6.0 Air Quality

6.1 Introduction

6.1.1 This chapter of the ES will identify and describe the nature and significance of the potential effects in relation to air quality as a result of the proposed development.

6.1.2 Brookbanks Consulting, instructed by Hallam Land Management, has undertaken an air quality assessment for the proposed development and sets out its findings in this chapter of the Environmental Statement (ES) to be submitted in support of the proposed development at North West Bicester (northeast of the Marylebone-Birmingham railway line).

6.2 Regulatory and Policy Context

Legislative Context

6.2.1 The Air Quality Strategy (2007) 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.

6.2.2 The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 (Statutory Instrument, 2000) and the Air Quality (Amendment) (England) Regulations 2002 (Statutory Instrument, 2002).

6.2.3 The Local Air Quality Management Technical Guidance (LAQM. TG16) (Defra, 2021), issued by the Department for Environment, Food and Rural Affairs (Defra) for local authorities provides advice as to where the NAQOs apply.

6.2.4 The Air Quality Standards (Amendment) Regulations 2016 amended the Standard Regulations 2010, which implemented the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO_2 (Statutory Instrument, 2016). 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.

6.2.5 Of the pollutants included in the Air Quality Strategy, NO_2, PM_{10} and $PM_{2.5}$ are particularly relevant to the assessment, since these are the primary pollutants associated with road traffic. A summary of the NAQOs for these pollutants is presented in Table 6.1.

Table 6.1: National Air Quality Objectives

Pollutant	Standard ($\mu g/m^3$)	Averaging Period	Number of Permitted Exceedances per Annum
NO_2	40	Annual	-
	200	1-Hour	18
PM_{10}	40	Annual	-
	50	24-Hour	35
$PM_{2.5}$	25 (a)	Annual	-
(a)Exposure reduction target and EU Limit Value			

National Planning Policy Framework and Planning Practice Guidance

National Planning Policy Framework, 2021

6.2.6 The revised National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied (Ministry of Housing, Communities & Local Government, 2021). In relation to achieving sustainable development, Paragraph 8 states that:

"*Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):*

c) an environmental objective –to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development. Paragraph 11 states that plans and decisions should apply a presumption in favour of sustainable development, which for decision-taking means:

6.2.7 Paragraph 180 on ground conditions and pollution states:

"*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development*."

6.2.8 Paragraph 181 states that:

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

National Planning Practice Guidance

6.2.9 Planning Practice Guidance (PPG) (Planning Practice Guidance, 2014) was first published in March 2014 to support the National Planning Policy Framework. Paragraph 001, Reference 32-007-20140306 (revision date 06.03.2014) of the PPG 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."

Local Policy

Cherwell Local Plan Part 1 2011-2031 (Adopted 2015)

6.2.10 The Cherwell Local Plan sets out the strategic policies for future development in the District. With regard to air quality, Policy ESD10 "*Protection and Enhancement of Biodiversity and the Natural Environment' states that "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*."

6.2.11 In addition, Policy ESD15 'The Character of the Built and Historic Environment' states that "*New development proposals should Integrate and enhance green infrastructure and*

incorporate biodiversity enhancement features where possible. Well-designed landscape schemes should be an integral part of development proposals to support improvements to biodiversity, the microclimate, and air pollution and provide attractive places that improve people's health and sense of vitality".

6.2.12 The Local Plan also retains Policy ENV1 of the Adopted Local Plan 1996 , which states that "*development which is likely to cause materially detrimental levels of noise, vibration, smell, smoke, fumes or other type of environmental pollution will not normally be permitted*". Furthermore "*the Council will seek to ensure that the amenities of the environment, and in particular the amenities of residential properties, are not unduly affected by development proposals which may cause environmental pollution, including that caused by traffic generation*".

Cherwell District Council Air Quality Action Plan

6.2.13 Local Authorities are required to regularly review and assess air quality to establish whether there are any locations where pollutant concentrations exceed the relevant air quality objectives or EU limit values. Where an exceedance is identified, the local authority is obliged to declare an Air Quality Management Area (AQMA) and prepare an Action Plan setting out measures to improve air quality and achieve compliance with the objective(s).

6.2.14 To date, Cherwell District Council (CDC) have declared four AQMAs due to measured exceedances of the air quality objectives for NO_2. One of the AQMAs is in Bicester and incorporates sections of Kings End, Queens Avenue, Field Street, St Johns Street. The extent of the designated area is shown in Figure 6.1.

Figure 6.1: Cherwell District Council AQMA No. 4 (Bicester)

6.2.15 The remaining three Cherwell AQMA's are in Banbury and Kidlington and will not be affected by traffic associated with the proposed development.

6.3 Assessment Methodology

Overview of Approach

6.3.1 Potentially sensitive receptors have been identified based on the initial baseline assessments – including any sensitive ecological receptors.

Construction

6.3.2 The potential impacts of dust during construction will be assessed with reference to the Institute of Air Quality Management's (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014), which is accepted as industry standard guidance on this subject. Air quality will be assessed at a range of worst-case receptors. For construction and demolition dust effects, the study area will be within 350 metres of the site. Consideration will also be given to the potential location of future dwellings and other sensitive uses proposed within the development site. For construction traffic activities, the study area will be defined by the transport data where changes in traffic are significant, taking into account the thresholds defined by the IAQM guidance (IAQM, 2014).

Post Completion

6.3.3 The assessment of operational road traffic impacts will be undertaken using the ADMS Roads detailed dispersion model. The model will be used to predict concentrations within the development site to assess the suitability of the site for the full extent of the residential development as proposed, and also at off-site receptors to assess the impacts of additional traffic associated with the development. Model outputs will be verified against local air quality monitoring data. This modelling will make use of mapped background concentration data provided by Defra and of traffic flow projections.

6.3.4 Air quality will be assessed in relation to the NAQOs, established by the Government to protect human health. Air quality impacts arising from road traffic will be assessed with reference to guidance issued by the IAQM and Environment Protection UK (EPUK) in their document: Land-use Planning & Development Control: Planning for Air Quality (IAQM, 2017).

6.3.5 Existing local air quality, the likely future air quality in the absence of any further new development, and the likely future air quality if the development goes ahead will all be defined. The assessment of construction impacts will focus on the anticipated duration of works. The assessment of operational impacts will focus on impacts as a result of the proposed development.

6.3.6 The assessment will be based on a comparison of predicted air quality in:

- The baseline year (for model verification purposes);
- In the operational year with no development; and
- In the operational year with the proposed development.

