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Crest Nicholson Operations Ltd

LAND OFF BARKHAM SQUARE, WOKINGHAM

Air Quality Assessment

Revision E

Independent, multidisciplinary engineering
and environmental consultants

LAND OFF BARKHAM SQUARE, WOKINGHAM

Air Quality Assessment

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1.0 INTRODUCTION

- 1.1 Create Consulting Engineers Limited (CCE) have been appointed by Crest Nicholson to undertake an Air Quality Assessment (AQA) in support of the planning application at Land off Barkham Square, Wokingham.
- 1.2 The proposed development lies within the jurisdiction of Wokingham Borough Council (WBC). The site is bounded by Langley Common Road, to the west, and Commonfield Lane, to the east. The north consists of fields and residential land. The south is bounded by Arborfield Studios. The red line boundary is shown in Figure 1.1.
- 1.3 The Proposed Development comprises:
- “Outline application (with all matters reserved except for access) for residential development (Use Class C3), plus elderly care dwellings (Use Class C2/C3), associated open space, allotments, green and blue infrastructure including the provision of Suitable Alternative Natural Greenspace (SANG) and other associated works.”*
- 1.4 The completion year of the development is expected to be 2035.

Assessment Scope

- 1.5 This report considers potential air quality impacts associated with both the construction and operation of the development. Likely changes to air quality in the area, because of the proposed development have been considered in relation to the UK Air Quality Objectives (AQOs). The assessment follows the principles set out in relevant national and local planning policy and technical guidance. Also, where required, the AQA considers mitigation measures to reduce the effect of the proposed development upon local air quality.
- 1.6 During the construction phase, the proposed development has the potential to generate dust, particulate matter (PM₁₀) affecting amenity at existing receptors. This has been assessed with Institute of Air Quality Management (IAQM) 2024 guidance on construction dust and an adequate level of dust mitigation and practices during the construction phases proposed.
- 1.7 Vehicle movements generated during the operation of the development will give rise to NO₂, PM₁₀ and PM_{2.5} emissions which will have potential impacts on local air quality at existing receptors within the area. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions and assess potential effects as a result of the proposals.
- 1.8 The Air Quality Assessment was undertaken for the following modelling scenarios:
- Opening year without the development (2035),
 - Opening year with the development (2035),
 - WBC Local Plan growth without the development (2040), and
 - WBC Local Plan growth with the development (2040).
- 1.9 The year 2035 represents the anticipated completion and first operational year of the proposed development, while 2040 has been assessed to determine the potential impacts of the development in a future year when Local Plan infrastructure growth within the wider area is expected to be in place.

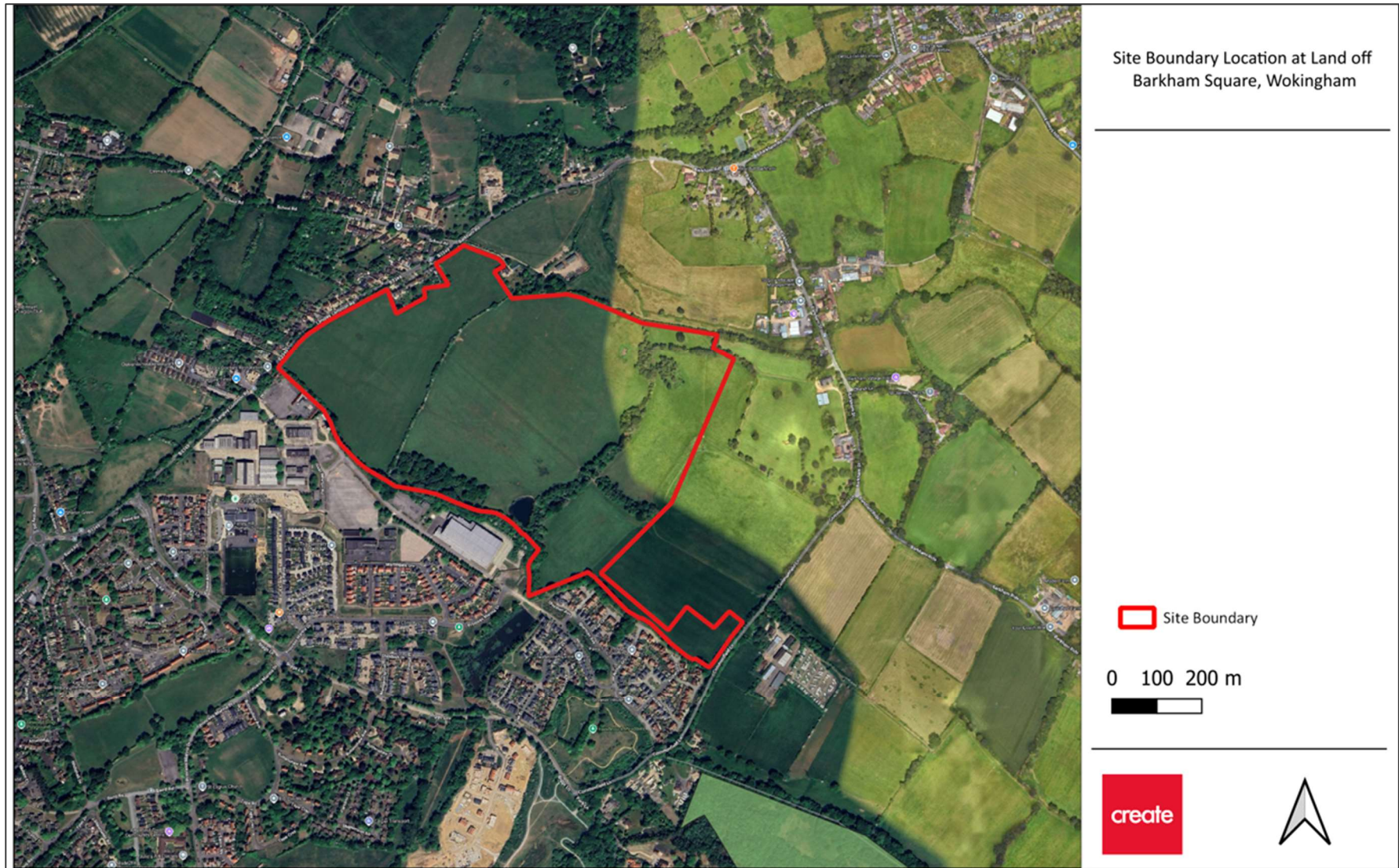


Figure 1.1: Red Line Boundary

2.0 LEGISLATION, POLICY AND GUIDANCE

Environmental Protection Act 1990

- 2.1 The 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 on industrial, trade or business premises and being prejudicial to health or a nuisance." and

"Any accumulation or deposit which is prejudicial to health or a nuisance."

- 2.2 Following this, Section 80 stipulates that where a statutory nuisance is found to exist, the local authority is required to serve an abatement notice. Failure to comply with such a notice constitutes an offence. If necessary, the local authority has the power to abate the nuisance directly and recover the associated costs.
- 2.3 The statutory nuisance provisions are relevant, among other matters, to the control of dust arising from demolition and construction activities. There are no statutory limit values for dust levels that automatically constitute a 'nuisance'; rather, nuisance is a subjective concept, largely dependent on existing local conditions and the degree of change experienced. The party responsible for the premises from which emissions originate must therefore employ Best Practicable Means (BPM) to prevent the occurrence of a statutory nuisance.

Environment Act 2021

- 2.4 The Environment Act 1995 is updated, with key provisions now in the Environment Act 2021. The Act includes several changes that aim to improve air quality in England. These changes include a requirement for the Secretary of State to review the National Air Quality Strategy every five years, as well as a requirement for annual reports to be made to Parliament on the progress made towards achieving air quality objectives. Additionally, changes are being made to the way Air Quality Management Areas (AQMAs) are designated and managed.
- 2.5 The Environment Act 2021 established a legally binding duty on the UK government to bring forward at least two new air quality targets in secondary legislation.
- 2.6 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set a new target for PM_{2.5} in ambient air to reduce air pollution's environmental and health impacts. These Regulations come into force on the day after the day on which they are made:
- The annual mean concentration target is that by the end of 31st December 2040 the annual mean level of PM_{2.5} in ambient air must be equal to or less than 10 µg/m³ ("the target level").*
- 2.7 The Environmental Improvement Plan 2023 for England set interim targets by January 2028:
- An annual average of 12 µg/m³ for PM_{2.5} is not exceeded at any monitoring station.*
- 2.8 The above targets are not intended to be applied retrospectively to planning applications submitted before the regulations came into effect. However, this assessment will be undertaken in consideration of the new PM_{2.5} legislation, ensuring that it is appropriately factored into the air quality assessment

process. The assessment should clarify whether the predicted operational impacts are compared against these future targets, or only the current AQOs.

2.9 Table 2.1 details the current AQOs in relation to the proposed development and this assessment.

Pollutant	Air Quality Objectives	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³	1-hour mean not to be exceeded more than 18 times per year*
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³	24-hour mean not to be exceeded more than 35 times per year
	40 µg/m ³	Annual mean
Particulate Matter (PM _{2.5})	AQO	20 µg/m ³
	Interim target by 2028	12 µg/m ³
	Legally binding target by 2040	10 µg/m ³
		Annual mean

***Note:** if the annual mean concentration is less than 60µg/m³ then it can be assumed that the 1-hour mean standard is likely to be met

Table 2.1: Air Quality Objectives (England)

National Planning Policy Framework 2024

2.10 The National Planning Policy Framework (NPPF), paragraph 199, 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.

2.11 Paragraph 200 states:

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.” Note: This paragraph is the ‘Agent of Change’ principle, relevant for the operational phase.

Clean Air Strategy 2019

- 2.12 In 2019, the Department for Environment, Food and Rural Affairs (Defra) released the Government's Clean Air Strategy, which sets out a comprehensive plan to reduce emissions from all sources of air pollution. The Strategy aims to enhance air quality, protect ecosystems, and promote sustainable economic development. The primary focus of air quality management has primarily been related to NO₂ and its principal source in the UK, road traffic. It also includes specific targets to limit public exposure to airborne particulate matter (PM), consistent with the guidance provided by the World Health Organization (WHO).
- 2.13 Moreover, the Strategy affirms the Government's commitment to enacting new legislation to *"create a stronger and more coherent framework for action to tackle air pollution...in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanisms."* New enforcement powers will also be given at national and local levels, across all sectors of society.

Air quality strategy: Framework for local authority delivery

- 2.14 The Air Quality Strategy for England provides the strategic framework from Defra to guide local authorities to *"...make best use of their powers and make air quality improvements for their communities."* The document emphasises the critical role of local governments in achieving cleaner air and highlights its commitment to prioritizing planning reforms aimed at meeting the PM_{2.5} reduction targets set out in the Environment Act 2021.

UK Air Quality Strategy 2023

- 2.15 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.
- 2.16 It provides a framework for reducing air pollution in the UK with the aim of meeting the air quality standards.

Local Planning Policy

Wokingham Borough Local Development Framework: Adopted Core Strategy Development Plan Document (January 2010)

- 2.17 The Core Strategy outlines the vision for the borough's development up to 2026, detailing how the council plans to protect and enhance the high quality of life within the borough.

"CPI – Sustainable development

Planning permission will be granted for development proposals that:

1. *Maintain or enhance the high quality of the environment,*
2. *Minimise the emission of pollutants into the wider environment,*
3. *[...]*
4. *Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers,"*

Wokingham Borough Local Plan Update (2023-2040): Proposed Submission Plan

- 2.18 Wokingham Borough Council has prepared the Wokingham Borough Local Plan Update: Proposed Submission Plan. This plan sets out the vision, strategic objectives, strategy and associated policies for managing development across Wokingham Borough.
- 2.19 The spatial strategy outlines how to address the development requirements of Wokingham Borough from 2023 to 2040, aligning with the vision and objectives of the Local Plan Update.

