance are therefore outlined below.

3.21 Policy NRM9 – Air Quality of the South East Plan⁽⁶⁾ states:

“Strategies, plans, programmes and planning proposals should contribute to sustaining the current downward trend in air pollution in the region. This will include seeking improvements in air quality so that there is a significant reduction in the number of days of medium and high air pollution by 2026. Local development documents and development control can help to achieve improvements in local air quality through:

- *Ensuring consistency with Air Quality Management Plans;*
- *Reducing the environmental impacts of transport, congestion management, and support the use of cleaner transport fuels;*
- *Mitigating the impact of development and reduce exposure to poor air quality through design, particularly for residential development in areas which already, or are likely to, exceed national air quality objectives;*
- *Encouraging the use of best practice during construction activities to reduce the levels of dust and other pollutants; and*
- *Assessing the potential impacts of new development and increased traffic levels on internationally designated nature conservation sites, and adopt avoidance and mitigation measures to address these impacts.”*

Local planning policy

Non Statutory Cherwell Local Plan 2011

3.22 Cherwell District Council (CDC) is currently in the process of preparing its local development framework (LDF). Once adopted, the LDF will act as planning policy for the district for the period up to 2026. However, in the

⁶ Government Office for the South East (GOSE) *The South East Plan (Adopted May 2009)*.

interim, CDC has issued a Non Statutory Local Plan 2011⁽⁷⁾ for the purposes of development control.

3.23 Policy EN5 - Air Quality of the Non Statutory Local Plan states that:

“In determining planning applications, the Council will have regard to the likely impact of the development on air quality as a result of its operational characteristics and the traffic generated by it. Development which would have a significant adverse impact on air quality will not be permitted. Wherever possible the council will seek to improve air quality through the control of development.”

Methodology

Scope of the assessment

- 3.24 There is the potential for air quality effects to occur during the construction and operational phases of the proposed development. The scope of the air quality assessment presented in this chapter has been agreed with the Environmental Health Officer (EHO) at CDC. A copy of the CDC’s consultation response is provided in technical appendix C.2.
- 3.25 Data sources and references used within the air quality assessment are set out in table 3.1.

⁷ Cherwell District Council (2011) Non Statutory Local Plan.

Arup Environmental and Ove Arup and Partners (December 1995) <i>The Environmental Effects of dust from Surface Mineral Workings Volume 2</i> . Prepared for Department of the Environment Minerals Division.
Cherwell Borough Council (2011) <i>Non Statutory Local Plan</i>
Cook, A. (2008) <i>Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective</i> .
DEFRA (Feb 2009) <i>Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09)</i> .
Department for Communities & Local Government (2012) <i>National Planning Policy Framework</i>
EPUK (April 2010) <i>Development Control: Planning for Air Quality - 2010 Update</i> .
HMSO (2002) <i>The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043</i>
HMSO (2000) <i>The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928</i>
HMSO (1995) <i>Environment Act 1995</i>
HMSO (1990) <i>Environmental Protection Act 1990</i>
http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html accessed November 2011.
Institute of Air Quality Management (January 2012) <i>Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance</i> .
Laxen, D. and Marner, B. (July 2003) <i>Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites</i> .
London Councils and Greater London Authority (November 2006) <i>The control of dust and emissions from construction and demolition – Best Practice Guidance</i> .
Quality of Urban Air Review Group (May 1996) <i>Airborne Particulate Matter in the United Kingdom – Third Report of the Quality of Urban Air Review Group</i> . Prepared for the Department of the Environment.
UK Government and Devolved Administrations (July 2007) <i>The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)</i>
WSP (2005) <i>South West Bicester Transport Assessment</i>

Table 3.1: Data sources and references

3.26 Further details regarding the methodology for the assessment of potential air quality effects both during and post-construction are provided below.

Construction phase

3.27 During the construction of the proposed development, on site activities may cause dust and particulate matter to be emitted to the atmosphere.

3.28 Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust, therefore, is unlikely to cause long term or widespread changes to local air quality; however, its deposition on property and cars can cause soiling and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

- 3.29 The smaller particles of dust (typically less than 10 µm in aerodynamic diameter) are known as particulate matter (PM₁₀) and represent only a small proportion of total dust released. As these particles are at the smaller end of the size range of dust particles, they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM₁₀ is small enough to be drawn into the lungs during breathing, which in sensitive members of the public could cause an adverse reaction. As a result of this potential impact on health, standards and objectives for PM₁₀ are defined in the AQS and Regulations.
- 3.30 Exhaust emissions from construction vehicles will have an effect on local air quality both on site and adjacent to the routes used by these vehicles to access the site.
- 3.31 Sensitive locations (e.g. nearby residential properties within the vicinity of the site) may experience adverse effects during construction if effective mitigation is not employed.