6.3.7 Traffic associated with other proposed and committed development in the area are included in the future (operational year) baseline and therefore the cumulative impact of the proposed development with these schemes is intrinsic to the assessment.

Scoping and Response

6.3.8 A scoping document was produced outlining the proposed methodology for the assessment of potential air quality impacts. Cherwell District Council's Environmental Protection Team have confirmed that the proposed approach is acceptable.

Consultations Undertaken

6.3.9 Further consultation with the Environmental Protection Team was not required.

Surveys Undertaken

6.3.10 No surveys have been undertaken to support the air quality assessment.

Method for Assessing Baseline and Future Baseline Conditions

6.3.11 A review of existing air quality monitoring data for Bicester, published in Cherwell District Councils Annual Air Quality Status Reports, has been undertaken to determine the existing

and future baseline conditions at the proposed development and sensitive receptor locations. Supplementary background air quality data has been obtained from the Defra background maps, the most recent of which were published in August 2020 and are based on monitoring undertaken in 2018.

6.3.12 Pollutant concentrations measured in 2020 have not been included in the assessment, due to the influence of the Covid-19 pandemic on traffic levels.

Method for Assessing Impacts and Magnitude and Significance of Effects

Construction Dust

6.3.13 The potential impact of dust generated during site enabling, earthworks and construction works at the proposed development has been undertaken in accordance with the IAQM construction dust guidance (IAQM,2014). A full description of the assessment methodology is provided in Appendix 6A.

6.3.14 A detailed assessment of dust impacts is required where there are human receptors within:

- 350m of the site boundary; or
- 50m of the route(s) used by construction vehicles on public roads, up to 500m from the site entrance(s).

6.3.15 For ecological impacts, a detailed assessment is required if there are dust sensitive habitat sites within

- 50m of the site boundary; or
- 50m of the route(s) used by construction vehicles on public roads, up to 500m from the site entrance(s).

6.3.16 The IAQM methodology allows the potential risk of dust soiling and human health effects to be determined, based primarily on the sensitivity of nearby receptors and the anticipated magnitude of the dust emission due to:

- Demolition;
- Earthworks;
- Construction; and
- Track-out (re-suspended dust from vehicle movements).

6.3.17 The assessment of dust risk is also based on professional judgement taking into account factors such as the prevailing wind direction, the proposed construction phasing, the likely duration of dust raising activities, local topography and existing air quality.

6.3.18 A range of best practice mitigation measures are provided within the guidance, which are dependent on the level of dust risk attributed to the site. It is recommended that these

measures are incorporated into a Dust Management Plan (DMP) or Construction Environmental Management Plan (CEMP) for the proposed development.

6.3.19 The significance of the residual impacts following appropriate mitigation is determined by professional judgement.

Construction Traffic

6.3.20 The EPUK and IAQM air quality planning guidance sets out criteria to assist in establishing when an air quality assessment will be required. Within or adjacent to an AQMA, a detailed assessment of traffic-related impacts is required where:

- There is a change in the annual average daily traffic (AADT) flow of light goods vehicles (LGV) of more than 100 vehicles; and/or
- There is a change in the AADT flow of heavy goods vehicles (HGV) of more than 25 vehicles; and/or
- There is a change in the road re-alignment by more than 5m; and/or
- A new junction is introduced, which will significantly alter vehicle speeds.

6.3.21 Elsewhere, a detailed assessment of impacts is required where:

- There is a change in the annual average daily traffic (AADT) flow of light goods vehicles (LGV) of more than 500 vehicles; and/or
- There is a change in the AADT flow of heavy goods vehicles (HGV) of more than 100 vehicles; and/or
- There is a change in the road re-alignment by more than 5m; and/or
- A new junction is introduced, which will significantly alter vehicle speeds.

6.3.22 Detailed information regarding the number of vehicles that will be generated during the construction phase is not currently available. The construction traffic will not travel through the Bicester AQMA and thefore based on the phased nature of the development, the trip generation is very unlikley to exceed the above thresholds. On this basis, the temporary impact on air quality is expected to be neglgible.

Operational Traffic

6.3.23 A summary of the road links where the operational traffic AADT flow will exceed the IAQM/ EPUK screening thresholds is presented in Table 6.2.

Table 6.2: Operational Traffic Flows (AADT)

Road Link	LGV	HGV	In AQMA?
A41 Oxford Rd, S of A41 junction	1300	18	No
Vendee Drive, W of A41 junction	578	8	No
A41, N of Pingle Drive	947	13	No
Middleton Stoney Rd, W of Kings End	507	7	No
Middleton Stoney Rd, W of Howes Lane	3870	54	No
Bucknell Road, S of Howes Lane	561	8	No
Banbury Road, N of Lords Lane	1275	18	No
Banbury Road, S of A4095	1199	17	No
Buckingham Road, S of Skimmingdish Lane	1348	19	No
Queens Avenue, S of Bucknell Road	824	12	Yes
A41 E of A41 Oxford Road	1080	15	No
A4421 Neunkirchen Way	752	11	No
A4421, E of Skimmingdish Lane	983	14	No
Shakespeare Drive, S of Howes Lane	556	8	No
M40 J10 northbound off slip road	951	13	No
Shakespeare Drive, E of Middleton	1099	15	No
The Approach, W of Bucknell Road	1222	17	No
Middleton Road, W of Bucknell	1486	21	No
B4030 Middleton Stoney Road, NW of NWB	1272	18	No
M40 northbound (mainline only), S of J10 / N of J9	931	13	No

6.3.24 Detailed dispersion modelling of emissions from traffic has been undertaken using the ADMS-Roads dispersion model, to determine the potential impact of the operational traffic on air quality at sensitive receptors close to the identified road links.

6.3.25 The ADMS-Roads dispersion model is a commercially available dispersion model that has been widely validated for this type of assessment. A summary of the model input parameters is presented in Appendix 6.2. The data includes details of annual average daily traffic flows (AADT), vehicle speeds and percentage HGV for the assessment scenarios considered.

6.3.26 Concentrations of NOx, PM_{10} and $PM_{2.5}$ have been predicted using 2031 vehicle emission factors from the latest version of the Emissions Factor Toolkit (v11). The predicted NOx concentrations have been converted to NO_2 using version 8.1 of the NOx to NO_2 calculator, available from the Defra air quality website .

6.3.27 Hourly sequential meteorological data from RAF Benson (approximately 33 km south of the proposed development) for 2018 has been used in the dispersion modelling).

6.3.28 LAQM.TG16 describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

6.3.29 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standard (i.e., 15 minute mean or 1 hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term (such as 24 hour mean or annual mean) standards may be most appropriate. In general terms, concentrations associated with 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.