“Policy HC6: Air pollution and air quality

1. *Development proposals should maintain, and where possible improve air quality.*
2. *Development proposals should consider the prevailing air quality and potential impacts upon air quality arising from airborne particulates, dust and odour associated with the construction and operation of a proposal (including vehicular traffic).*
3. *Air Quality Assessments can demonstrate how prevailing air quality and potential impacts upon air quality have been considered and how air quality will be maintained at an acceptable standard through avoidance and mitigation measures. Development proposals are likely to require an Air Quality Assessment where:*
 - a) *The site is located within an Air Quality Management Area (AQMA),*
 - b) *The development has the potential to impact on air quality within an AQMA either on its own or in combination with other development,*
 - c) *It has the potential to impact on the implementation of Air Quality Action Plans or Local Air Quality Strategies, either on its own or in combination with other development,*
 - d) *The site is located within or close to an urban area that is known to experience higher levels of airborne particulates from vehicle emissions,*
 - e) *The site is within proximity to a source of air pollution which could present a significant risk to human health, protected species, or irreplaceable habitats, or*
 - f) *The type of development would mean its occupiers would be particularly sensitive to air pollution, such as schools, health care establishments or specialist accommodations.”*

Guidance

National Planning Practice Guidance 2019

- 2.20 This guidance outlines key principles for integrating air quality considerations into the planning process. It specifies the level of detail required for air quality assessments of proposed developments and provides guidance on how to mitigate potential impacts. Additionally, the guidance offers insight into how local authorities should incorporate air quality into broader planning frameworks, such as Local Plans and neighbourhood planning, as well as how air quality considerations should be addressed in individual planning decisions.

Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024)

- 2.21 This guidance provides advice, methodology and criteria to assess the dust impacts that arise from construction activities. This assessment evaluates the impact of dust soiling and human health

impacts during the demolition, earthworks, construction and trackout activities. The methodology is replicated in Appendix A of this report.

Land Use Planning and Development Control: Planning for Air Quality (EPUK-IAQM, 2017)

- 2.22 This guidance includes a method for screening the requirement for an air quality impact assessment and whether a detailed assessment is required. The methodology is reproduced in Appendix B of this report.

Local Air Quality Management Technical Guidance (LAQM.TG22)

- 2.23 This technical guidance is used by local authorities in their review and assessment work. Local Air Quality Management (LAQM) is a statutory process through which local authorities are required to monitor, assess, and take actions to improve local air quality.
- 2.24 Within this guidance, Box 1.1 contains examples where air quality objectives should apply. Annual mean objectives for NO₂ and PM₁₀ should apply at locations where members of the public might be regularly exposed, including building façades of residential properties, school, hospitals and care homes.
- 2.25 The following impacts should be assessed with the consideration of cumulative effects from other planned or proposed developments within the area:
- Impact of the proposed development upon the local air quality; and
 - The impact of local air quality on the receptors using the development.
- 2.26 The methodology is reproduced in Appendix B of this report.

A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM 2020)

- 2.27 This document is designed to aid the assessment of the air quality impacts of development on designated nature conservation sites. The document focuses on air quality assessments in support of Habitats Regulations Assessments, however, is useful when assessing the air quality impact on national or local designated nature conservation sites. The methodology is reproduced in Appendix C of this report.

3.0 BASELINE CONDITIONS

3.1 Baseline data was gathered from the following sources:

- WBC's 2023 Air Quality Annual Status Report;
- DEFRA's UK AIR website; and
- DEFRA's national air quality background maps 2021.

Local Air Quality Management

Air Quality Management Areas

3.2 As required by the Environment Act (2021), WBC has undertaken a review and assessment of air quality within their administrative area. There are three designated AQMAs for elevated annual mean concentrations of NO₂ above the AQO.

3.3 Neither of these AQMAs are located within close proximity of the proposed development. There are no other neighbouring AQMA's within close proximity of the proposed development. Therefore, AQMAs have not been assessed any further within this report.

Air Quality Monitoring Data

Automatic Monitoring Locations

3.4 WBC operated two continuous automatic monitoring stations throughout the administrative boundary in 2022. Table 3.1 shows monitoring results from CM2 in recent years. This station only monitors NO₂ concentrations.

3.5 As indicated in Table 3.1, monitored annual NO₂ concentrations have not exceeded the annual AQO in recent years. The 1-hourly NO₂ AQO of 200 µg/m³ was exceeded 15 times in 2018, however it was below the threshold of 18 times per year and therefore did not breach the AQO. There have been no exceedances of the 1-hourly AQO since 2018.

3.6 CM2 is located within Wokingham Town Centre and therefore the monitor is not indicative of the proposed development site location.

Non-Automatic Monitoring Locations

3.7 WBC operated 47 passive monitoring stations (diffusion tubes) within the area in 2022. Table 3.2 shows diffusion tube monitoring results within 3.75 km of the site.

3.8 Table 3.2 shows there have been no exceedances of the annual mean NO₂ AQO at any monitoring station in recent years.

3.9 The diffusion tubes are located in urban areas and along the M4. These are not indicative of concentrations expected at the proposed development site where concentrations are likely to be lower.

Site ID	Site Name	NGR		Site Type	Measurement	Annual Mean NO ₂ Concentrations (µg/m ³)				
		X	Y			2018	2019	2020	2021	2022
CM2	Peach Street Wokingham	481348	168603	Roadside	Annual	33	33	22	24	27
					1-hourly exceedances	15	0	0	0	0

Table 3.1: Automatic Monitoring Results

Site ID	Site Name	NGR		Site Type	Annual Mean NO ₂ Concentrations (µg/m ³)				
		X	Y		2018	2019	2020	2021	2022
WOK 883	Evendons Pri Sch	480483	167011	Roadside	27.0	29.1	19.6	22.4	22.2
WOK 895	47 Barkham Road	480375	168399	Roadside	-	-	13.5	16.4	16.6
WOK 846	4 Hatch Farm Cottages	477131	170019	Roadside	26.0	21.6	14.0	15.2	16.2

Table 3.2: Diffusion Tube Monitoring Results

Mapped Background Pollution

- 3.10 Predictions of background pollutant concentrations on a 1km-by-1km grid basis have been produced by DEFRA for the entire of the UK to assist Local Authorities (LAs) in their Review and Assessment of air quality.
- 3.11 The proposed development site is located in grid squares NGR: 477500, 166500. The predicted background concentrations for the baseline year (2022), for 2035 when the development is expected to be fully completed, and for 2040 to reflect the WBC Local Plan growth scenario.

Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)		
	2022	2035	2040
NO _x	12.96	6.76	6.32
NO ₂	9.87	5.38	5.04
PM ₁₀	13.11	10.27	10.01
PM _{2.5}	8.95	6.16	5.91

Table 3.3: DEFRA Predicted Background Concentrations

- 3.12 As shown in Table 3.3, background concentrations do not exceed the relevant AQOs and are predicted to reduce further at the completion year (2035) and through to 2040. The predicted concentrations are lower than the monitored data, reflecting the current farmland area.

Ecological Baseline Condition

- 3.13 The proposed development is located approximately 237 m north of Longmoor Bog of Special Scientific Interest (SSSI). The relevant habitat features and associated critical load and level data for Longmoor Bog, obtained from the Air Pollution Information System (APIS), are summarised in Table 3.4.

Interested Feature Name	Feature Code	Min CL for N ($\text{kgN}/\text{ha}/\text{yr}$)	Max CL for N ($\text{kgN}/\text{ha}/\text{yr}$)	NH ₃ CL ($\mu\text{g}/\text{m}^3$)	NO _x CL ($\mu\text{g}/\text{m}^3$)	SO ₂ CL ($\mu\text{g}/\text{m}^3$)
Erica Tetralix – Sphagnum Compactum Wet Heath	SSSI0504	5	15	1	30	10
Betula pubescens – Molinia caerulea Woodland	SSSI0151	15	25	3	30	10
Molinia Caerulea – Potentilla Erecta Mire	SSSI0975	10	15	3	30	10

Table 3.4: APIS Information for SSSI

- 3.14 The assessment benchmarks for evaluating air pollutant impacts on ecological receptors are referred to as Critical Levels (CL_e) and Critical Loads (CL_o).
- Critical Levels (CL_e) represent pollutant concentrations in air ($\mu\text{g}/\text{m}^3$) below which no harmful effects on vegetation or ecosystems are expected.

- Critical Loads (CL_c) represent the threshold deposition rates (kg N/ha/yr for nitrogen, or keq/ha/yr for acidity) below which no significant harmful effects occur on sensitive habitats.

3.15 As shown in Table 3.5, Nitrogen deposition for moorland (short vegetation) in Longmoor Bog is 9.3 kgN/ha/yr for the 2019 mid-year, which falls within the critical load range (CLo) of 5–15 kgN/ha/yr for Erica Tetralix and below CLo for the other habitat features.

3.16 Table 1.14 summarises the critical levels applicable to the qualifying habitats within Longmoor Bog SSSI. Among these, Erica tetralix – Sphagnum compactum Wet Heath is the most sensitive, with critical levels of 1 µg/m³ for ammonia, 30 µg/m³ for NO_x, and 10 µg/m³ for SO₂. The other habitats, Betula pubescens – Molinia caerulea Woodland and Molinia caerulea – Potentilla erecta Mire, have slightly higher ammonia thresholds (3 µg/m³) but the same limits for NO_x and SO₂.

3.17 Table 3.6 also provides the acid deposition and related air pollutant concentrations for Longmoor Bog SSSI.

NO _x Concentration (µg/m³)	SO ₂ Concentration (µg/m³)	Ammonia Concentration (µg/m³)	Acid deposition for Grid Average (keq/ha/yr)	Acid deposition for Moorland (short vegetation) (keq/ha/yr)	Total N deposition to Moorland (short vegetation) (kg/ha/yr)	Total N deposition to Grid Average (kg/ha/yr)
11.7	1.2	1.1	0.7	0.9	12.3	9.3

Table 3.5: Acid Deposition information for Longmoor Bog

3.18 The data presented in Table 3.6 indicate that deposition levels at Longmoor Bog SSSI are mainly influenced by regional background sources. Ammonia (1.1 µg/m³) and SO₂ (1.2 µg/m³) are well below their relevant critical levels, while acid deposition values (0.9–1.8 keq/ha/yr) reflect typical background conditions for the area.

4.0 DISPERSION MODEL ASSESSMENT INPUTS

- 4.1 The built and occupied development have the potential to expose future site users to elevated pollutant concentrations. To assess NO₂, PM₁₀ and PM_{2.5} concentrations across the site, detailed dispersion modelling was undertaken in accordance with the following methodology.

Dispersion Model

- 4.2 Dispersion modelling was undertaken using the ADMS-Roads Extra dispersion model (version 5.0.1.3). ADMS-Roads Extra is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Input Data

- 4.3 The model requires input data that details the following parameters:

- Emission Factors;
- Traffic Flow Data;
- Diurnal Profiling;
- Energy Inputs;
- Meteorological data;
- Roughness length;
- Monin-Obukhov length;
- Background Concentrations;
- Verification Factor; and
- Sensitive Receptor Locations.

Emission Factors

- 4.4 Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (EFT) (Version 13.1) released in March 2025.