Post-construction

- 3.32 Once construction has been completed, the traffic generated by the proposed development will have an effect on local pollution concentrations, both within and around the site. The main pollutants of concern for road traffic are generally considered to be NO₂, PM₁₀, CO and C₆H₆. Of these pollutants, emissions of NO₂ and PM₁₀ are most likely to result in exceedences of the relevant air quality standards or objectives in urban areas (or on the outskirts of urban areas such as the proposed development site). This air quality assessment will therefore only consider these two pollutants. It should be noted that this approach is consistent with the air quality assessment undertaken as part of the EIA for the outline planning application, which also considered changes in concentrations of these two pollutants.

Extent of the study area

- 3.33 The study area for the assessment of construction phase effects includes sensitive receptors located within a distance of 350 m from the site boundary.
- 3.34 The study area for the assessment of operational phase effects includes sensitive receptors (see figure 3.1) alongside the following roads:
- B4030 Middleton Stoney Road
 - B4030 Oxford Road
 - A41 Oxford Road
- 3.35 These are the roads that are predicted to experience the greatest change in traffic as a result of traffic generated by the additional 100 units. Further details regarding the predicted change in traffic flows on roads within the vicinity of the site are provided in table 3.2.

Road link	Predicted % change in traffic flows (based on annual average daily traffic flow)
Middleton Stoney Road (east of Perimeter Road)	1.70%
Middleton Stoney Road (west of Oxford Road)	0.45%
A41 (south of Oxford Road)	0.11%
B4030 Oxford Road (north of A41)	0.06%
Middleton Stoney Road (west of Perimeter Road)	0.23%
Kings End / Queens Avenue	0.28%
A41 (east of Oxford Road)	0.14%
A4095 Howes Lane	0.27%

Table 3.2: Predicted change in traffic flows (%) as a result of the additional 100 residential units

Method of baseline data collation

Desk study

- 3.36 A desk study was undertaken to obtain baseline data to inform the assessment. This study included a review of available air quality data for the area surrounding the site, including CDC's local air quality review and assessment documentation and information available on the internet. A study of local mapping data available for the study area was also undertaken to identify local receptors that may be sensitive to changes in local air quality as a result of the proposed development.

Assessment methodology

Construction phase

- 3.37 A qualitative assessment of the potential impacts due to the generation and dispersion of dust and PM₁₀ during the construction phase has been undertaken using information in guidance documents produced by the following organisations:

- Building Research Establishment (BRE)⁽⁸⁾
- Quality of Urban Air Review Group (QUARG)⁽⁹⁾
- Department of the Environment (DoE)⁽¹⁰⁾
- Institute of Air Quality Management (IAQM)⁽¹¹⁾

- 3.38 The following potential impacts of increased dust and PM₁₀ generated during the construction phase have been considered:

⁸ Kukadia, V., Upton, S. L. and Hall, D. J.; *Control of dust from Construction and Demolition Activities*. BRE (Feb 2003).

⁹ Quality of Urban Air Review Group: *Airborne Particulate Matter in the United Kingdom – Third Report of the Quality of Urban Air Review Group*. Prepared for the Department of the Environment (May 1996).

¹⁰ Arup Environmental and Ove Arup and Partners: *The Environmental Effects of dust from Surface Mineral Workings Volume 2*. Prepared for Department of the Environment Minerals Division (Dec 1995).

¹¹ Institute of Air Quality Management: *Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance* (January 2012).

- Annoyance due to dust soiling
- Harm to ecological receptors
- The risk of health effects due to a significant increase in exposure to PM₁₀

3.39 Exhaust emissions from construction vehicles will have an impact on local air quality both on site and adjacent to the routes used by these vehicles to access the site. As information on the number of vehicles associated with the construction phase is not available, a qualitative assessment of their impact on local air quality has been undertaken by considering:

- The level of construction traffic likely to be generated by the construction of an additional 100 units
- The number and distance of sensitive receptors in the vicinity of the site and along the likely routes to be used by construction vehicles
- The likely duration of the construction phase and the nature of the construction activities undertaken

3.40 Technical appendix C.3 summarises the assessment procedure given in the guidance published by the IAQM for the consideration of potential dust and PM₁₀ impacts from demolition; earthworks; general construction activities and track-out.

Post-construction

3.41 For the prediction of impacts due to emissions arising from road traffic during operation, the air pollutant dispersion model ADMS Roads has been used. This model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user.

3.42 Meteorological data, such as wind speed and direction, are used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model were obtained from the Met Office observing station at Brize Norton. This station is considered to provide data representative of the conditions at the site. The meteorological data used for this assessment were from 2011; a windrose is provided in technical appendix C.4.