6.3.30 Pollutant concentrations have been predicted at worst-case (closest to the carriageway) locations on the road links identified in Table 6.1. Details of these receptors are presented in Table 6.3. Unless specified otherwise, concentrations have been predicted at a typical exposure height of 1.5m above ground-level. The location of the sensitive receptors is presented in Figure 6 2.

Table 6.3: Sensitive Receptors

ID	Location	Type	Easting	Northing
1	Pine Close	Residential	458940	224315
2	Curtiss Close	Residential	459384	224034
3	Fair Close	Residential	458710	223842
4	Hill View, Buckingham Road	Residential	458479	223360
5	1 Buckingham Road	Residential	458290	222972
6	4 Field Street	Residential	458207	222855
7	33 Bucknell Road	Residential	457850	223229
8	Ewart Close	Residential	457685	223449
9	Chaucer Close	Residential	456955	223607
10	Shakespeare Drive	Residential	456926	222627
11	Tubb Close	Residential	457213	222482
12	Kings End	Residential	458006	222398
13	Newton Close	Residential	457879	222200
14	Lovelynych House, Middleton Stoney Road	Residential	455422	223133

15	Linkslade, Middleton Stoney Road	Residential	454897	223314
16	The Barn House, Ardley Road	Residential	454890	227251
17	Bucknell	Residential	455905	225555
18	Kestral Way	Residential	459316	221285
19	Lodge Close	Residential	458185	224321
20	2 Stable Road	Residential	458260	223466
21	2 Banbury Road	Residential	458278	222980
22	Green Acres	Residential	458110	225011

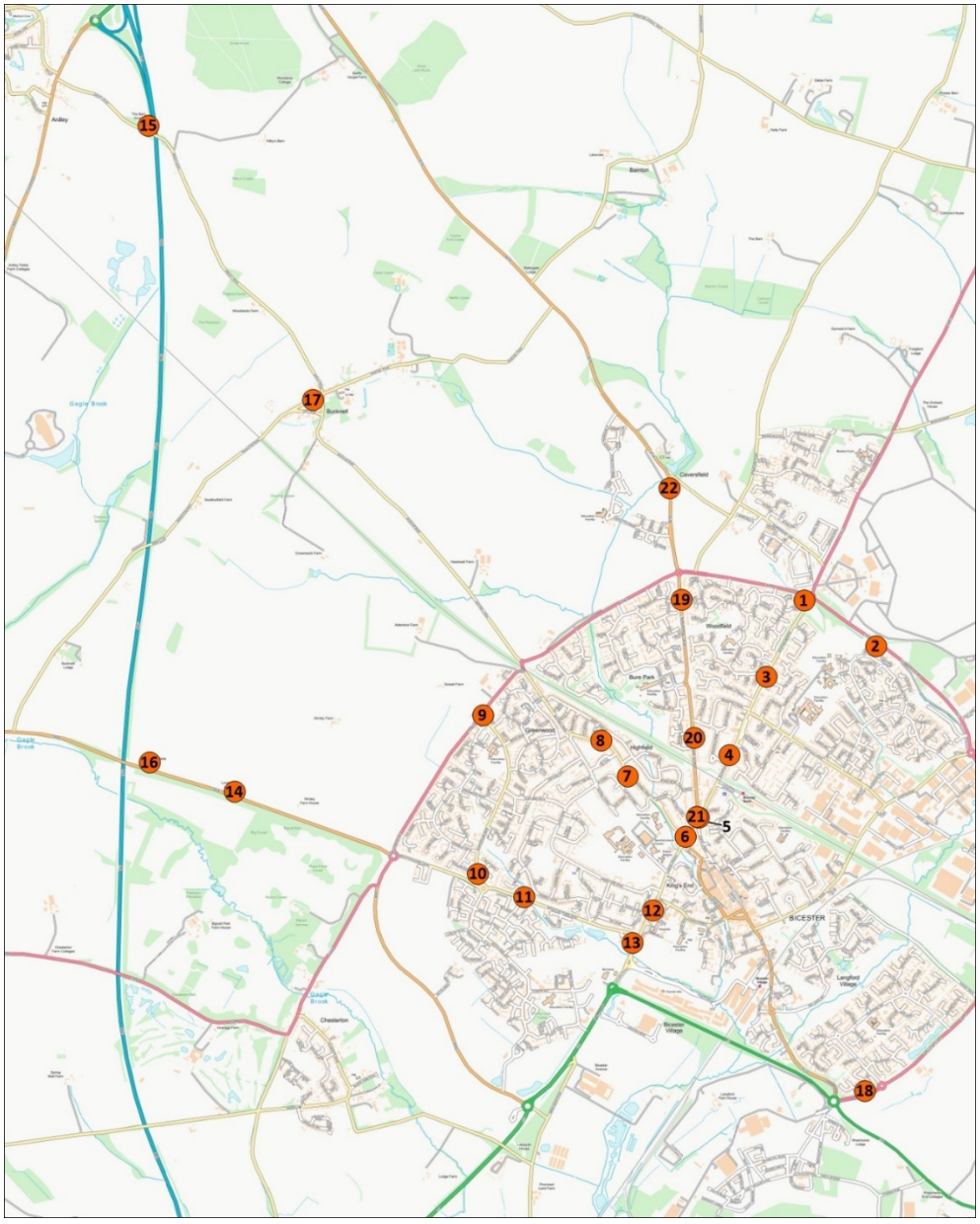

Figure 6.2: Sensitive Receptor Locations

6.3.31 There are no statutory designated habitat sites or ancient woodland within 200m of the road links identified in Table 6.1. The impact of emissions from operational traffic associated with the Proposed Development on local, national or European (Natura 2000) habitat sites, is therefore considered to be negligible.

6.3.32 The significance of the predicted long-term impact at human health receptors is determined in accordance with the EPUK/ IAQM planning guidance, in combination with the professional judgement of the author. The impact at individual receptors depends on the predicted change in the pollutant concentration compared with the relevant air quality standard or objective and existing air quality as illustrated in Table 6.4.