Traffic Flow Data

- 4.5 Five scenarios have been modelled as follows:

- S1 – baseline scenario (2022)
- S2 – Opening year without the development scenario (2035)
- S3 – Opening year with the development scenario (2035)
- S4 – WBC local plan growth without the development (2040); and
- S5 – WBC local plan growth with the development (2040)

- 4.6 Traffic data for this scheme for S1 was obtained from The Department for Transport's (DfT's) Traffic Count Website and summarised in Tables 4.1 and 4.3.

- 4.7 The DfT Matrix web tool enables the user to view and download traffic flows on every link of the A-road and motorway network in Great Britain for the years 1999 to 2023. It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM.TG22 as being a suitable source of data for air quality

assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

- 4.8 Traffic data for S2 – S5 modelling scenarios was supplied by the Transport Consultants for this project, i-Transport. The traffic data used in S2–S5 modelling scenarios is summarised in Tables 4.2 – 4.4.
- 4.9 Vehicle speeds were estimated based on the free flow ‘potential’ of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.
- 4.10 In accordance with the modelling methodology, different speeds for road links have been used for the base plus development traffic approaching at busy junctions and delays during peak/off peak. The road width stayed the same for all modelling scenarios. The mean vehicular speeds stayed the same for all modelling scenarios.
- 4.11 Various building heights have been input into the model, where the building height or structure is taller than the width of the road to the opposite building or structure, creating a canyon effect. These heights will remain the same and therefore have not been altered for the modelling scenarios.
- 4.12 Reference should be made to Figure 4.1 for a graphical representation of the road links and the verification monitoring station, WOK 883, used in the S1 modelling scenario.
- 4.13 Figure 4.2 shows the road links included in the S2 and S3 scenarios, while Figure 4.3 illustrates the road links used in the S4 and S5 scenarios.

Link ID	Road Link	Average Road Width (m)	Average Canyon Height (m)	Mean Vehicle Speed (km/h)
L1	Finchampstead Road, A321	7	20	16

Table 4.1: Traffic Links Used in S1 Modelling Scenario

Link ID	Road Link	Average Road Width (m)	Mean Vehicle Speed (km/h)
L2	Langley Common Road	7	48
L3	Barkham Road, B3349- East of Barkham Street	8	48
L4	Barkham Road, B3349- East of Barkham street	7	48
L5	Barkham Street	6.5	64
L6	Commonfield Lane	6	40
L7	Biggs Lane	7	24
L8	Bearwood Road	6.5	48
L9	Eversley Road (Between Poperinghe Way and Observer Way)	7	50
L10	Eversley Road (Between Observer Way and Baird Road)	7.5	48
L11	Eversley Road (Towards Arborfield Cross)	8	48
L13	Langley Common Road (Between Eversley Road and Biggs Lane)	8	48
L14	Langley Common Road (Between Biggs Lane and Site Access)	7	64

Link ID	Road Link	Average Road Width (m)	Mean Vehicle Speed (km/h)
L15	Langley Common Road (Between Site Access and School Road)	8	48
L16	Barkham Road (Between School Road and Barkham Street)	7	48
L17	Barkham Road (Between Barkham Street and Bearwood Road)	8	48
L18	Barkham Road (Bearwood Road and Edneys Hill)	7.5	24
L19	Observer Way	7	113
L20	Baird Road	6	20

Note: Road links shown in **bold** are included in the S4 and S5 scenarios only.

Table 4.2: Traffic Links Used in S2 and S3 Modelling Scenarios

Link ID	S1		S2		S3	
	24-hour AADT Flow	HDV %	24-hour AADT Flow	HDV %	24-hour AADT Flow	HDV %
L1	14908	1	-	-	-	-
L2	-	-	11654	4	12793	4
L3	-	-	13919	4	14762	3
L4	-	-	11409	4	12547	3
L5	-	-	7711	3	8005	3
L6			1892	3	1892	3
L7			5057	4	5057	3

Table 4.3: Traffic Data Input into S1-S3 Modelling Scenarios

Link ID	S4		S5	
	24-hour AADT Flow	HDV %	24-hour AADT Flow	HDV %
L8	15499	1	15791	1
L9	19257	2	19417	2
L10	18763	1	19349	1
L11	8142	1	8364	1
L12	16980	2	17560	2
L13	12946	1	14414	1
L14	12623	1	13341	1
L15	12623	1	13341	1
L16	16836	1	17363	1
L17	15408	2	15673	2
L18	19299	2	19580	2
L19	19299	1	19580	1
L20	584	1	750	1

Table 4.4: Traffic Data Input into S4 and S5 Modelling Scenarios



Figure 4.1: Road Links Used in S1 Modelling Scenario and Verification Monitoring Location



Figure 4.2: Road Links Used in S2 and S3 Modelling Scenarios



Figure 4.3: Road Links Used in S4 and S5 Modelling Scenarios

Diurnal Profiling

- 4.14 A 2022 national diurnal profile was added to all scenarios to evaluate the distribution of traffic across the week within the model. A representation of the profile is shown in Figure 4.4.

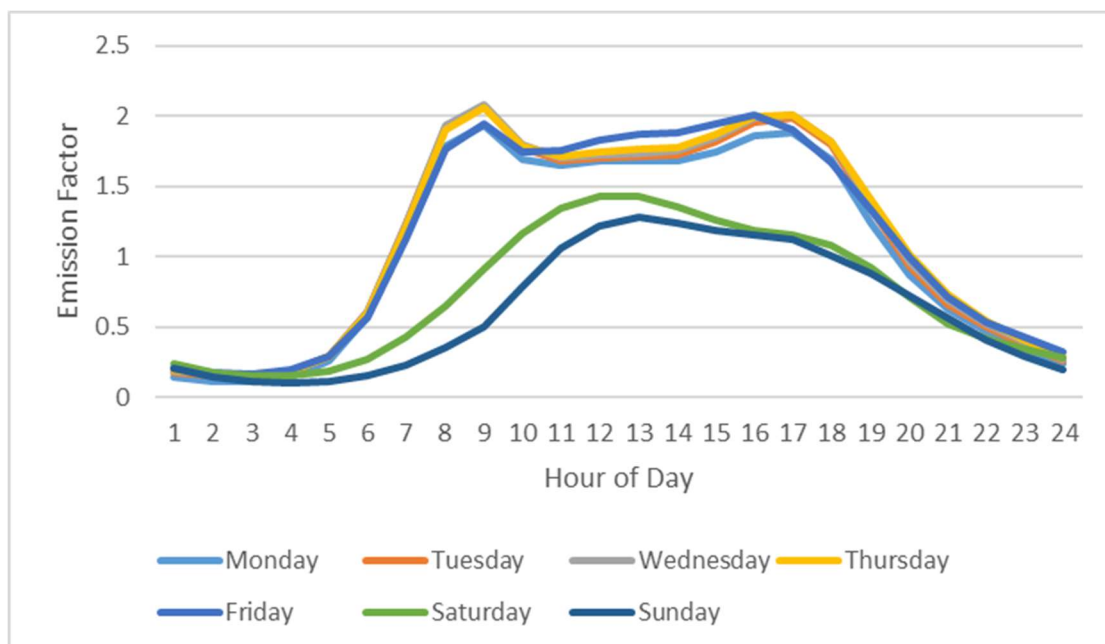


Figure 4.4: 2022 National Diurnal Profile

Energy Inputs

- 4.15 The development will use Air Source Heat Pumps to provide heating arrangements to the housing units. As a result, the development will not produce any NO_x emissions and further energy inputs have been screened out of the modelling assessment.

Meteorological Data

- 4.16 Meteorological data used in this assessment was taken from Farnborough Airport meteorological station over the period 1st January 2022 to 31st December 2022 (inclusive) as shown in Figure 4.5 This meteorological station is located approximately 14.5 km south of the proposed development site.
- 4.17 All meteorological records used in the assessment were provided by Air Pollution Services Ltd, which is an established distributor of data within the UK.

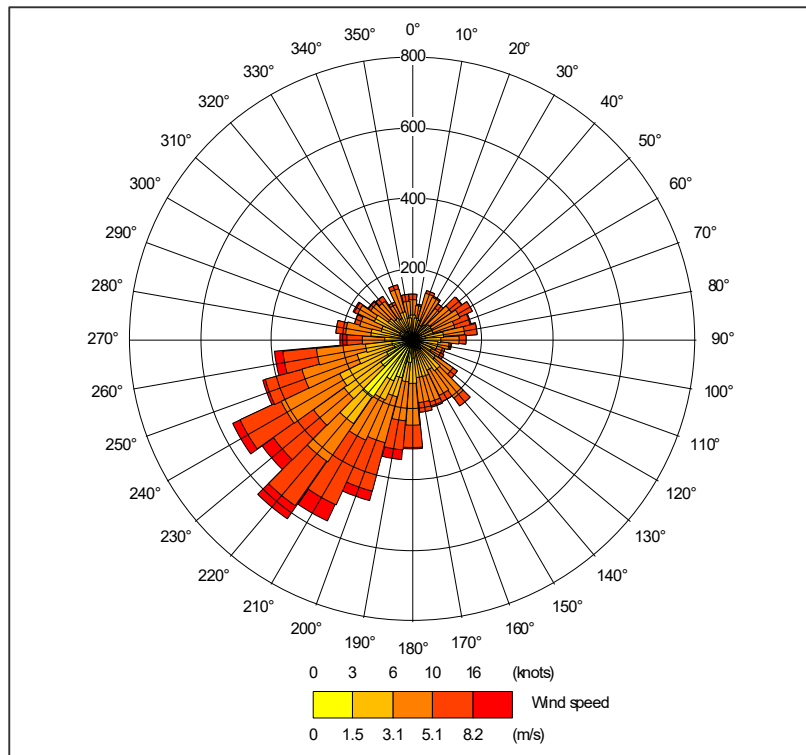


Figure 4.5: 2022 Wind Rose for Farnborough Airport Meteorological Station

Roughness Length

- 4.18 A roughness length (z_0) of 0.5 m was used for the dispersion site. This value is considered appropriate for the morphology of the assessment area, which is suggested within ADMS-Roads Extra as being suitable for 'parkland, open suburbia'.
- 4.19 A roughness length (z_0) of 1 m was used for the dispersion site and meteorological site. This value is considered appropriate for the morphology of the assessment area, which is suggested within ADMS-Roads Extra as being suitable for 'cities, woodlands'.

Monin-Obukhov Length

- 4.20 A minimum Monin-Obukhov length of 10 m was used in the assessment area for the dispersion site and meteorological area. This value is considered appropriate for the nature of the assessment area and is suggested within ADMS-Roads Extra as being suitable for 'small towns <50,000'.

Background Concentrations

- 4.21 There are representative no background monitoring stations for NO_2 , PM_{10} , and $\text{PM}_{2.5}$ within close proximity of the proposed development. Therefore, DEFRA's background maps for the grid squares covering the proposed development site were used to provide background concentrations in the model.
- 4.22 The background concentrations used within the model are as follows:
- NO_2 annual concentration of $9.87 \mu\text{g}/\text{m}^3$;
 - PM_{10} annual concentration of $13.11 \mu\text{g}/\text{m}^3$; and

- PM_{2.5} annual concentration of 8.95 µg/m³.

4.23 Background concentrations for 2022 were utilised in preference to the development's completion year, 2035. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operational phase of the proposals.

Verification Factor

4.24 The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations.

4.25 The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations

4.26 For this assessment the model verification was undertaken for 2022, using traffic data, meteorological data and background concentrations from this year. Monitoring Station WOK 883 was used within the modelled road network to verify the model against.

Verification Factor for NO₂

4.27 The monitored and modelled road contribution concentrations for NO₂ were graphed and the equation of the trendline based on the linear progression through zero was calculated. The results for predicted versus monitored NO₂ concentrations are shown in Figure 4.6 and Table 4.5.