3.43 It should be noted that the air quality assessment undertaken for the outline planning application (contained within the original ES) used the screening methodology outlined within the Design Manual for Roads and Bridges (DMRB)⁽¹²⁾. In July 2012, DEFRA published updated emission factors for the purposes of air quality modelling. These updated emission factors take into account recent trends in emissions from new road vehicles in line with EU standards and address concerns that emission rates were not falling as quickly as previously predicted and assumed within the previous emission factors. At the time of assessment, the local air quality spreadsheet calculator (which

¹² Highways Agency (2007) *Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1: Air Quality*.

accompanies the DMRB guidance) had not been updated to reflect these new emissions factors and, consequently, was considered unsuitable for use within this assessment. The use of ADMS Roads instead was agreed with the EHO at CDC.

3.44 For the assessment, four scenarios have been modelled. These scenarios are as follows:

- 2011 verification – 2011 baseline traffic flows without the perimeter road operational
- 2012 baseline – 2012 baseline traffic flows with the perimeter road operational
- 2019 ‘without development’ – future baseline traffic flows with phase 1 (1,585 residential units), the reserved school site (46 residential units), the eco town pilot phase and other consented developments operational
- 2019 ‘with development’ - future baseline (i.e. with phase 1, the reserved school site, eco town pilot phase and other consented developments operational) plus traffic associated with operation of the additional 100 units

3.45 2012 is the baseline assessment year, whilst 2019 is the year in which the phase 1 development (including the additional 100 residential units) is likely to be completed. 2011 is the latest year for which meteorological data, monitoring data and traffic data are all available for use in verifying the model.

3.46 A summary of the traffic data used in the assessment can be found in technical appendix C.5. It includes details of annual average daily traffic flows (AADTs), average vehicle speeds and the percentage of heavy goods vehicles (HGVs) used in the assessment.

Model validation and verification

3.47 The ADMS Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose.

3.48 Model validation undertaken by the software developer will not have included validation in the vicinity of the site. To determine the performance of the model at a local level it is therefore advisable to perform a comparison of modelled results with local monitoring data at one or more relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

3.49 Suitable local monitoring data for the purpose of model verification are available for concentrations of NO₂ at the locations shown in table 3.3.

Location and site classification	O.S grid reference	Distance to site (km)*	2011 monitored NO ₂ concentrations (µg/m ³)
Kings End North (roadside diffusion tube)	457943, 222304	0.08	43.9
Kings End South (roadside diffusion tube)	458006, 222404	0.20	49.5
Queens Road / Kings End (roadside diffusion tube)	458028, 222471	0.27	42.9

Table 3.3: Local monitoring data sources suitable for model verification

* Taken from north eastern corner of the proposed development site.

- 3.50 Model verification has been undertaken following the methodology specified in Annex 3 of LAQM.TG(09) using the NO_x:NO₂ calculator available from DEFRA's website to calculate the roadside NO_x component of the annual mean NO₂ concentrations measured at the diffusion tube sites. Details of the verification calculations are presented in technical appendix C.6.
- 3.51 A factor of 2.4 was obtained during the verification process and this factor has been applied to the modelled NO_x roads component before addition of the relevant background NO_x concentration and conversion to an annual mean NO₂ concentration.
- 3.52 Local monitoring data are not available for concentrations of PM₁₀; final modelling results for this pollutant have been verified using the factor calculated for adjusting the modelled NO_x roads concentrations. This approach is considered to be appropriate according to guidance given in LAQM.TG(09).

Processing of the modelled results

- 3.53 Modelled annual mean oxides of nitrogen (NO_x) concentrations were converted to annual mean NO₂ concentrations using the methodology given in LAQM.TG(09) and the NO_x:NO₂ calculator available from DEFRA's website. The calculator provides a method of calculating NO₂ from NO_x wherever NO_x emissions from road traffic are predicted using dispersion modelling.
- 3.54 For PM₁₀, the modelled annual mean concentrations were used to calculate the number of exceedences of the 24-hour mean objective for direct comparison with the relevant AQS objective, following the methodology given in LAQM.TG(09).
- 3.55 LAQM.TG(09) does not provide a method for the conversion of annual mean NO₂ concentrations to 1 hour mean NO₂ concentrations. However, research⁽¹³⁾ determined that exceedences of the 1 hour mean objective were unlikely to occur where annual mean concentrations were below 60 µg/m³.

¹³ D Laxen and B Marner: *Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites* (July 2003).

Further research⁽¹⁴⁾ generally supported this relationship and as a result this criterion has been adopted for the purposes of local air quality review and assessment.

- 3.56 Quantitative assessments of the effects on local air quality from road traffic emissions associated with the operation of the proposed development have been completed against the current statutory standards and objectives for NO₂ and PM₁₀ set out in technical appendix C.1.