Table 6.4: Impact Descriptors for Individual Receptors

Long term average concentration at receptor	**% Change in concentration relative to Air Quality Assessment Level (AQAL)**			
	1	**2-5**	**5-10**	**>10**
75% or less of AQAL	Negligible	Negligible	Minor Adverse	Moderate Adverse
76-94% of AQAL	Negligible	Minor Adverse	Moderate Adverse	Moderate Adverse
95-102% of AQAL	Minor Adverse	Moderate Adverse	Moderate Adverse	Major Adverse
103-109% of AQAL	Moderate Adverse	Moderate Adverse	Major Adverse	Major Adverse
110% or more of AQAL	Moderate Adverse	Major Adverse	Major Adverse	Major Adverse
Note: A change in concentration of less than 0.5% of the AQAL is considered insignificant, however changes between 0.5% and 1% are rounded up to 1%.				

6.3.33 Short-term impacts of less than 10% of the AQAL are described as 'negligible', regardless of existing air quality. Where the short-term process concentrations are 10-20% of the AQAL the severity of the impact is described as 'minor adverse'. Impacts of 20-50% and over 50% are described as 'moderate' and 'major' adverse, respectively.

6.3.34 The IAQM/ EPUK guidance states that when a single development is judged in isolation, a 'moderate' or 'major' impact is likely to give rise to a significant effect on air quality, whereas a 'negligible' or 'slight' impact would not have a significant effect. However, professional judgement is required taking into account the 'existing and future air quality in the proposed development; the extent of current and future population exposure to the impacts; and the influence and validity of any assumptions adopted when undertaking the prediction of impacts.'

6.3.35 The potential exposure of future occupants to poor air quality has been assessed by predicting pollutant concentrations at four locations on the site, representing residential

areas (receptors 2,3,and 4) and a proposed school (receptor 1). The location of the on-site receptors in shown in Figure 6.3.

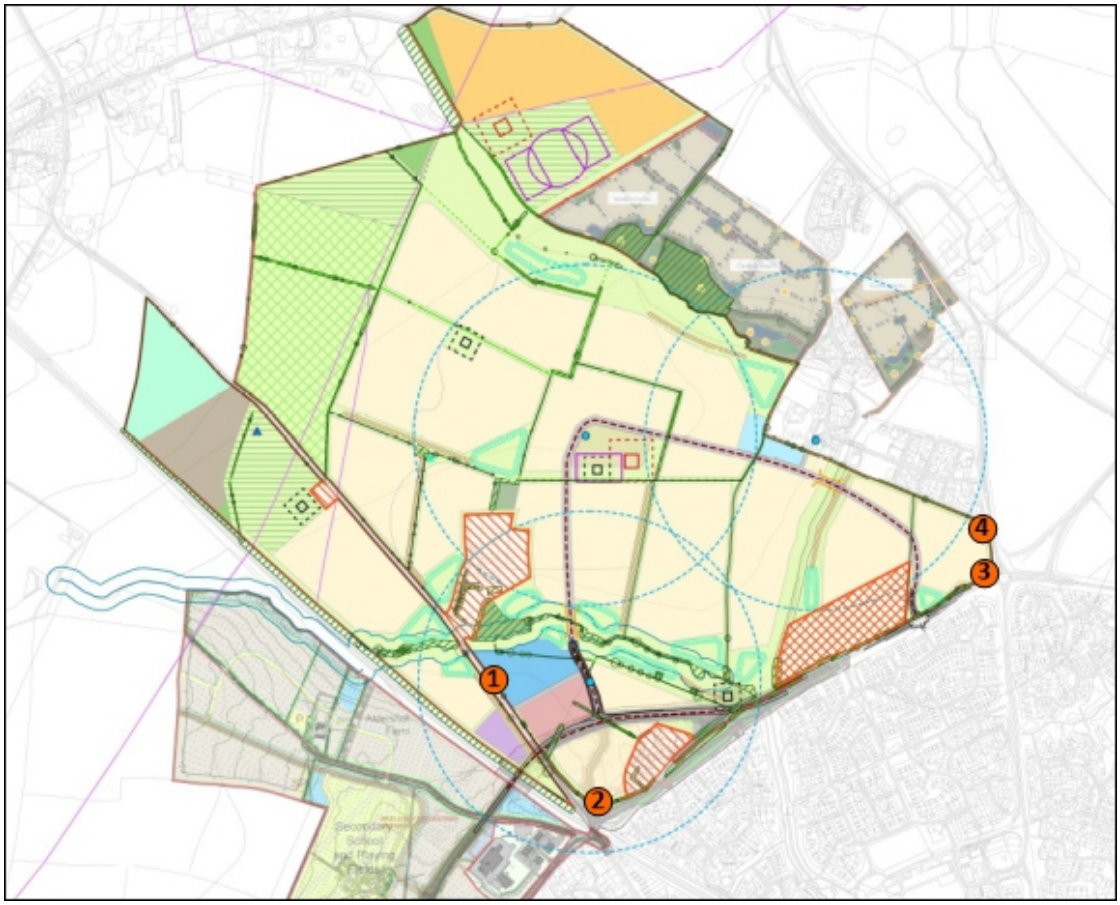

Figure 6.3: On-Site Receptor Locations

Limitations and Assumptions

6.3.36 There is an inherent level of uncertainty associated with any assessment process; however, the methodology presented has been developed to minimise errors where possible. Potential errors in predicted concentrations due to uncertainties in the assessment source activity data (e.g., traffic flows and emission factors) and the estimated background concentration are minimised by the verification of modelled concentrations using local monitoring data.

6.3.37 LAQM.TG16 recommends that modelled concentrations should be within 25% of monitored concentrations, ideally within 10%. Where there is a large discrepancy between modelled and measured concentrations, it is considered necessary to adjust the model results to reflect local air quality more accurately.

6.3.38 The modelled NO_2 concentrations have been verified using 2018 data from roadside diffusion tube monitoring sites on Kings End (within the AQMA), A4095 Howes Lane and A4095 Lords

Lane. Other monitoring sites in the area were excluded from model verification because of poor traffic data availability or because they are at kerbside locations. Full details of the model verification process are presented in Appendix 6.3.

6.4 Baseline Conditions

Existing

6.4.1 Cherwell District Council monitor ambient NO_2 concentrations via a network of passive diffusion tubes, of which 13 are located in Bicester. Details of the monitoring sites are presented in Table 6.5. Tubes 21, 22, 23 and 24 are located within the Bicester AQMA. The locations of the monitoring sites is shown in Figure 6.4.