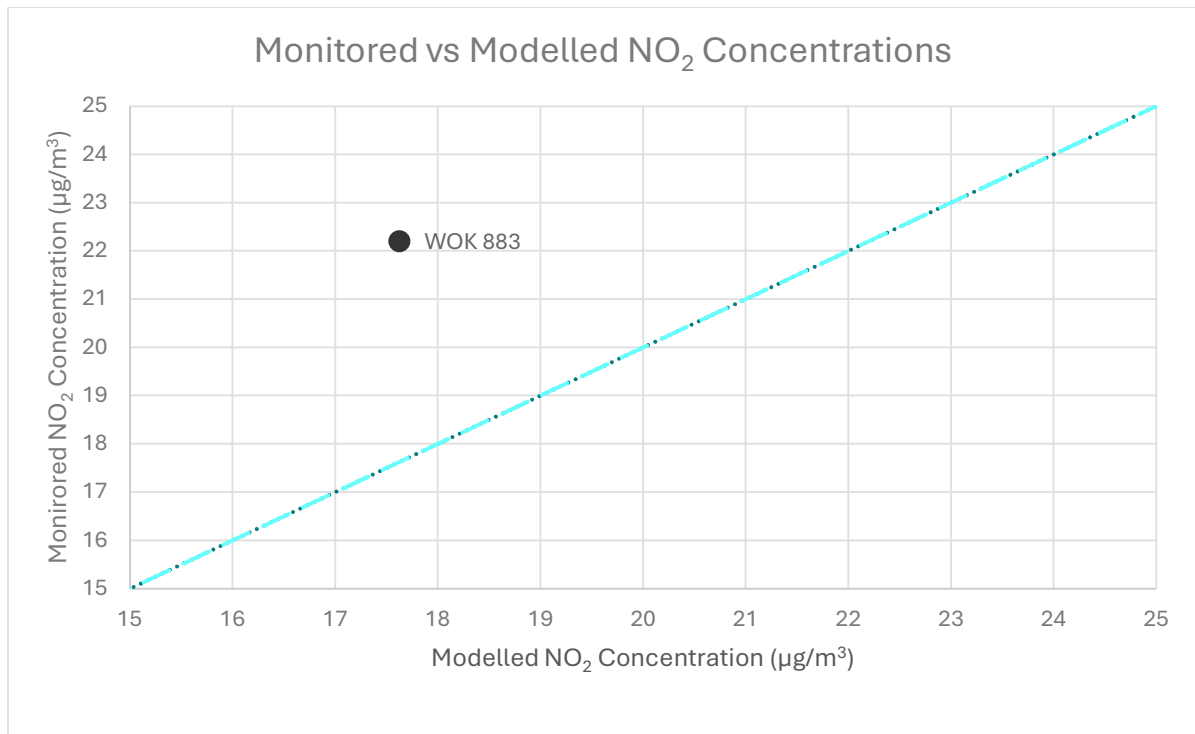


Figure 4.6: Monitored vs Modelled NO₂ Concentrations

Site ID	Monitored Road NO ₂ Concentration (µg/m³)	Modelled Road NO ₂ Concentration (µg/m³)	Difference (%)
WOK 883	22.20	18.67	-15.89

Table 4.5: Modelled NO₂ Concentrations

4.28 The results in Figure 4.6 and Table 4.5 show that the modelled annual NO₂ concentrations are lower than the monitored annual concentrations at monitoring station WOK 883. This indicates that the model is underpredicting the annual NO₂ concentration by -15.89%. As such, a verification factor of 1.18897 has been added to the modelling scenarios for NO₂.

4.29 Table 4.6 presents the adjusted modelled NO₂ concentration using the verification factor.

Site ID	Monitored NO ₂ Concentration (µg/m³)	Adjusted Modelled Total NO ₂ Concentration (µg/m³)	Difference (%)
WOK 883	22.20	22.20	0.00

Table 4.6: Adjusted Modelled NO₂ Concentrations

4.30 Table 4.6 shows that the addition of the verification factor creates a 0% difference between the monitored and modelled data at monitoring station WOK 883. Therefore, the modelled dispersion area is aligned with the actual area.

Verification Factor for PM₁₀ and PM_{2.5}

4.31 There are no monitoring stations that monitor PM₁₀ and PM_{2.5} concentrations within the vicinity of the proposed development and therefore these pollutants were not modelled in the baseline modelling scenario.

- 4.32 As a result, a factor of 1.18897 was derived from the NO₂ verification factor and utilised to adjust model predictions for PM₁₀ and PM_{2.5}, in accordance with the guidance provided within LAQM.TG22.

Sensitive Receptor Locations

- 4.33 Existing and future human receptors were modelled at locations across the proposed development, as detailed in Table 4.7 and Figure 4.7. Human receptors were modelled at a height of 1.5 m to represent ground-level exposure.
- 4.34 Sensitive ecological receptor locations within and adjacent to the proposed development were modelled, as detailed in Table 4.8 and shown in Figure 4.8. Receptors were assessed at a height of 0 m to represent ground-level vegetation.
- 4.35 The selected ecological receptors include areas of ancient and deciduous woodland located within and adjacent to the site, as well as a bat habitat approximately 90 m west of the site. Receptor E4 is situated within the SSSI boundary.

Receptor ID	Location	NGR (m)	
		X	Y
R1	High Barn Farm, Commonfield Lane,	478038	165898
R2	Barkham Street	478218	166288
R3	Barkham Street	478179	166470
R4	White Cottage, Barkham Street	478164	166517
R5	Brook House, Bakham Street	478138	166574
R6	Barkham Street	478154	166633
R7	Manor Cottage, Barkham Street	478074	166734
R8	The Well House, Barkham Street	478017	166860
R9	Barkham Road	477848	166928
R10	2 Bridge Cottages	477613	166921
R11	Barkham Road	477423	166891
R12	Handpost Farm	477300	166819
R13	A property east of the proposed development	477455	166702
R14	10 Langley Common Road	477298	166758
R15	3 Langley Common Road	477295	166714
R16	23 Langley Common Road	477223	166678
R17	18 Langley Common Road	477148	166669
R18	2 Langley Common Road	477082	166636
R19	28 Langley Common Road	476986	166573
R20	48 Langley Common Road	476926	166504
R21	58-62 Langley Common Road	476846	166433
R22	26 Equestrian Court	476672	166191
R23	14 Equestrian Court	476676	166168
R24	17 Equestrian Court	476686	166135
R25	Montgomery House	476706	166083
R26	3 Hill Road	476680	166036
R27	Venning Road	476708	166007
R28	93 Venning Road	476746	165980
R29	Venning Road	476804	165938
R30	44 Biggs Lane	476848	165901

Receptor ID	Location	NGR (m)	
		X	Y
R31	14 Biggs Lane	477055	165779
R32	Shelduck Drive	477120	165803
R33	1 Mandarin Grove	477157	165779
R34	14 Pintail Place	477221	165762
R35	22 Shelduck Drive	477294	165747
R36	Oak Drive	477492	165705
R37	2 Oak Drive	477530	165680
R38	Commonfield Lane	477689	165537
R39	The Finches, Commonfield Lane	477802	165618
R40	34 Archer Grove	477826	165689
R41	6 Archer Grove	477872	165787
R42	Barkham Road	478059	167014
R43	Barkham Road	478327	167126
R44	390 Barkham Road	478378	167173
R45	Onsite Receptor	477227	166225
R46	Onsite Receptor	477898	167038
R47	Onsite Receptor	477670	167091
R48	Onsite Receptor	477900	165571
R49	Onsite Receptor	478322	167219
R50	Onsite Receptor	476824	165991
R51	Onsite Receptor	478149	166489
R52	Onsite Receptor	477622	165563
R53	Onsite Receptor	477330	166795
R54	Onsite Receptor	476969	166466

Table 4.7: Sensitive Human Receptor Locations

Receptor ID	Location	NGR (m)	
		X- Axis	Y-Axis
E1	Habitat: Woodland	477227	166225
E2	Ancient and Semi-Natural Woodland	477920	166945
E3	Deciduous Woodland	477717	166971
E4	Statutory: Longmoor Bog SSSI	477823	165623
E5	Deciduous Woodland	476824	165991
E6	Bat	477622	165563
E7	Ancient and Semi-Natural Woodland	478173	166501
E8	Deciduous Woodland	477366	166799

Table 4.8: Sensitive Ecological Receptor Locations



Figure 4.7: Sensitive Human Receptor Locations



Figure 4.8: Sensitive Ecological Receptor Locations

5.0 CONSTRUCTION PHASE ASSESSMENT

- 5.1 There is the potential for air quality impacts because of the change of use of the site. A qualitative assessment of the air quality impact during the construction phase was carried out in accordance with the methodology outlined within the Institute of Air Quality Management's *"Guidance on the Assessment of Dust from Demolition and Construction (Version 2.2)"*.
- 5.2 The methodology for this assessment is detailed in Appendix A.

Sensitive Human Receptors

- 5.3 A sensitive receptor is defined as any location that may be affected by changes in air quality as a result of a development. These have been defined for construction dust impacts in the following Sections.
- 5.4 The proposed development is surrounded by residential receptors to the east and south of the site boundary. Additionally, to south lies Arborfield Studios. There are a few industrial developments located within close proximity to the site.
- 5.5 Based on the criteria shown in Table A2, Appendix A, the sensitivity of the receiving environment to potential dust impacts is considered to be high for residential receptors and medium for industrial and commercial receptors. This is because users would expect to enjoy a high and reasonable level of amenity, respectively.

Ecological Receptors

- 5.6 Ecological receptors were analysed using the Magic Maps website which provides authoritative geographic information about the natural environment from across government. This application is managed by Natural England. The application showed that the site boundary and trackout route are within a Site of Special Scientific Interest (SSSI) Impact Risk Zone (IRZ) for Longmore Bog SSSI.
- 5.7 Ancient woodland, including Kidgem Copse and deciduous woodland are located within and adjacent to the site. Additionally, European Protected Species, bats are located approximately 90 m west of the site. A Local Nature Reserve (LNR) and SSSI, Longmoor Bog, is approximately 250 meters south of the site boundary.
- 5.8 There is no SPA, SAC, or LNR within 50 m of the development boundary or along the access route within 250 m of the site entrance. However, Longmoor Bog SSSI is located approximately 237 m south of the development, and therefore the potential impacts of the development on this designated site have been considered within this assessment, as detailed in Section 6 of this report.

Construction and Trackout Sensitive Receptors

- 5.9 Receptors sensitive to potential dust impacts during all construction activities were identified from a desk-top study of the area up to 250 m from the development boundary. These are summarised in Table 5.1.

Distance from Site Boundary (m)	Approximate Number of High Sensitivity Receptors	Approximate Number of Medium Sensitivity Receptors
Less than 20	10 to 100	Less than 10
Less than 50	10 to 100	Less than 10
Less than 100	10 to 100	Less than 10
Less than 350	More than 100	Less than 10

Table 5.1: Construction Activities Dust Sensitive Receptors

- 5.10 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 250 m of the site and within 50 m of the road. These are summarised in Table 5.2.
- 5.11 The exact construction vehicle access routes are not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. It is expected that vehicles will use Langley Common Road and Commonfield Lane to access the development.

Distance from Site Access Route (m)	Approximate Number of High Sensitivity Receptors	Approximate Number of Medium Sensitivity Receptors
Less than 20	More than 100	Less than 10
Less than 50	More than 100	Less than 10

Table 5.2: Trackout Activities Dust Sensitive Receptors

Additional Factors

- 5.12 The prevailing wind direction is predominantly from southwesterly, as shown in Figure 4.3. As such, receptors to the northeast are mostly affected by dust emissions.
- 5.13 A review of WBC planning portal shows that there are no approvals for large scale developments in close proximity to the proposed development site boundary.