Significance criteria

- 3.57 The potential air quality effects associated with the construction and operation of the proposed development have been assessed using the following significance criteria.

Construction phase

Dust / PM₁₀ generation as a result of activities associated with the construction of the proposed development

- 3.58 The potential effects of the proposed development during the construction phase have been assessed using the significance criteria produced by the IAQM (provided in technical appendix C.3). These criteria take into account the sensitivity of the area surrounding the construction site and the risk of the site giving rise to dust effects to determine the significance of effects associated with each of the following phases: earthworks, construction and track-out.

Emissions to air from traffic associated with the construction phase of the proposed development

- 3.59 The effect of emissions to air from construction traffic has assessed qualitatively using the significance criteria outlined within the 2006 ES (see technical appendix C.7). These significance criteria take into account both the magnitude of change and the sensitivity of the receptors. When considering both the magnitude of change and the sensitivity of the receptor, reference has also been made to the significance criteria published by Environmental Protection UK (EPUK)⁽¹⁵⁾ (which have also been used to determine the significance of effects associated with the operational phase of the proposed development). The sensitivity of receptors to changes in air quality has also been considered in relation to the results of the baseline / future baseline modelling in the vicinity of the site.

¹⁴ A Cook: *Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective* (2008).

¹⁵ EPUK, April 2010. *Development Control: Planning for Air Quality (2010 Update)*

Post-construction

Emissions to air from traffic associated with the operation of the proposed development

- 3.60 The effects of the proposed development on local air quality once operational have been evaluated against the significance criteria published by EPUK and presented in technical appendix C.8. These criteria take into account the sensitivity of the receptor (i.e. how close concentrations are to exceeding the AQS objectives at that receptor) and the magnitude of change.
- 3.61 In addition to these quantitative criteria, the EPUK report also outlines a method that uses textual descriptors to identify the differing levels of relative priority that should be afforded to the air quality considerations of a development proposal in the planning process. A summary of the method is given in table 3.4.

Effect of development	Outcome
Development would lead to a breach or significant ⁽¹⁾ worsening of a breach of an EU limit value; cause a new breach to occur, or introduce of new exposure into an exceedence area.	Air quality an overriding consideration.
Lead to a breach or significant ⁽¹⁾ worsening of a breach of an AQ Objective, or cause a new AQMA to be declared, or introduce new exposure into an area of exceedence ⁽²⁾ .	Air quality a high priority consideration.
Development would interfere significantly with or prevent the implementation of actions within an AQ action plan	Air quality a high priority consideration.
Development would interfere significantly with the implementation of a local AQ strategy.	Air quality a medium priority consideration.
Development would lead to a significant increase in emissions, degradation in air quality or increase in exposure, below the level of a breach of an objective.	Air quality a medium priority consideration.
None of the above.	Air quality a low priority consideration.
⁽¹⁾ Where the term significant is used, it will be based on the professional judgement of the local authority officer.	
⁽²⁾ This could include the expansion of an existing AQMA or introduction of new exposure to cause a new AQMA to be declared. Where new exposures is introduced this should be with reference to the exceedence area, and not the AQMA boundary.	
Table 3.4: Summary of method for assessing the significance of air quality in the planning process	

- 3.62 For comparison and consistency, reference has also been made to the significance criteria outlined within the original ES (see technical appendix C.7). The significance of the effect using the ES significance criteria is presented within this chapter in brackets (e.g. ES significance criteria – slight adverse).

Sensitive receptors

3.63 Sensitive locations are those where the public may be exposed to pollutants from the site. These will include locations sensitive to an increase in dust deposition as a result of on site activities, or exposure to gaseous pollutants from exhaust emissions from traffic associated with the construction and operational phases of the proposed development.

Dust and PM₁₀

3.64 Examples of locations that are sensitive to dust and PM₁₀ generated by construction phase activities are shown in table 3.5. This table is based on a table of examples provided in the guidance published by the IAQM.

Sensitivity of the area	Examples	
	Human receptors	Ecological receptors
Very High	<ul style="list-style-type: none"> • Very densely populated area • More than 100 dwellings within 20 m • Local PM₁₀ concentrations exceed the objective • Very sensitive receptors nearby (e.g. hospitals) • Construction works continuing in one area of the site for more than 1 year 	European designated site
High	<ul style="list-style-type: none"> • Densely populated area • 10-100 dwellings with 20 m of the site • Schools, hi tech and food processing industries nearby • Local PM₁₀ concentrations are within 10% of the objective • Commercially sensitive horticultural land within 20 m 	Nationally designated site
Medium	<ul style="list-style-type: none"> • Suburban or edge of town area • Less than 10 receptors within 20 m • Local PM₁₀ concentrations between 10-25% below the objective 	Locally designated site
Low	<ul style="list-style-type: none"> • Rural area / industrial area • No receptors within 20 m • Local PM₁₀ concentrations are below 75% of the objective • Wooded area between site and receptors 	No designations