Table 6.5: Diffusion Tube Monitoring Sites

ID	Location	Easting	Northing	Type
18	Villiers Road	457619	222535	Urban Background
19	A41, Oxford Rd (Premier Inn)	458419	222334	Kerbside
20	Kings End South	458006	222404	Roadside
21	St Johns 2014	458310	222720	Kerbside
22	Field Street	458214	222836	Kerbside
23	North Street	458274	222935	Kerbside
24	Queens Avenue (x3)	458028	222471	Kerbside
25	Market Square 2014	458539	222381	Roadside
26	Tamarisk Gardens	458333	224432	Urban Background
27	Howes Lane 2014	457956	224362	Roadside
28	Aylesbury Rd 2014	459100	221190	Roadside
29	London Road 2016	458721	222115	Roadside
30	Shakespeare Drive 2016	456937	223586	Roadside

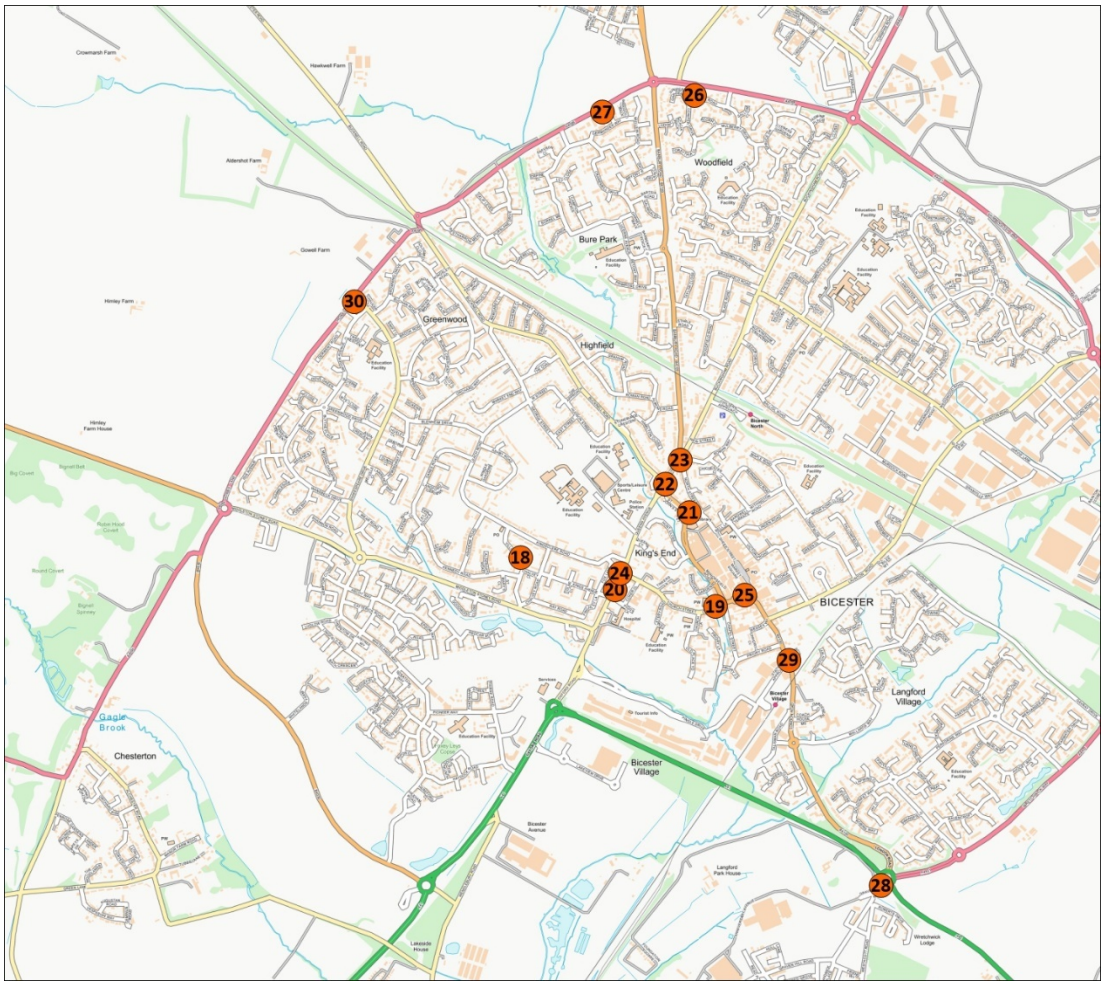

Figure 6.4: Monitoring Locations

6.4.2 A summary of bias adjusted annual mean NO_2 concentrations measured between 2015 and 2019 is presented in Table 6.6. Data for 2020 has not been included in the assessment due to the effect of the Covid-19 pandemic on traffic levels and consequently, pollutant concentrations. Exceedances of the air quality objective of 40 µg/m^3 are highlighted in bold.

6.4.3 At locations outside the AQMA, concentrations of NO_2 remain well within the objective and the data indicate a significant decline overall between 2016 and 2020. Within the AQMA, there are ongoing exceedances at the roadside diffusion tube on Kings End, although a decline in concentrations is also evident at this location.

Table 6.5: Annual Mean NO_2 Concentrations Measured in Bicester

ID	Type	2015	2016	2017	2018	2019
18	Urban Background	16.9	18.2	17.9	17.2	17.0
19	Kerbside	-	-	-	-	25.5
20	Roadside	**46**	**46**	**41.7**	**41.9**	**41.5**

21	Kerbside	38.3	36.2	37.8	38.6	31.7
22	Kerbside	36.5	34.3	33.5	31.6	32.1
23	Kerbside	**41.8**	37.9	36.5	37.6	35.6
24	Kerbside	**40.6**	**40.5**	39.5	35.0	35.6
25	Roadside	23.7	25.4	24.7	23.1	22.2
26	Urban Background	15.7	17.2	16.3	15.9	15.0
27	Roadside	23.9	25.6	25.6	24.5	20.7
28	Roadside	30.5	30	28.8	29.5	26.7
29	Roadside	-	29.1	26.3	25.7	23.6
30	Roadside	-	23.2	24.0	23.4	23.2

6.4.4 Diffusion tubes 27 and 30 measure concentrations close to the A4095, which runs adjacent to the southwest boundary of the proposed development. The data indicate that concentrations are well within the air quality objective. At Tamerisk Gardens, an urban background site approximately 35m from the A4095, the concentrations in 2019 were less than 40% of the air quality objective. Existing NO_2 concentrations at the proposed development are therefore expected to be well within the annual mean air quality objective.

6.4.5 Research has shown that exceedances of the short-term objective for NO_2 are unlikely where the annual mean concentrations are below 60 $\mu g/m^3$ (Laxen and Marner, 2003). The measured concentrations at all locations in Bicester are well below this threshold and therefore the risk of an exceedace of 1-hour mean NO_2 objective at the proposed development is considered to be negligible.