The development will be constructed over several phases, where the localised impact on nearby receptors will change. It is not expected that one set of receptors will be subjected to construction activities and dust for more than two years. Therefore, the duration of significant dust impact on any single receptor is not expected to be long-term.

Sensitivity of the Surrounding Area

- 5.14 Sensitive receptors have been assessed based on distance from source and annual mean PM₁₀ concentrations within the area. This has been used to determine the sensitivity of the surrounding area to earthworks, construction and trackout activities.
- 5.15 Table 5.3 shows the sensitivity of the surrounding area in relation to dust soiling, human health impacts and ecological impacts for each of the construction activities.

Receptor	Potential Impact	Sensitivity of the Surrounding Area		
		Earthworks	Construction	Trackout
High	Dust Soiling	High	High	High
	Human Health	Low	Low	Low
Medium	Dust Soiling	Medium	Medium	Medium
	Human Health	Low	Low	Low
	Ecological	Medium	Medium	Medium

Table 5.3: Sensitivity of the Surrounding Area

Construction Phase Assessment

- 5.16 The undertaking of activities such as excavation, ground works, cutting, construction and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.
- 5.17 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.
- 5.18 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 250 m of the site boundary. As such, a detailed assessment of potential dust impacts was required.
- 5.19 There is currently no data available on the construction-based activities. Therefore, professional judgement has been used to assess each activity.

Demolition

- 5.20 The area is currently open fields and therefore no demolition activities will be taking place.

Earthworks

- 5.21 Earthworks will primarily involve excavating material, haulage, as well as site levelling and landscaping. The British Geological Survey website informs that the soil type lying beneath the site is London Clay Formation and Bagshot Formation. The total site area is more than 110,000 m². Due to the size of the site area, there may be more than 10 HGVs active at any one time. Height of bunds is expected to be up to 6 m.
- 5.22 In accordance with the criteria outlined in Table A1, the magnitude of potential dust emissions from earthworks is therefore large.

Construction

- 5.23 The construction activities will involve the erection of up to 1000 units with associated infrastructure. The total construction volume will be between over 75,000 m³. Various materials will be used for the construction of dwellings including concrete, timber, metals and/or cladding. It is unknown if on-site concrete batching and/or sandblasting will take place and therefore have been included in this assessment.
- 5.24 In accordance with the criteria outlined in Table A1, the magnitude of potential dust emissions from construction works is therefore large.

Trackout

- 5.25 Trackout activities will include vehicles accessing and leaving the site with new construction materials and site waste. Unpaved road is expected to be more than 100 m with trackout materials from clay, silt and sand. The number of HGV movements per day is expected to be more than 50 movements.
- 5.26 In accordance with the criteria outlined in Table A1, the magnitude of potential dust emissions from trackout activities is therefore large.

Risk of Impacts

- 5.27 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. Table 5.4 provides a summary of the risk of impacts for the proposed development. The highest risk category identified for each construction activity has been used to determine the level of mitigation required.

Receptor	Potential Impact	Sensitivity of the Surrounding Area		
		Earthworks	Construction	Trackout
High	Dust Soiling	High	High	High
	Human Health	Low	Low	Low
Medium	Dust Soiling	Medium	Medium	Medium
	Human Health	Low	Low	Low
	Ecological	Medium	Medium	Medium

Table 5.4: Summary of Potential Unmitigated Dust Risks

- 5.28 As indicated in Table 5.4, the highest risk for dust generating activities during all activities is a high. The overall dust risk level is classed as a high risk for all non-specified activities.
- 5.29 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phases.

Mitigation and Residual Effects

- 5.30 The IAQM guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site as summarised in Table 5.5.
- 5.31 The mitigation measures can be reviewed prior to the commencement of construction works incorporated into the existing the strategies as applicable.
- 5.32 Assuming the relevant mitigation measures outlined in Table 5.5 are implemented, the residual effect from all dust generating activities is predicted to be not significant, in accordance with the IAQM guidance.

Guidance	Comment
Communications	• 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. • Develop and implement a Dust Management Plan.
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 window sills within 100 m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP, 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 PM10 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 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.

Guidance	Comment
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.
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 trackifiers 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.

Guidance	Comment
	• 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.

Table 5.5: Fugitive Dust Mitigation Measures

6.0 DISPERSION MODELLING ASSESSMENT

6.1 Vehicle movements associated with the operation of the proposed development will generate exhaust emissions on the local and regional road networks. Dispersion modelling was carried out for following scenarios to estimate annual concentrations of NO₂, PM₁₀, and PM_{2.5} across the site and at sensitive receptors.

- S2 – Baseline scenario (2035);
- S3– Completion year with the development (2035);
- S4 – WBC local plan growth without the development (2040); and
- S5 – WBC local plan growth with the development (2040)

Human Receptors

6.2 Sensitive receptors were modelled along the site boundary to represent the future site users, as well as at selected locations along road links anticipated to be affected by the proposed development. Human receptors were modelled at a height of 1.5 m to represent ground floor height.

6.3 Predicted pollutant concentrations for the above scenarios are presented in Figures 6.1 to 6.6b.

6.4 Figures 6.1 to 6.6b show that the predicted annual mean NO₂, PM₁₀, and PM_{2.5} concentrations across the site boundary are below the relevant AQOs under all scenarios, except for Scenario S3, where PM_{2.5} concentrations slightly exceed the legally binding target of 10 µg/m³. There is minimal variation between the ‘without development’ and ‘with development’ scenarios.

6.5 On this basis, the site is considered suitable for the proposed use in air quality terms. Future occupants are not expected to be exposed to pollutant concentrations exceeding the relevant AQOs or target limits, and no additional mitigation measures are considered necessary.

Nitrogen Dioxide (NO₂) Impacts (S2 and S3 Scenarios)

6.6 In accordance with the assessment criteria the annual mean NO₂ concentrations were predicted for S2 and S3 scenarios and are summarised in Table 6.1.

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
	S2	S3	Change
R1	11.75	11.75	0.0001
R2	11.78	11.78	0.0013
R3	11.78	11.78	0.0015
R4	11.79	11.80	0.0020
R5	11.79	11.79	0.0018
R6	11.82	11.83	0.0030
R7	11.80	11.80	0.0022
R8	11.84	11.84	0.0038
R9	11.85	11.86	0.0087
R10	11.88	11.89	0.0107
R11	11.80	11.80	0.0047
R12	11.79	11.79	0.0041

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
	S2	S3	Change
R13	11.76	11.76	0.0020
R14	11.88	11.89	0.0106
R15	11.85	11.86	0.0092
R16	11.87	11.88	0.0106
R17	11.89	11.90	0.0121
R18	11.87	11.88	0.0104
R19	11.85	11.86	0.0092
R20	11.86	11.87	0.0096
R21	11.85	11.86	0.0087
R22	11.92	11.93	0.0033
R23	11.87	11.88	0.0016
R24	11.82	11.82	0.0008
R25	11.79	11.79	0.0004
R26	11.77	11.77	0.0003
R27	11.77	11.77	0.0003
R28	11.77	11.77	0.0002
R29	11.77	11.77	0.0002
R30	11.77	11.77	0.0002
R31	11.78	11.78	0.0001
R32	11.79	11.79	0.0001
R33	11.80	11.80	0.0001
R34	11.79	11.79	0.0001
R35	11.79	11.79	0.0001
R36	11.79	11.79	0.0001
R37	11.79	11.79	0.0001
R38	11.75	11.75	0.0001
R38	11.75	11.75	0.0001
R39	11.76	11.76	0.0001
R40	11.75	11.75	0.0001
R41	11.75	11.75	0.0001
R42	11.97	11.98	0.0095
R43	11.84	11.84	0.0050
R44	11.88	11.89	0.0067
R45	11.80	11.81	0.0053
R46	11.83	11.84	0.0078
R47	11.79	11.80	0.0045
R48	11.76	11.76	0.0012
R49	11.74	11.74	0.0003
R50	11.75	11.75	0.0001
R51	11.75	11.76	0.0002
R52	11.75	11.75	0.0006
R53	11.75	11.75	0.0004
R54	11.74	11.74	0.0002

Table 6.1: Predicted Annual Mean NO₂ Concentrations for S2 and S3

- 6.7 As indicated in Table 6.1, predicted annual mean NO₂ concentrations are below the AQO at all modelled sensitive receptor locations. There are small changes in concentrations with the development in place.
- 6.8 Impacts on the Air Quality Assessment Level (AQAL) for the predicted annual mean NO₂ concentrations at the human sensitive receptor locations are summarised in Table 6.2.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.0010	29.37	Negligible
R2	0.0110	29.45	Negligible
R3	0.0125	29.45	Negligible
R4	0.0172	29.49	Negligible
R5	0.0154	29.47	Negligible
R6	0.0251	29.57	Negligible
R7	0.0190	29.50	Negligible
R8	0.0324	29.60	Negligible
R9	0.0731	29.66	Negligible
R10	0.0900	29.72	Negligible
R11	0.0399	29.50	Negligible
R12	0.0352	29.48	Negligible
R13	0.0166	29.41	Negligible
R14	0.0892	29.72	Negligible
R15	0.0775	29.66	Negligible
R16	0.0890	29.71	Negligible
R17	0.1013	29.76	Negligible
R18	0.0879	29.70	Negligible
R19	0.0774	29.65	Negligible
R20	0.0806	29.67	Negligible
R21	0.0734	29.65	Negligible
R22	0.0274	29.82	Negligible
R23	0.0131	29.69	Negligible
R24	0.0070	29.55	Negligible
R25	0.0038	29.49	Negligible
R26	0.0026	29.42	Negligible
R27	0.0022	29.41	Negligible
R28	0.0020	29.42	Negligible
R29	0.0017	29.43	Negligible
R30	0.0015	29.43	Negligible
R31	0.0010	29.45	Negligible
R32	0.0011	29.47	Negligible
R33	0.0010	29.51	Negligible
R34	0.0010	29.49	Negligible
R35	0.0009	29.46	Negligible
R36	0.0008	29.48	Negligible
R37	0.0008	29.48	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R38	0.0006	29.38	Negligible
R39	0.0007	29.39	Negligible
R40	0.0007	29.39	Negligible
R41	0.0009	29.37	Negligible
R42	0.0789	29.96	Negligible
R43	0.0421	29.61	Negligible
R44	0.0567	29.71	Negligible
R45	0.0448	29.52	Negligible
R46	0.0656	29.60	Negligible
R47	0.0386	29.49	Negligible
R48	0.0102	29.39	Negligible
R49	0.0021	29.36	Negligible
R50	0.0012	29.38	Negligible
R51	0.0019	29.39	Negligible
R52	0.0050	29.37	Negligible
R53	0.0034	29.37	Negligible
R54	0.0013	29.36	Negligible

Table 6.2: Predicted NO₂ Impacts as a Result of the Development (S2 and S3)

- 6.9 As shown in Table 6.2, the significance of impacts of annual mean NO₂ concentrations as a result of the development was predicted to be negligible at all receptor locations, and therefore, not significant in accordance with EPUK-IAQM guidance.
- 6.10 Predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. However, as stated in LAQM.TG22 if annual mean NO₂ concentrations are below 60 µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such, it is not predicted that concentrations will exceed the 1-hour mean AQO for NO₂ across the modelled site for the development's proposed operational year. The impact of operational traffic on 1-hour mean NO₂ concentrations at sensitive receptors is also considered negligible at all receptors, and thus not significant.
- 6.11 It should also be noted that background NO₂ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at heights above ground floor level are considered to be acceptable in regard to pollutant exposure across all receptor locations and have not been assessed further.
- 6.12 The assessment indicates a negligible impact with the development in place in 2035, with predicted annual mean NO₂ concentrations remaining below the relevant AQO. The site is therefore considered suitable for the proposed use without the need for additional mitigation to protect future site users from elevated NO₂ concentrations.