Table 3.5: Examples of receptor sensitivity to site preparation, demolition, earthworks and remediation phase and construction phase effects

3.65 A review of local aerial mapping indicates that the key (human) sensitive receptors are in the residential areas to the north of the site (i.e. in the vicinity of Middleton Stoney Road, Ray Road, Kennedy Road, Shannon Road, Eden Way, Isis Avenue, Hambleside, Shakespeare Drive, Villiers Road and Chalvey Road). There are very few receptors to the east, south and west of the site.

- 3.66 With regards to ecological receptors, there are no relevant statutory designated sites located within the immediate vicinity of the site that are considered to be sensitive to air quality. Ecological receptors are therefore not considered any further within this assessment.
- 3.67 Background concentrations obtained from DEFRA's website indicate that PM₁₀ concentrations in the vicinity of the site are currently more than 50% below the current AQS objective for this pollutant.
- 3.68 Taking into consideration all of the above, and the information presented in table 3.5, the overall sensitivity of the surrounding area to emissions of dust and particulates is considered to be medium. However, it is important to note that the construction of the additional 100 residential units will take place in tandem with the construction of the wider development (1,585 residential units plus 46 units at the reserved school site). Consequently, the number of sensitive receptors within the vicinity of the planned construction works will increase over time as the construction of the wider development takes place.

Air pollutants

- 3.69 In terms of locations that are highly sensitive to gaseous pollutants emitted from engine exhausts, these will include places where members of the public will be exposed to pollution over the period of time that they are present, and therefore the most suitable AQS averaging period of the pollutant needs to be used for assessment purposes.
- 3.70 For instance, on a footpath where exposure will be transient (i.e. for the duration of passage along that path) comparison with a short term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. In a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long term standard (such as 24-hour mean or annual mean) may be more appropriate. In general terms, long term standards are lower than short term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.
- 3.71 To complete the assessment of operational phase effects, a number of 'receptors' were identified at which pollution concentrations were predicted. The locations of the assessment receptors are shown on figure 3.1 and detailed in table 3.6. They include locations adjacent or near to the key roads within the study area and those roads that are likely to experience the greatest change in traffic volume as a result of the proposed development.

Receptor	Description	OS grid reference		Height above ground
		X	Y	
1	25 Tubb Close	457208	222487	1.8
2	35 Middleton Stoney	457322	222461	1.8
3	16 Goodwood Close	457371	222390	1.8
4	6 St Marys Close	457517	222372	1.8
5	10 Ray Road	457816	222291	1.8
6	Farm on the A41 Oxford Road	457694	221725	1.8
7	Little Chef / garage (on the A41)	457777	221998	1.8
8	Sports Club & Rifle Range	457925	222191	1.8
9	63 Shannon Road	456759	222648	1.8
10	94 Isis Avenue	456461	222767	1.8
11	37 Shannon Avenue	456903	222593	1.8

Table 3.6: Location of existing sensitive receptors

Baseline

3.72 The site is located in an area where air quality is mainly influenced by emissions from road transport. A number of roads pass close to the site, including the A41, B4030 Oxford Road and B4030 Middleton Stoney Road.

Industrial processes

3.73 A review of the Environment Agency's website reveals that there are two Part A1⁽¹⁶⁾ industrial processes within the vicinity of the site. These are:

- A wastewater treatment works (WWTW) operated by Thames Water, located approximately 0.5 km east of the site
- Intensive farming at Wendlebury Farm, operated by Faccenda Group Ltd, located approximately 0.3 km south east of the site

3.74 Between 2007 and 2010, there were no notifiable releases (i.e. above limits prescribed in their authorisation) to air from either process. Consequently, they are considered unlikely to significantly affect air quality in the vicinity of the site. Furthermore, the potential for future occupants of the proposed development to experience odour as a result of operations at the WWTW was scoped out of the original ES and, on this basis, has not been considered further within this assessment.

3.75 A review of CDC's air quality review and assessment reports reveals that there are no Part A2/B⁽¹⁷⁾ industrial processes within the vicinity of the site

¹⁶ Industrial processes regulated by the Environment Agency.

¹⁷ Industrial processes regulated by the local authority.

other than the petrol station on the A41, which is considered unlikely to significantly affect air quality at the site.