6.4.6 Cherwell District Council do not currently monitor particulate concentrations and therefore background PM_{10} and $PM_{2.5}$ concentrations have been obtained from the Defra UK Background Air Pollution maps (https://uk-air.defra.gov.uk/data/laqm-background-home). These 1km grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The latest version of the background maps were issued in August 2020 and are based on 2018 monitoring data, with projections for future years.

6.4.7 A summary of the 2018 (verification year) mapped annual mean PM_{10} and $PM_{2.5}$ background concentrations at the proposed development and the identified sensitive receptor locations is presented in Table 6.6. Data for NO_2 are also included for comparison with the measured urban background concentrations at Villiers Road and Tamerisk Gardens. The concentrations presented were derived from contour plots of the mapped data and represent the maximum and minimum over the assessment area.

Table 6.6: Mapped 2018 Background NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Pollutant	2018 Annual Mean (µg/m³)	NAQO (µg/m³)
NO_2	10.2 – 11.5	40
PM_{10}	15.0 – 15.9	40
$PM_{2.5}$	9.7 – 10.9	25

6.4.8 The maximum urban background NO_2 concentration measured in Bicester in 2018 was 17.2 µg/m³, considerably higher than the maximum mapped concentration. To account for the potential underestimation of NO_2 concentrations in the area, the maximum measured concentration has been used for verification purposes.

6.4.9 The mapped background PM_{10} and $PM_{2.5}$ concentrations are less than 50% of the air quality objectives. Whilst there will be an additional contribution from road traffic emissions, existing concentrations at the proposed development and sensitive receptor receptor locations are expected to be well within the objectives.

Future Baseline Conditions (DO Nothing Scenario)

6.4.10 The latest year for which mapped data is available is 2030 and no estimated concentrations are available for 2031, the proposed opening year. A summary of the maximum and minimum 2030 mapped annual mean background concentrations at the proposed development and receptor locations is presented in Table 6.7.

6.4.11 The concentrations are lower than in 2018 due to anticipated emissions reductions associated with increasingly stringent standards, the gradual renewal of the vehicle fleet and the increased uptake of electric vehicles.

Table 6.7: Mapped Future Background NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Pollutant	2030 Annual Mean (µg/m³)	NAQO (µg/m³)
NO_2	6.7 – 8.0	40
PM_{10}	13.8 – 14.4	40
$PM_{2.5}$	8.6 – 9.7	25

6.4.12 The projections are based on assumptions which were current before the Covid-19 outbreak in the UK. Consequently, the mapped data do not reflect short or longer term impacts on emissions resulting from behavioural change during the national or local lockdowns.

6.4.13 To ensure that the assessment of potential impacts is as conservative as possible, concentrations have been predicted at the proposed development and sensitive receptors in 2031, using 2018 background concentrations, as summarised in Table 6.8.

Table 6.8: Assessment Background NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Pollutant	Annual Mean (µg/m³)	NAQO (µg/m³)
NO_2	17.2	40
PM_{10}	15.9	40
$PM_{2.5}$	10.9	25

6.5 Assessment of Likely Significant Effects

Construction Effects

Dust

6.5.1 Sensitive receptors that may be affected by dust emissions during construction activities include residential properties, educational facilities, retail premises, places of work, recreational areas and ecological receptors.

6.5.1 The sensitivity of the area to dust soiling impacts is dependent on the proximity of the most sensitive receptors to the site boundary. A summary of the receptor and area sensitivity to health and dust soiling impacts is presented in Table 6.9. It has been has assumed that, due to the phased development of the site, some residential properties will be in occupation during the later stages of the construction phase.

6.5.2 There are no dust sensitive habitat sites within 50m of the Site; therefore, ecological impacts have not been considered in the assessment.

6.5.3 The sensitivity of the area to impacts on human health impacts is also based on the proximity of the most sensitive receptors, but it also dependant on existing particulate concentrations in the area. The higher the existing PM_{10} concentration the more likely health impacts will occur at receptor locations. Based on the mapped background concentrations in Bicester, it is assumed that the existing PM_{10} concentrations in the area are below 24 µg/m^3.

6.5.4 Due to the close proximity of Gagle Brook Primary School and the potential for new occupants to be exposed to dust from ongoing construction works, the area surrounding the proposed development is considered to be of 'medium' sensitivity to health impacts and 'high' sensitivity to dust soiling impacts.

Table 6.9: Assessment Background NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Receptor	Distance from Site Boundary	No. of Receptors	Sensitivity to Health Impacts		Sensitivity to Dust Soiling Impacts	
			Receptor	Area	Receptor	Area
Residential properties	<20m	10 - 100	High	Medium	High	High
	<50m	>100	High	Low	High	High

Gagle Brook Primary	<20m	>100	High	Medium	High	High

6.5.5 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

6.5.6 A wind rose from RAF Benson (2018) is provided below in Figure 6.5, which shows that the prevailing wind is from the south. Receptors located to the north are therefore most likely to experience significant impacts as a result of dust generated during the construction process.

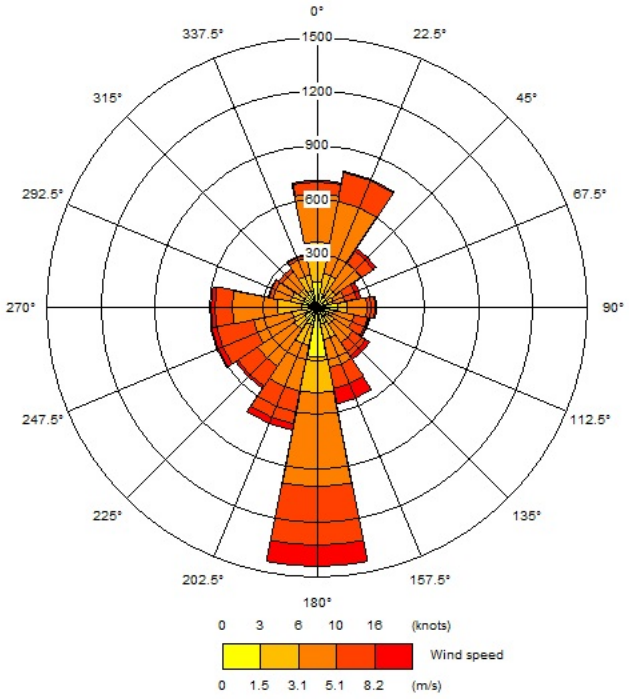

Figure 6.5: Wind Rose RAF Benson 2018

6.5.7 The magnitude of the likely dust emission from earthworks, construction and trackout is presented in Table 6.10. The development is a greenfield site and therefore no significant demolition works are required.