NO₂ Impacts (S4 and S5 Scenarios)

- 6.13 In accordance with the assessment criteria the annual mean NO₂ concentrations were predicted for S4 and S5 scenarios and are summarised in Table 6.3.

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
	S4	S5	Change
R1	9.88	9.88	0.0002
R2	9.90	9.90	0.0013
R3	9.90	9.90	0.0014
R4	9.91	9.91	0.0020
R5	9.90	9.91	0.0017
R6	9.93	9.93	0.0028
R7	9.91	9.91	0.0019
R8	9.93	9.94	0.0028
R9	9.94	9.94	0.0033
R10	9.96	9.96	0.0041
R11	9.91	9.91	0.0019
R12	9.91	9.91	0.0018
R13	9.89	9.89	0.0009
R14	9.96	9.96	0.0041
R15	9.94	9.95	0.0036
R16	9.96	9.96	0.0042
R17	9.97	9.98	0.0049
R18	9.96	9.96	0.0043
R19	9.95	9.95	0.0040
R20	9.96	9.96	0.0044
R21	9.95	9.96	0.0057
R22	10.01	10.02	0.0055
R23	9.99	9.99	0.0051
R24	9.95	9.95	0.0040
R25	9.93	9.93	0.0032
R26	9.91	9.91	0.0019
R27	9.90	9.90	0.0017
R28	9.90	9.91	0.0019
R29	9.90	9.91	0.0021
R30	9.90	9.90	0.0019
R31	9.90	9.91	0.0021
R32	9.91	9.91	0.0027
R33	9.92	9.93	0.0035
R34	9.92	9.92	0.0031
R35	9.91	9.91	0.0026
R36	9.92	9.92	0.0030
R37	9.91	9.92	0.0029
R38	9.88	9.88	0.0004
R38	9.88	9.88	0.0002
R39	9.88	9.88	0.0002
R40	9.88	9.88	0.0002
R41	10.01	10.01	0.0037
R42	9.94	9.95	0.0020
R43	9.98	9.98	0.0028

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
	S4	S5	Change
R44	10.00	10.01	0.0024
R45	10.16	10.16	0.0056
R46	9.94	9.94	0.0015
R47	9.93	9.93	0.0013
R48	9.92	9.92	0.0028
R49	9.94	9.94	0.0034
R50	9.91	9.91	0.0019
R51	9.89	9.89	0.0010
R52	9.88	9.88	0.0004
R53	9.88	9.88	0.0002
R54	9.88	9.88	0.0003

Table 6.3: Predicted Annual Mean NO₂ Concentrations for S4 and S5

6.14 As shown in Table 6.3, the predicted annual mean NO₂ concentrations in 2040 for both scenarios are lower than those predicted for Scenarios S2 and S3 in 2035, and are below the AQO at all modelled sensitive receptor locations. Only small changes in concentrations are observed with the development in place.

6.15 Impacts on the Air Quality Assessment Level (AQAL) for the predicted annual mean NO₂ concentrations at the human sensitive receptor locations are summarised in Table 6.4.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.0019	24.70	Negligible
R2	0.0130	24.75	Negligible
R3	0.0143	24.75	Negligible
R4	0.0197	24.78	Negligible
R5	0.0172	24.77	Negligible
R6	0.0283	24.83	Negligible
R7	0.0196	24.78	Negligible
R8	0.0278	24.84	Negligible
R9	0.0334	24.86	Negligible
R10	0.0407	24.90	Negligible
R11	0.0193	24.78	Negligible
R12	0.0177	24.77	Negligible
R13	0.0095	24.73	Negligible
R14	0.0414	24.90	Negligible
R15	0.0364	24.87	Negligible
R16	0.0421	24.90	Negligible
R17	0.0490	24.94	Negligible
R18	0.0436	24.91	Negligible
R19	0.0404	24.88	Negligible
R20	0.0445	24.90	Negligible
R21	0.0570	24.90	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R22	0.0547	25.04	Negligible
R23	0.0513	24.98	Negligible
R24	0.0405	24.89	Negligible
R25	0.0320	24.83	Negligible
R26	0.0188	24.77	Negligible
R27	0.0170	24.76	Negligible
R28	0.0190	24.76	Negligible
R29	0.0207	24.77	Negligible
R30	0.0189	24.76	Negligible
R31	0.0214	24.77	Negligible
R32	0.0269	24.79	Negligible
R33	0.0352	24.82	Negligible
R34	0.0309	24.80	Negligible
R35	0.0266	24.78	Negligible
R36	0.0303	24.80	Negligible
R37	0.0292	24.79	Negligible
R38	0.0037	24.71	Negligible
R39	0.0023	24.71	Negligible
R40	0.0025	24.71	Negligible
R41	0.0024	24.70	Negligible
R42	0.0365	25.03	Negligible
R43	0.0205	24.86	Negligible
R44	0.0277	24.96	Negligible
R45	0.0237	25.02	Negligible
R46	0.0550	25.40	Negligible
R47	0.0150	24.84	Negligible
R48	0.0133	24.82	Negligible
R49	0.0280	24.81	Negligible
R50	0.0343	24.85	Negligible
R51	0.0192	24.78	Negligible
R52	0.0097	24.73	Negligible
R53	0.0039	24.70	Negligible
R54	0.0021	24.70	Negligible

Table 6.4: Predicted NO₂ Impacts as a Result of the Development

- 6.16 As shown in Table 6.4, the significance of impacts of annual mean NO₂ concentrations as a result of the development was predicted to be negligible at all receptor locations, locations and, therefore, not significant, in accordance with EPUK-IAQM guidance.
- 6.17 The assessment shows a negligible impact with the development in place in 2040, taking into account the Local Plan infrastructure growth, with predicted annual mean NO₂ concentrations remaining below the relevant AQOO. Therefore, the site is considered suitable for the proposed use without the need for mitigation measures to protect future site users from elevated NO₂ concentrations.

Particulate Matter (PM₁₀) Impacts (S2 and S3 Scenarios)

6.18 The predicted annual mean PM₁₀ concentrations for the S2 and S3 operational scenarios at sensitive locations are summarised in Table 6.5.

Sensitive Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
	S2	S3	Change
R1	15.64	15.64	0.0005
R2	15.75	15.75	0.0051
R3	15.75	15.76	0.0058
R4	15.81	15.82	0.0079
R5	15.78	15.79	0.0071
R6	15.92	15.94	0.0116
R7	15.81	15.82	0.0088
R8	15.92	15.93	0.0148
R9	16.04	16.08	0.0380
R10	16.17	16.22	0.0482
R11	15.83	15.85	0.0208
R12	15.80	15.82	0.0180
R13	15.69	15.70	0.0084
R14	16.17	16.22	0.0472
R15	16.08	16.12	0.0406
R16	16.14	16.19	0.0457
R17	16.19	16.24	0.0475
R18	16.10	16.14	0.0407
R19	16.03	16.07	0.0358
R20	16.06	16.09	0.0373
R21	16.02	16.05	0.0342
R22	15.94	15.95	0.0110
R23	15.91	15.92	0.0056
R24	15.85	15.86	0.0031
R25	15.81	15.81	0.0017
R26	15.71	15.71	0.0012
R27	15.70	15.70	0.0010
R28	15.72	15.72	0.0009
R29	15.74	15.74	0.0008
R30	15.73	15.73	0.0007
R31	15.75	15.75	0.0005
R32	15.79	15.79	0.0005
R33	15.86	15.86	0.0005
R34	15.83	15.83	0.0005
R35	15.79	15.80	0.0004
R36	15.83	15.83	0.0004
R37	15.82	15.82	0.0004
R38	15.64	15.64	0.0003
R38	15.66	15.66	0.0003

Sensitive Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
	S2	S3	Change
R39	15.66	15.66	0.0004
R40	15.64	15.64	0.0004
R41	16.31	16.35	0.0396
R42	15.99	16.01	0.0219
R43	16.14	16.17	0.0296
R44	15.64	15.64	0.0005
R45	15.85	15.87	0.0207
R46	15.96	15.99	0.0303
R47	15.82	15.84	0.0200
R48	15.66	15.66	0.0048
R49	15.62	15.62	0.0010
R50	15.64	15.64	0.0006
R51	15.66	15.66	0.0009
R52	15.63	15.63	0.0025
R53	15.63	15.63	0.0016
R54	15.62	15.62	0.0006

Table 6.5: Predicted Annual Mean PM₁₀ Concentrations for S2 and S3

- 6.19 As indicated in Table 6.5, predicted annual mean PM₁₀ concentrations are below the AQO at all the modelled sensitive receptor locations. There are small changes in concentrations with the development in place.
- 6.20 Impacts on the AQAL for the predicted annual mean PM₁₀ concentrations at sensitive receptor locations are summarised in Table 6.6.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.0031	39.10	Negligible
R2	0.0322	39.38	Negligible
R3	0.0366	39.39	Negligible
R4	0.0502	39.55	Negligible
R5	0.0450	39.48	Negligible
R6	0.0728	39.84	Negligible
R7	0.0558	39.56	Negligible
R8	0.0931	39.84	Negligible
R9	0.2366	40.19	Negligible
R10	0.2971	40.56	Negligible
R11	0.1315	39.63	Negligible
R12	0.1138	39.55	Negligible
R13	0.0535	39.25	Negligible
R14	0.2910	40.55	Negligible
R15	0.2521	40.29	Negligible
R16	0.2824	40.47	Negligible
R17	0.2922	40.60	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R18	0.2522	40.36	Negligible
R19	0.2226	40.17	Negligible
R20	0.2316	40.23	Negligible
R21	0.2128	40.13	Negligible
R22	0.0688	39.88	Negligible
R23	0.0355	39.80	Negligible
R24	0.0196	39.64	Negligible
R25	0.0111	39.54	Negligible
R26	0.0076	39.28	Negligible
R27	0.0066	39.26	Negligible
R28	0.0059	39.30	Negligible
R29	0.0050	39.35	Negligible
R30	0.0044	39.31	Negligible
R31	0.0031	39.37	Negligible
R32	0.0032	39.49	Negligible
R33	0.0030	39.66	Negligible
R34	0.0029	39.58	Negligible
R35	0.0028	39.49	Negligible
R36	0.0025	39.57	Negligible
R37	0.0024	39.54	Negligible
R38	0.0019	39.11	Negligible
R39	0.0021	39.16	Negligible
R40	0.0023	39.15	Negligible
R41	0.0026	39.10	Negligible
R42	0.2423	40.88	Negligible
R43	0.1368	40.02	Negligible
R44	0.1834	40.42	Negligible
R45	0.1306	39.66	Negligible
R46	0.1896	39.98	Negligible
R47	0.1259	39.60	Negligible
R48	0.0305	39.16	Negligible
R49	0.0066	39.05	Negligible
R50	0.0038	39.11	Negligible
R51	0.0058	39.16	Negligible
R52	0.0157	39.08	Negligible
R53	0.0105	39.07	Negligible
R54	0.0041	39.06	Negligible

Table 6.6: Predicted PM₁₀ Impacts as a Result of the Development

- 6.21 As indicated in Table 6.6, impacts on annual mean PM₁₀ concentrations as a result of the development were predicted to be negligible at all receptor locations, and, therefore, not significant, in accordance with EPUK-IAQM guidance.