Cherwell District Council's Review and Assessment of Air Quality

- 3.76 CDC has designated one AQMA within its administrative area as part of its review and assessment work. This AQMA has been designated due to exceedances of the AQS objective for annual mean NO₂ concentrations and is located approximately 22 km north of the site.
- 3.77 The site does not fall within an AQMA, although recent monitoring undertaken by CDC has indicated that exceedances of the AQS objective for annual mean NO₂ concentrations are occurring within in the vicinity of Kings End / Queens Avenue, located approximately 0.2 km north east of the site. At the time of assessment, CDC had not declared this area as an AQMA.

Background air quality data

- 3.78 There are no automatic monitoring stations located within the immediate vicinity of the site from which appropriate background concentrations can be obtained. Suitable estimates have therefore been taken from DEFRA's website, where estimated background concentrations of the pollutants included in the AQS have been mapped at a grid resolution of 1x1 km grid squares for the whole of the UK.
- 3.79 Up until the end of April 2012, estimated background concentrations were available for NO₂, NO_x (required in the adjustment of NO₂ values) and PM₁₀ for all years between 2008 and 2020. These estimates assumed that, with improvements in vehicle technologies and tighter controls on emissions to air, background pollutant concentrations would improve over time, which has since been found not to be the case. DEFRA therefore released revised 2010 background maps for NO₂, NO_x and PM₁₀ for use by local authorities in undertaking their review and assessment work. These revised background maps take into account ambient monitoring and meteorological data for 2010, new information on the age distribution and emissions factors (for NO_x) for road vehicles and updated information on the composition of ambient concentrations of particulate matter.
- 3.80 DEFRA recommends that these revised background maps be used in all new air quality assessments and therefore they have been used in this assessment. To ensure a conservative approach to the assessment, the 2010 background concentrations have also been adopted for all future assessment scenarios.
- 3.81 Table 3.7 shows the estimated background concentrations of NO_x, NO₂ and PM₁₀ that were used in the assessment.

Receptor numbers	Grid reference		2010 annual mean concentration ($\mu\text{g}/\text{m}^3$)	
	X	Y	NO ₂	PM ₁₀
9, 10 and 11	456500	222500	13.96	16.49
1-5, 7 and 8	457500	222500	14.76	16.50
6	458500	222500	16.45	16.68
Verification	458500	222500	16.45	16.68

Table 3.7: Estimated background concentrations used in the assessment

3.82 Table 3.7 indicates that estimated background concentrations of NO₂ are below the objective limit of 40 $\mu\text{g}/\text{m}^3$ to be achieved by 2005 and thereafter. Estimated background concentrations of PM₁₀ are also predicted to meet the objective limit of 40 $\mu\text{g}/\text{m}^3$ to be achieved by 2004 and thereafter.

Local air quality monitoring data

3.83 Concentrations of NO₂ measured at CDC’s diffusion tube monitoring locations within the vicinity of the site are provided in table 3.8.

Site	Classification	Grid reference		Approx. distance from site	Annual mean NO ₂ concentration ($\mu\text{g}/\text{m}^3$)		
		X	Y		2009	2010	2011
Villiers Road	Roadside	457619	222535	0.2 km north	-	26.8	19.0
Kings End West	Roadside	458071	222450	0.3 km north	-	36.5	30.1
Kings End South	Roadside	458006	222404	0.2 km north	-	51.3	49.5
Kings End North	Roadside	457943	222304	0.1 km north	-	46.2	43.9
Field Street	Roadside	458274	222935	0.8 km north	-	46.2	42.9
North Street	Roadside	458214	222836	0.7 km north	-	44.1	46.1
Queens Avenue / Kings End	Roadside	458028	222471	0.3 km north	-	46.0	42.9
Market Square	Roadside	458589	222340	0.70 km north east	33.7	37.2	29.6

Table 3.8: NO₂ diffusion tube monitoring results ($\mu\text{g}/\text{m}^3$)

3.84 The results indicate that the AQS objective for annual mean NO₂ concentrations is being exceeded at the majority of locations in the vicinity of North Street, Kings End and Queens Avenue. Between 2010 and 2011, annual mean NO₂ concentrations decreased at all diffusion tube monitoring locations, with the exception of North Street where a small increase in concentrations was recorded between these years.

Baseline modelling

- 3.85 In order to establish current and future baseline air quality in the vicinity of the site, concentrations of NO₂ and PM₁₀ were predicted at a number of sensitive receptors (see table 3.6) using traffic flows provided for the 2012 ‘baseline’ and 2019 ‘without development’ scenarios.
- 3.86 The full results of the dispersion modelling are presented in technical appendix C.9 and a discussion of these is provided below.