Table 6.10: Dust Emission Magnitude

Dust Source	IAQM Criteria	Proposed Development	Dust Emission Magnitude
Earthworks	Total site area	>10,000 m2	Large
	Soil type?	Assumed moderately dusty.	Medium
	Number of heavy earth moving vehicles active at any one time	Assumed 10 – 50.	Medium
	Maximum bund height	Based on scale of works, assumed 4 – 8m.	Large
	Total material moved	>100,000 tonnes	Large
	Earthworks during wetter months?	Assumed no.	Medium
Dust Emission Magnitude from Earthworks			**Large**
Construction	Total building volume	>100,000 m3	Large
	Potentially dusty construction materials?	Brick, concrete	Medium
	On-site concrete batching?	Assumed yes	Large
	Sandblasting?	Assumed no.	n/a
Dust Emission Magnitude from Construction			**Large**
Trackout	Number of outward HGV movements in any one day	>50	Large
	Dusty surface material?	Assumed moderately dusty.	Medium
	Unpaved road length	>100m	Large
Dust Emission Magnitude from Construction			**Large**

6.5.8 A summary of the potential risk of dust impacts prior to mitigation, based on the 'medium' sensitivity of the area to human health impacts and 'high' sensitivity to dust soiling impacts is presented in Table 6.11.

6.5.9 Measures recommended to mitigate the dust impacts, based on the risk, are presented later in the report.

Table 6.11: Dust Risk, Prior to Mitigation

Dust Source	Emission Magnitude	Human Health Risk	Dust Soiling Risk	Overall Dust Risk
Earthworks	Large	Medium	High	High
Construction	Large	Medium	High	High
Trackout	Large	Medium	High	High

Operational Effects

Traffic

6.5.10 Predicted 2031 annual mean NO_2 concentrations at the identified receptor locations, without (Do Nothing) and with (Do Something) the proposed development traffic are presented in Table 6.12.

6.5.11 The predicted concentrations at all locations are well below the air quality standard of 40 µg/m^3. The maximum increase due to the proposed development traffic occurs at 1 Buckingham Road (receptor 5) and 2 Banbury Road (receptor 21), at 2% of the air quality standard. However, the predicted concentrations are less than 75% of the objective and therefore in accordance with the IAQM/ EPUK criteria, the impact is 'negligible'.

Table 6.12: Predicted Annual Mean NO_2 Concentrations (µg/m^3)

ID	Receptor	Do Nothing	Do Something	Increase (% of AQAL)	Impact
1	Pine Close	19.3	19.4	0%	Negligible
2	Curtiss Close	21.5	21.7	0%	Negligible
3	Fair Close	21.8	22.2	1%	Negligible
4	Hill View, Buckingham Road	21.9	22.4	1%	Negligible
5	1 Buckingham Road	25.3	26.0	2%	Negligible
6	4 Field Street	27.6	28.1	1%	Negligible
7	33 Bucknell Road	20.0	20.3	1%	Negligible
8	Ewart Close	20.5	20.7	1%	Negligible
9	Chaucer Close	20.6	20.7	0%	Negligible
10	Shakespeare Drive	21.4	21.7	1%	Negligible
11	Tubb Close	20.5	20.7	0%	Negligible
12	Kings End	26.7	27.1	1%	Negligible
13	Newton Close	22.3	22.4	0%	Negligible
14	Lovelynych House, Middleton Stoney Road	18.6	19.1	1%	Negligible

15	Linkslade, Middleton Stoney Road	29.7	29.9	0%	Negligible
16	The Barn House, Ardley Road	20.7	20.9	0%	Negligible
17	Bucknell	18.1	18.7	2%	Negligible
18	Kestral Way	20.2	20.3	0%	Negligible
19	Lodge Close	20.4	20.8	1%	Negligible
20	2 Stable Road	21.1	21.5	1%	Negligible
21	2 Banbury Road	25.2	26.0	2%	Negligible
22	Green Acres	26.1	26.6	1%	Negligible

6.5.12 The predicted PM_{10} and $PM_{2.5}$ concentrations at receptor locations are presented in Table 6.13 and Table 6.14, respectively. The concentrations are well below the long term air quality objectives at all locations. The increase, due to the operational traffic, is less 0.5 µg/m^3 for both pollutants, and therefore the impact on particulate concentrations is 'negligible'.

Table 6.13: Predicted Annual Mean PM_{10} Concentrations (µg/m^3)

ID	Receptor	Do Nothing	Do Something	Increase (% of AQAL)	Impact
1	Pine Close	17.3	17.4	0%	Negligible
2	Curtiss Close	18.9	19.0	0%	Negligible
3	Fair Close	19.0	19.3	1%	Negligible
4	Hill View, Buckingham Road	19.1	19.3	1%	Negligible
5	1 Buckingham Road	21.2	21.6	1%	Negligible
6	4 Field Street	22.4	22.7	1%	Negligible
7	33 Bucknell Road	17.6	17.8	1%	Negligible
8	Ewart Close	17.9	18.0	0%	Negligible
9	Chaucer Close	18.2	18.2	0%	Negligible
10	Shakespeare Drive	18.4	18.6	1%	Negligible
11	Tubb Close	17.9	18.0	0%	Negligible
12	Kings End	21.8	22.0	1%	Negligible
13	Newton Close	19.0	19.1	0%	Negligible
14	Lovelynych House, Middleton Stoney Road	16.5	16.7	1%	Negligible
15	Linkslade, Middleton Stoney Road	20.4	20.5	0%	Negligible

16	The Barn House, Ardley Road	17.2	17.2	0%	Negligible
17	Bucknell	16.2	16.5	1%	Negligible
18	Kestral Way	18.0	18.0	0%	Negligible
19	Lodge Close	17.8	18.0	1%	Negligible
20	2 Stable Road	18.2	18.5	1%	Negligible
21	2 Banbury Road	20.9	21.4	1%	Negligible
22	Green Acres	20.6	20.9	1%	Negligible

Table 6.14: Predicted Annual Mean $PM_{2.5}$ Concentrations ($\mu g/m^3$)