- 6.22 Similar to NO₂ concentrations, it should also be noted that background PM₁₀ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at heights above ground floor level are considered to be acceptable in regard to pollutant exposure across all receptor locations and have not been assessed further.
- 6.23 The assessment shows a negligible impact with the development in place and predicted annual PM₁₀ concentrations below the AQO. Therefore, the site is considered to be suitable for the proposed use without the implementation of mitigation techniques to protect future site users from elevated PM₁₀ concentrations.

PM₁₀ Impacts (S4 and S5 Scenarios)

- 6.24 In accordance with the assessment criteria the annual mean PM₁₀ concentrations were predicted for S4 and S5 scenarios and are summarised in Table 6.7.

Sensitive Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
	S4	S5	Change
R1	13.17	13.17	0.0013
R2	13.27	13.28	0.0080
R3	13.28	13.29	0.0088
R4	13.34	13.35	0.0120
R5	13.31	13.32	0.0105
R6	13.45	13.47	0.0173
R7	13.35	13.36	0.0121
R8	13.45	13.47	0.0172
R9	13.55	13.58	0.0235
R10	13.68	13.71	0.0294
R11	13.36	13.37	0.0135
R12	13.33	13.34	0.0121
R13	13.23	13.23	0.0064
R14	13.68	13.71	0.0294
R15	13.59	13.61	0.0256
R16	13.65	13.68	0.0289
R17	13.70	13.73	0.0305
R18	13.63	13.65	0.0268
R19	13.57	13.59	0.0248
R20	13.60	13.62	0.0275
R21	13.58	13.62	0.0354
R22	13.70	13.74	0.0333
R23	13.67	13.70	0.0329
R24	13.56	13.59	0.0276
R25	13.46	13.49	0.0226
R26	13.33	13.34	0.0131
R27	13.30	13.31	0.0119
R28	13.31	13.33	0.0134
R29	13.32	13.34	0.0147

Sensitive Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
	S4	S5	Change
R30	13.30	13.32	0.0133
R31	13.32	13.33	0.0149
R32	13.38	13.39	0.0191
R33	13.46	13.49	0.0253
R34	13.42	13.44	0.0223
R35	13.37	13.39	0.0191
R36	13.41	13.43	0.0219
R37	13.40	13.42	0.0211
R38	13.17	13.18	0.0026
R38	13.19	13.19	0.0016
R39	13.18	13.19	0.0017
R40	13.17	13.17	0.0017
R41	13.86	13.89	0.0251
R42	13.57	13.58	0.0144
R43	13.79	13.81	0.0195
R44	14.00	14.02	0.0171
R45	14.73	14.77	0.0388
R46	13.52	13.53	0.0105
R47	13.42	13.42	0.0086
R48	13.40	13.42	0.0174
R49	13.50	13.52	0.0211
R50	13.35	13.36	0.0133
R51	13.21	13.22	0.0062
R52	13.16	13.16	0.0026
R53	13.17	13.17	0.0015
R54	13.19	13.19	0.0017

Table 6.7: Predicted Annual Mean PM₁₀ Concentrations for S2 and S3

- 6.25 As shown in Table 6.7, predicted annual mean PM₁₀ concentrations in 2040 for both scenarios are lower than those predicted for Scenarios S2 and S3 in 2035, and are below the AQO at all modelled sensitive receptor locations. Only small changes in concentrations are observed with the development in place.
- 6.26 Impacts on the AQAL for the predicted annual mean PM₁₀ concentrations at sensitive receptor locations are summarised in Table 6.8.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.0096	32.92	Negligible
R2	0.0600	33.20	Negligible
R3	0.0661	33.22	Negligible
R4	0.0901	33.39	Negligible
R5	0.0792	33.31	Negligible
R6	0.1282	33.68	Negligible
R7	0.0902	33.39	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R8	0.1275	33.67	Negligible
R9	0.1734	33.94	Negligible
R10	0.2143	34.28	Negligible
R11	0.1010	33.43	Negligible
R12	0.0905	33.36	Negligible
R13	0.0485	33.08	Negligible
R14	0.2143	34.27	Negligible
R15	0.1881	34.03	Negligible
R16	0.2113	34.20	Negligible
R17	0.2218	34.33	Negligible
R18	0.1964	34.13	Negligible
R19	0.1825	33.98	Negligible
R20	0.2017	34.06	Negligible
R21	0.2603	34.04	Negligible
R22	0.2427	34.34	Negligible
R23	0.2398	34.25	Negligible
R24	0.2030	33.97	Negligible
R25	0.1675	33.72	Negligible
R26	0.0984	33.36	Negligible
R27	0.0893	33.29	Negligible
R28	0.1003	33.32	Negligible
R29	0.1099	33.35	Negligible
R30	0.0996	33.29	Negligible
R31	0.1119	33.33	Negligible
R32	0.1424	33.49	Negligible
R33	0.1877	33.72	Negligible
R34	0.1660	33.60	Negligible
R35	0.1430	33.48	Negligible
R36	0.1632	33.58	Negligible
R37	0.1573	33.55	Negligible
R38	0.0200	32.94	Negligible
R39	0.0123	32.98	Negligible
R40	0.0132	32.97	Negligible
R41	0.0128	32.93	Negligible
R42	0.1805	34.71	Negligible
R43	0.1060	33.96	Negligible
R44	0.1415	34.52	Negligible
R45	0.1221	35.05	Negligible
R46	0.2625	36.91	Negligible
R47	0.0773	33.83	Negligible
R48	0.0644	33.56	Negligible
R49	0.1297	33.54	Negligible
R50	0.1563	33.79	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R51	0.0993	33.41	Negligible
R52	0.0469	33.05	Negligible
R53	0.0197	32.89	Negligible
R54	0.0110	32.93	Negligible

Table 6.8: Predicted PM₁₀ Impacts as a Result of the Development

- 6.27 As shown in Table 6.8, impacts on annual mean PM₁₀ concentrations as a result of the development were predicted to be negligible at all receptor locations, and, therefore, not significant, in accordance with EPUK-IAQM guidance.
- 6.28 Similar to NO₂ concentrations, it should also be noted that background PM₁₀ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at heights above ground floor level are considered to be acceptable in regard to pollutant exposure across all receptor locations and have not been assessed further.
- 6.29 The assessment shows a negligible impact with the development in place in 2040, taking into account the Local Plan infrastructure growth, with predicted annual mean PM₁₀ concentrations remaining below the relevant AQOO. Therefore, the site is considered suitable for the proposed use without the need for mitigation measures to protect future site users from elevated PM₁₀ concentrations.

Particulate Matter (PM_{2.5}) Impacts (S2 and S3 Scenarios)

- 6.30 In accordance with the assessment criteria the annual mean PM_{2.5} concentrations were predicted for S2 and S3 scenarios and are summarised in Table 6.9.

Sensitive Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
	S2	S3	Change
R1	10.67	10.67	0.0003
R2	10.73	10.73	0.0027
R3	10.73	10.73	0.0031
R4	10.76	10.77	0.0043
R5	10.75	10.75	0.0038
R6	10.82	10.83	0.0062
R7	10.76	10.77	0.0047
R8	10.82	10.83	0.0079
R9	10.88	10.90	0.0199
R10	10.95	10.98	0.0252
R11	10.77	10.78	0.0109
R12	10.75	10.76	0.0095
R13	10.70	10.70	0.0044
R14	10.95	10.98	0.0248
R15	10.90	10.92	0.0213
R16	10.93	10.96	0.0241
R17	10.97	10.99	0.0254

Sensitive Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m³)		
	S2	S3	Change
R18	10.92	10.94	0.0218
R19	10.88	10.90	0.0192
R20	10.89	10.91	0.0200
R21	10.87	10.89	0.0183
R22	10.83	10.83	0.0057
R23	10.81	10.81	0.0030
R24	10.78	10.78	0.0016
R25	10.76	10.76	0.0009
R26	10.71	10.71	0.0006
R27	10.70	10.70	0.0005
R28	10.71	10.71	0.0005
R29	10.72	10.72	0.0004
R30	10.71	10.71	0.0004
R31	10.72	10.72	0.0003
R32	10.75	10.75	0.0003
R33	10.79	10.79	0.0003
R34	10.77	10.77	0.0002
R35	10.75	10.75	0.0002
R36	10.77	10.77	0.0002
R37	10.76	10.76	0.0002
R38	10.67	10.67	0.0002
R38	10.68	10.68	0.0002
R39	10.68	10.68	0.0002
R40	10.67	10.67	0.0002
R41	11.02	11.04	0.0207
R42	10.85	10.86	0.0115
R43	10.93	10.95	0.0155
R44	10.67	10.67	0.0003
R45	10.78	10.79	0.0111
R46	10.84	10.86	0.0163
R47	10.76	10.78	0.0105
R48	10.68	10.68	0.0025
R49	10.66	10.66	0.0005
R50	10.67	10.67	0.0003
R51	10.68	10.68	0.0005
R52	10.66	10.66	0.0013
R53	10.66	10.66	0.0009
R54	10.66	10.66	0.0003

Table 6.9: Predicted Annual Mean PM_{2.5} Concentrations for S2 and S3

- 6.31 As shown in Table 6.9, predicted annual mean PM_{2.5} concentrations are below the interim target of 12 µg/m³, however slightly exceed the legally binding AQO of 10 µg/m³ at all modelled sensitive receptor locations. There are small changes in concentrations with the development in place which are considered to be insignificant.

6.32 Impacts on the AQAL for the predicted annual mean PM_{2.5} concentrations at sensitive receptor locations are summarised in Tables 6.6 and 6.10.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.0024	106.70	Negligible
R2	0.0253	107.29	Negligible
R3	0.0288	107.32	Negligible
R4	0.0395	107.67	Negligible
R5	0.0354	107.51	Negligible
R6	0.0574	108.29	Negligible
R7	0.0437	107.67	Negligible
R8	0.0726	108.27	Negligible
R9	0.1826	108.98	Negligible
R10	0.2300	109.75	Negligible
R11	0.1015	107.81	Negligible
R12	0.0880	107.63	Negligible
R13	0.0413	107.00	Negligible
R14	0.2257	109.75	Negligible
R15	0.1954	109.20	Negligible
R16	0.2198	109.58	Negligible
R17	0.2312	109.91	Negligible
R18	0.1996	109.41	Negligible
R19	0.1760	109.01	Negligible
R20	0.1831	109.13	Negligible
R21	0.1679	108.92	Negligible
R22	0.0528	108.31	Negligible
R23	0.0273	108.14	Negligible
R24	0.0151	107.82	Negligible
R25	0.0085	107.61	Negligible
R26	0.0059	107.07	Negligible
R27	0.0051	107.02	Negligible
R28	0.0045	107.12	Negligible
R29	0.0038	107.21	Negligible
R30	0.0034	107.14	Negligible
R31	0.0024	107.25	Negligible
R32	0.0025	107.50	Negligible
R33	0.0023	107.87	Negligible
R34	0.0023	107.69	Negligible
R35	0.0022	107.50	Negligible
R36	0.0019	107.67	Negligible
R37	0.0019	107.62	Negligible
R38	0.0015	106.71	Negligible
R39	0.0016	106.82	Negligible
R40	0.0018	106.79	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R41	0.0020	106.70	Negligible
R42	0.1874	110.43	Negligible
R43	0.1056	108.63	Negligible
R44	0.1417	109.47	Negligible
R45	0.1029	107.91	Negligible
R46	0.1497	108.59	Negligible
R47	0.0973	107.75	Negligible
R48	0.0238	106.81	Negligible
R49	0.0051	106.58	Negligible
R50	0.0029	106.72	Negligible
R51	0.0045	106.82	Negligible
R52	0.0121	106.64	Negligible
R53	0.0081	106.62	Negligible
R54	0.0032	106.60	Negligible

Table 6.10: Predicted PM_{2.5} Impacts as a Result of the Development for the 2040 Target (10 µg/m³)

- 6.33 As shown in Table 6.10, impacts on annual mean PM_{2.5} concentrations as a result of the development were predicted to be negligible at all receptor locations, and, therefore, not significant, in accordance with EPUK-IAQM guidance.
- 6.34 Similar to NO₂ and PM₁₀ concentrations, it should also be noted that background PM_{2.5} levels are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at heights above ground floor level are lower than those modelled within the assessment.
- 6.35 Although predicted annual PM_{2.5} concentrations are above the legally binding AQO, it should be noted that pollutant concentrations have been decreasing year on year due to changes in traffic movements after the COVID pandemic and improvements in vehicle technologies. This is also supported by the monitored data shown in Section 3 where pollutants have reduced in annual concentrations from pre-pandemic (2018 and 2019) to post pandemic (2022) years. Therefore, concentrations are expected to reduce further in 2040, with a lower impact on existing receptor locations.