Annual mean NO₂ concentrations

- 3.87 The objective for annual mean NO₂ concentrations is 40 µg/m³ to be achieved by the end of 2005 and thereafter. The results of the modelling show that in the 2012 baseline case concentrations are predicted to meet this objective at all but two of the assessment receptors (receptors 6 and 7, both properties along the A41 / B4030 Oxford Road). The highest concentration is 43.89 µg/m³, predicted at receptor 7, the petrol station / Little Chef.
- 3.88 It is important to note that as there is no long term exposure at these locations (i.e. the AQS objective for annual mean NO₂ concentrations does not apply), the short term (1-hour) objective is more applicable.
- 3.89 In general, the assessment results show good correlation with the results of recent air quality monitoring undertaken by CDC, which indicated that exceedences of the AQS objective for annual mean NO₂ concentrations may be occurring at roadside monitoring locations within the district.
- 3.90 In 2019, without the proposed development, the AQS objective for annual mean NO₂ concentrations is predicted to be met at all of the assessment receptors. The highest concentration is 35.00 µg/m³, again predicted at receptor 7.
- 3.91 It should be noted that NO₂ concentrations in 2019 are lower than those predicted in the 2012 baseline case. This is due to an expected future improvement (i.e. decrease) in vehicle emissions.

Hourly mean NO₂ concentrations

- 3.92 In both 2012 and 2019, without the proposed development, annual mean NO₂ concentrations predicted by the modelling were all below 60 µg/m³, and therefore exceedences of the hourly mean NO₂ concentration objective are unlikely to occur.
- 3.93 These results again agree with the conclusions of the review and assessment work undertaken by CDC, which concluded that no AQMAs needed to be designated due to exceedences of the AQS objective for hourly mean NO₂ concentrations.

Annual mean PM₁₀ concentrations

- 3.94 The objective for annual mean PM₁₀ concentrations is a concentration of 40µg/m³ to be achieved by the end of 2004 and thereafter. The results of the modelling show that, in the 2012 baseline case, this objective is predicted to be met at all of the existing assessment receptors. The highest concentration is 22.56 µg/m³, predicted at receptor 6, the farm to the east of the A41 Oxford Road.
- 3.95 These results agree with the conclusions of the review and assessment work undertaken by CDC, which concluded that no AQMAs needed to be designated for this pollutant.
- 3.96 In 2019, without the proposed development, the AQS objective for annual mean PM₁₀ concentrations is again predicted to be met at all the existing assessment receptors. The highest concentration is 22.97 µg/m³, again predicted at receptor 6.

24-hour mean PM₁₀ concentrations

- 3.97 The objective for 24 hourly mean PM₁₀ concentrations is 50 µg/m³ to be exceeded no more than 35 times a year by the end of 2004 and thereafter. The results of the dispersion modelling show that, in the 2012 baseline case, the number of exceedences is a maximum of seven days, which is below the objective.
- 3.98 These results again agree with the conclusions of the review and assessment work undertaken by CDC, which concluded that no AQMAs needed to be designated for this pollutant.
- 3.99 In 2019, without the proposed development, the number of exceedences is a maximum of eight days, which is also below the objective.

Effects of the proposals during construction

Dust and PM₁₀ generation

- 3.100 The proposed development (i.e. the additional 100 residential units) will not take place within one discrete area and instead will be split between the various parcels that make up the consented development. The number of additional units varies from three to 15 residential units per parcel.
- 3.101 The prevailing wind direction at the site is from the south west. Consequently, properties to the north east of the site are the most likely to experience an increase in dust deposition during the construction phase.
- 3.102 There are a limited number of receptors in the vicinity of the proposed development, with the majority of existing receptors located to the north of the site on the northern side of Middleton Stoney Road. According to the criteria produced by the IAQM, the proposed development is considered to be a medium risk site in terms of the potential for dust and PM₁₀ generation.

- 3.103 The air quality assessment undertaken for the 2006 ES concluded that the consented development would give rise to a negligible change in dust and particulate matter generation and, according to the significance criteria used in the original ES, determined the significance of dust and PM₁₀ generation during the construction phase to be not significant.
- 3.104 Given the number of additional residential units proposed per parcel, it is considered unlikely that there would be a significant change in dust or PM₁₀ deposition from the consented development as a result of the construction of the proposed development. Furthermore, a Construction Environmental Management Plan (CEMP) has been established for the consented development, which includes a number of measures to help minimise dust and PM₁₀ generation.
- 3.105 Based on the above and according to the significance criteria produced by the IAQM, the potential effects of dust and PM₁₀ generation and deposition during the construction phase of the proposed development are considered to be negligible (ES criteria – not significant).

Emissions to air from construction traffic

- 3.106 The original ES assessed traffic movements associated with the construction phase of the consented development as not significant. It is unlikely that the proposed development will significantly affect the volume of traffic associated with the consented development. The assessment of the air quality effects of the traffic associated with the construction of 1,585 units was negligible and the proposed development is for only 100 units.
- 3.107 On this basis, based on the significance criteria used within the 2006 ES, the effect of emissions from traffic associated with the construction phase of the proposed development is assessed as being not significant.