ID	Receptor	Do Nothing	Do Something	Increase (% of AQAL)	Impact
1	Pine Close	11.6	11.7	0%	Negligible
2	Curtiss Close	12.5	12.6	0%	Negligible
3	Fair Close	12.6	12.7	1%	Negligible
4	Hill View, Buckingham Road	12.6	12.8	1%	Negligible
5	1 Buckingham Road	13.8	14.0	1%	Negligible
6	4 Field Street	14.5	14.6	1%	Negligible
7	33 Bucknell Road	11.8	11.9	0%	Negligible
8	Ewart Close	12.0	12.1	0%	Negligible
9	Chaucer Close	12.1	12.2	0%	Negligible
10	Shakespeare Drive	12.3	12.4	0%	Negligible
11	Tubb Close	12.0	12.0	0%	Negligible
12	Kings End	14.2	14.3	0%	Negligible
13	Newton Close	12.6	12.7	0%	Negligible
14	Lovelynych House, Middleton Stoney Road	11.3	11.4	1%	Negligible
15	Linkslade, Middleton Stoney Road	13.6	13.7	0%	Negligible
16	The Barn House, Ardley Road	11.7	11.7	0%	Negligible
17	Bucknell	11.1	11.2	1%	Negligible
18	Kestral Way	12.0	12.1	0%	Negligible
19	Lodge Close	11.9	12.1	0%	Negligible
20	2 Stable Road	12.2	12.3	1%	Negligible
21	2 Banbury Road	13.6	13.9	1%	Negligible
22	Green Acres	13.6	13.8	1%	Negligible

On- Site Exposure

6.5.13 A summary of the predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations at the identified on-site receptors is presented in Table 6.15. The predicted concentrations are well below the relevant long-term air quality standards.

6.5.14 The predicted NO_2 concentrations are less than 50% of the 60 µg/m^3 threshold (which is indicative of a potential non-compliance with the 1-hour mean NO_2 objective) and therefore risk of a short-term exceedance at any location on-site is also 'negligible'.

6.5.15 LAQM.TG16 provides a relationship between predicted annual mean PM_{10} concentrations and the likely number of exceedances of the short-term (24-hour mean) PM_{10} objective of 50 µg/m^3. The objective allows 35 exceedances per year, which is equivalent to an annual mean of 32 µg/m^3. On this basis, the dispersion modelling indicates that compliance with the short term PM_{10} objective will be achieved at all locations on site.

6.5.16 Based on the results of the dispersion modelling, the proposed development will not introduce new exposure to poor air quality.

Table 6.15: Predicted Annual Mean Pollutant Concentrations at the Proposed Development (µg/m^3)

Receptor	NO_2	PM_{10}	$PM_{2.5}$
1	18.5	16.7	11.4
2	21.2	18.6	12.4
3	22.2	19.2	12.7
4	24.3	19.7	13.1

6.6 Mitigation Measures

Embedded Mitigation in Proposed Development

6.6.1 The proposed development has been designed to encourage sustainable transport, including the provision of electric vehicle charging points and secure cycle parking. A Framework Travel Plan has been developed to minimise vehicle trips associated with the site during the operational phase.

6.6.2 The proposed development also includes extensive landscaping, which will support improvements in air pollution.

Mitigation of Construction Effects of Development

6.6.3 Best Practice Guidance for dust control will be implemented, as appropriate, during the construction phase through the DMP or CEMP for the proposed development. The mitigation measures are based on the assessed risk of impacts presented in Table 6.11.

6.6.4 In accordance with the IAQM guidance the 'highly recommended' mitigation measures detailed in Table 6.16 should be incorporated into the DMP or CEMP.

6.6.5 The significance of dust impacts on nearby receptors following the implementation of appropriate and best practice mitigation is expected to be negligible.

Table 6.16: Highly Recommended Mitigation Measures

Category	Measure
General	• Develop and implement a stakeholder communications plan that includes community engagement before work commences • on site. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site Manager. • Display the head or regional office contact information.
Site management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook. • Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.
Monitoring	• Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP or CEMP. Record inspection results, and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences.
Preparing and maintaining the site	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Erect solid screens or barriers around dusty activities or at the site boundary that are at least as high as any stockpiles 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 runoff of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. • Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel	• Ensure all vehicles switch off engines when stationary - no idling vehicles. • Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate) • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. • Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. • Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management	• Avoid bonfires and burning of waste materials.
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. • Only remove the cover in small areas during work and not all at once
Construction	• Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.

	• For smaller supplies of fine power materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	• Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Record all inspections of haul routes and any subsequent action in a site logbook. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. • Access gates to be located at least 10 m from receptors where possible.

Mitigation of Operational Stages of Development

6.6.6 Operational traffic associated with the proposed development is predicted to have a negligible impact on local air quality, therefore no additional mitigation measures are proposed.

6.7 Residual Effects

Construction Effects

6.7.1 The residual effects of dust and particulate matter generated by construction activities will be minimised by following the mitigation measures outlined within this report. The residual effects are therefore considered to be negligible.

Operational Effects

6.7.2 The residual impact of the proposed development on local air quality is considered to be negligible

6.8 Cumulative Effects

6.8.1 The list of schemes considered as part of the cumulative effects within the ES chapter are listed in section 1.

6.8.2 The future baseline traffic flows used in the assessment of operational traffic impacts include traffic associated with these schemes and therefore the cumulative effects are intrinsic to the assessment. The cumulative effects are therefore predicted to be negligible.

6.9 Summary Statement of Effects

6.9.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the proposed development.

6.9.2 An assessment of the potential impacts during the construction phase has been undertaken in accordance with the Institute of Air Quality Management Guidance. This has shown that during this phase of the proposed development releases of dust and PM_{10} are likely to occur during site activities. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases may be effectively mitigated, and the resultant impacts are expected to be negligible.

6.9.3 Detailed dispersion modelling (using ADMS-Roads) has been undertaken to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the proposed development in the opening year (2031). The predicted concentrations are well within the relevant short and long term air quality objectives for the protection of health and therefore the proposed development will not introduce new exposure to poor air quality.

6.9.4 Dispersion modelling has also been undertaken to assess the potential impact of operational traffic associated with the proposed development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at worst-case sensitive receptor locations. The impact on air quality at all locations is predicted to be negligible.

6.9.5 Based on the results of the assessment, air quality is not considered a constraint to the development of the site, as proposed.

Table 6.17: Assessment of Significance of Residual Effects

Possible Effect	**Duration**	**Significance Major/Moderate/ Minor/Negligible Beneficial/Adverse**	**International/ National/ Regional/ Local**	**Mitigation**	**Residual Effect**
Construction					
Dust	Temporary	Negligible Adverse	Local	CEMP	Negligible
Traffic	Temporary	Negligible Adverse	Local	None Required	Negligible
Operational Development					
Traffic	Permanent	Negligible Adverse	Local	None Required	Negligible