Effects of the proposals post-construction

Annual mean NO₂ concentrations

- 3.108 In 2019, the year in which the proposed development is anticipated to be fully complete, the AQS objective for annual mean NO₂ concentrations is predicted to be met at all of the existing assessment receptors. The highest concentration is 35.01 µg/m³, predicted at receptor 7, the petrol station / Little Chef located on the A41 / B4030 Oxford Road.
- 3.109 In 2019, the proposed development is predicted to cause an imperceptible change in annual mean NO₂ concentrations at all of the assessment receptors. The greatest change is 0.17 µg/m³, predicted at receptor 9, the façade of 63 Shannon Road.
- 3.110 According to the significance criteria used in this assessment, in 2019 the effect of the proposed development on annual mean NO₂ concentrations is

predicted to be negligible (ES criteria – not significant) at all of the assessment receptors.

Hourly mean NO₂ concentrations

- 3.111 In 2019, with the proposed development operational, annual mean NO₂ concentrations predicted by the model were all below 60 µg/m³. Consequently, exceedences of the hourly objective for NO₂ are considered unlikely.

Annual mean PM₁₀ concentrations

- 3.112 In 2019, the AQS objective for annual mean PM₁₀ concentrations is predicted to be met at all of the existing assessment receptors. The highest concentration is 22.97 µg/m³, predicted at receptor 6, the farm to the east of the A41 Oxford Road.
- 3.113 In 2019, the proposed development is predicted to cause no change in annual mean PM₁₀ concentrations at all of the assessment receptors. On this basis, the potential effect of the proposed development on annual mean PM₁₀ concentrations is considered to be neutral (ES criteria – not significant).

Daily mean PM₁₀ concentrations

- 3.114 The results of the modelling indicate that in 2019, with the proposed development operational, the objective for daily mean PM₁₀ concentrations would be met at all of the existing assessment receptors. The maximum number of days of exceedence is eight, which is below the objective of no more than 35 days of exceedence.
- 3.115 The proposed development is predicted to cause no change in the number of days of exceedence and, consequently, according to the significance criteria used in this assessment, the effect of the proposed development on daily mean PM₁₀ concentrations is considered to be neutral (ES criteria – not significant).

Mitigation

Construction phase

Dust and PM₁₀ generation

- 3.116 The impact of dust and PM₁₀ generation during the construction phase will be reduced through the implementation of the CEMP established for the consented development. No additional mitigation measures are considered necessary for the purposes of the proposed development.

Emissions from construction traffic

- 3.117 The potential effects of emissions from construction traffic will also be reduced through the implementation of the CEMP, which includes details regarding the routes to be used by construction traffic. On this basis, no further

mitigation measures are proposed for the purposes of the proposed development.

Post-construction

- 3.118 The consented development has been designed to encourage the use of alternative methods of transport (e.g. walking, cycling, buses) to reduce the reliance on the private car. This will benefit future occupants of the proposed development who will be located within a number of the development parcels within the consented development. The perimeter road has also now been constructed, which will help direct traffic away from the residential areas along Middleton Stoney Road, although it should be noted that the effect of this has been considered within the modelling undertaken for this air quality assessment.
- 3.119 Given that the proposed development is predicted to cause a negligible change in annual mean NO₂ concentrations and no change in annual and daily mean PM₁₀ concentrations, no additional mitigation measures are considered necessary to mitigate the air quality effects associated with the proposed development (i.e. the construction of 100 additional residential units).

Residual effects

Construction phase

- 3.120 According to the significance criteria produced by the IAQM, the residual effects of the construction phase in terms of dust and PM₁₀ generation are considered to be negligible.
- 3.121 According to the significance criteria used in the 2006 ES, the residual effects of emissions to air from construction traffic are considered to be not significant.

Post-construction

- 3.122 In 2019, the year in which the proposed development and consented development are anticipated to be completed, the AQS objectives for NO₂ and PM₁₀ are predicted to be met at all of the assessment receptors.
- 3.123 The proposed development is predicted to cause an imperceptible change in annual mean NO₂ concentrations and no change in annual or daily mean PM₁₀ concentrations.
- 3.124 Based on the above, the residual effect of the proposed development on annual mean NO₂ concentrations is considered to be negligible (ES criteria – not significant), whilst the residual effect of the proposed development on annual and daily mean PM₁₀ is considered to be neutral (ES criteria – not significant).

- 3.125 According to the assessment significance criteria produced by EPUK, the proposed development is considered to be a low priority consideration as it is not predicted to result in a significant increase in emissions nor cause a breach of any AQS objectives.