PM_{2.5} Impacts (S4 and S5 Scenarios)

- 6.36 In accordance with the assessment criteria the annual mean PM_{2.5} concentrations were predicted for S4 and S5 scenarios and are summarised in Table 6.11.

Sensitive Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m³)		
	S4	S5	Change
R1	8.95	8.98	0.0315
R2	8.95	9.04	0.0934
R3	8.95	9.05	0.0980
R4	8.95	9.08	0.1341
R5	8.95	9.07	0.1174

Sensitive Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m³)		
	S4	S5	Change
R6	8.95	9.15	0.1977
R7	8.95	9.09	0.1351
R8	8.95	9.15	0.1957
R9	8.95	9.20	0.2507
R10	8.95	9.27	0.3236
R11	8.95	9.09	0.1418
R12	8.95	9.08	0.1262
R13	8.95	9.02	0.0666
R14	8.95	9.27	0.3208
R15	8.95	9.22	0.2703
R16	8.95	9.26	0.3072
R17	8.95	9.29	0.3412
R18	8.95	9.25	0.2975
R19	8.95	9.21	0.2647
R20	8.95	9.23	0.2818
R21	8.95	9.23	0.2774
R22	8.95	9.29	0.3354
R23	8.95	9.27	0.3163
R24	8.95	9.21	0.2554
R25	8.95	9.15	0.2022
R26	8.95	9.08	0.1256
R27	8.95	9.06	0.1101
R28	8.95	9.07	0.1168
R29	8.95	9.07	0.1226
R30	8.95	9.06	0.1100
R31	8.95	9.07	0.1192
R32	8.95	9.10	0.1525
R33	8.95	9.15	0.2022
R34	8.95	9.13	0.1774
R35	8.95	9.10	0.1519
R36	8.95	9.12	0.1737
R37	8.95	9.12	0.1665
R38	8.95	8.99	0.0356
R38	8.95	8.99	0.0440
R39	8.95	8.99	0.0416
R40	8.95	8.98	0.0330
R41	8.95	9.37	0.4155
R42	8.95	9.20	0.2542
R43	8.95	9.32	0.3735
R44	8.95	9.44	0.4871
R45	8.95	9.84	0.8859
R46	8.95	9.18	0.2270
R47	8.95	9.12	0.1701
R48	8.95	9.12	0.1673

Sensitive Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
	S4	S5	Change
R49	8.95	9.17	0.2232
R50	8.95	9.09	0.1370
R51	8.95	9.01	0.0601
R52	8.95	8.98	0.0257
R53	8.95	8.98	0.0337
R54	8.95	8.99	0.0431

Table 6.11: Predicted Annual Mean PM_{2.5} Concentrations for S2 and S3

- 6.37 As shown in Table 6.11, predicted annual mean PM_{2.5} concentrations are below the legally binding AQO of 10 µg/m³ at all modelled sensitive receptor locations. There are small changes in concentrations with the development in place.
- 6.38 Impacts on the AQAL for the predicted annual mean PM_{2.5} concentrations at sensitive receptor locations are summarised in Table 6.12.

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R1	0.3502	89.81	Negligible
R2	1.0326	90.43	Negligible
R3	1.0832	90.48	Negligible
R4	1.4761	90.84	Negligible
R5	1.2951	90.67	Negligible
R6	2.1609	91.48	Slight
R7	1.4867	90.85	Negligible
R8	2.1400	91.46	Slight
R9	2.7244	92.01	Slight
R10	3.4895	92.74	Slight
R11	1.5597	90.92	Negligible
R12	1.3907	90.76	Negligible
R13	0.7390	90.17	Negligible
R14	3.4598	92.71	Slight
R15	2.9320	92.20	Slight
R16	3.3183	92.57	Slight
R17	3.6720	92.91	Slight
R18	3.2170	92.47	Slight
R19	2.8724	92.15	Slight
R20	3.0524	92.32	Slight
R21	3.0063	92.27	Slight
R22	3.6126	92.85	Slight
R23	3.4134	92.66	Slight
R24	2.7748	92.05	Slight
R25	2.2098	91.52	Slight
R26	1.3844	90.76	Negligible
R27	1.2156	90.60	Negligible

Sensitive Receptor	% Change in Concentration Relative to AQAL	Long Term Average Concentration	Impact
R28	1.2881	90.67	Negligible
R29	1.3510	90.73	Negligible
R30	1.2146	90.60	Negligible
R31	1.3139	90.69	Negligible
R32	1.6758	91.03	Negligible
R33	2.2091	91.52	Slight
R34	1.9434	91.27	Slight
R35	1.6690	91.02	Negligible
R36	1.9041	91.24	Slight
R37	1.8262	91.16	Negligible
R38	0.3964	89.86	Negligible
R39	0.4893	89.94	Negligible
R40	0.4627	89.92	Negligible
R41	0.3673	89.83	Negligible
R42	4.4368	93.66	Slight
R43	2.7622	92.04	Slight
R44	4.0063	93.24	Slight
R45	5.1612	94.37	Slight
R46	9.0073	98.36	Moderate
R47	2.4739	91.77	Slight
R48	1.8647	91.20	Negligible
R49	1.8345	91.17	Negligible
R50	2.4334	91.73	Slight
R51	1.5079	90.87	Negligible
R52	0.6666	90.10	Negligible
R53	0.2862	89.76	Negligible
R54	0.3756	89.84	Negligible

Table 6.12: Predicted PM_{2.5} Impacts as a Result of the Development for the 2040 Target (10 µg/m³)

- 6.39 As shown in Table 6.12, the predicted impacts on annual mean PM_{2.5} concentrations as a result of the development range from negligible to moderate, in accordance with EPUK-IAQM guidance. A moderate impact was predicted only at receptor R46.
- 6.40 Although the predicted annual mean PM_{2.5} concentrations are below the legally binding AQO at all receptor locations in both the S4 and S5 scenarios, the proposed development, together with the Local Plan infrastructure growth in 2040, is predicted to result in slight effects at some receptors and a moderate impact at one receptor, as shown in Table 6.12. Mitigation measures should therefore be implemented to minimise residual impacts.



Figure 6.1: Predicted Annual NO₂ Concentrations for S3

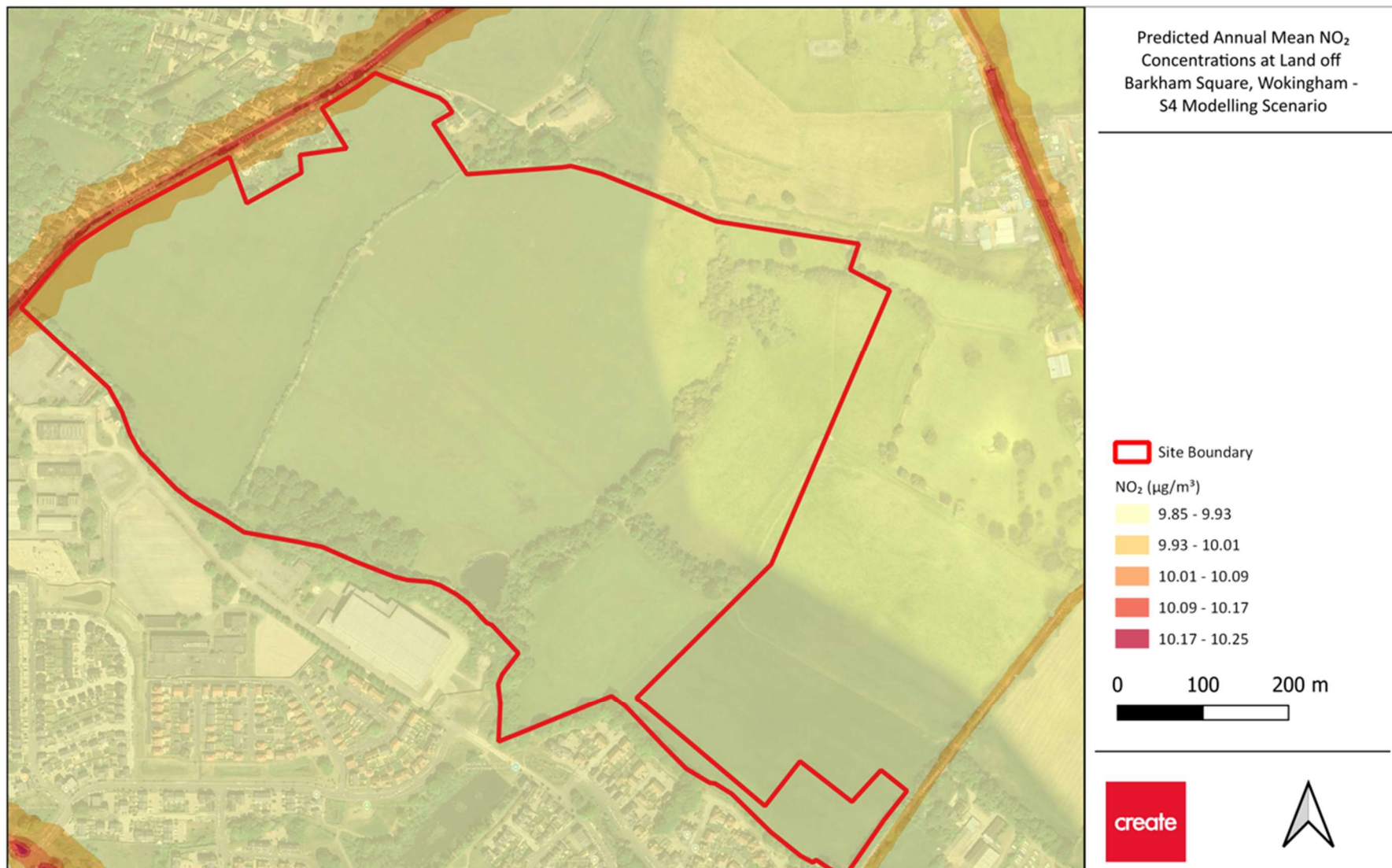


Figure 6.2a: Predicted Annual NO₂ Concentrations for S4



Figure 6.2b: Predicted Annual NO₂ Concentrations for S5



Figure 6.3: Predicted Annual PM₁₀ Concentrations for S3



Figure 6.4a: Predicted Annual PM₁₀ Concentrations for S4



Figure 6.4b: Predicted Annual PM₁₀ Concentrations for S5

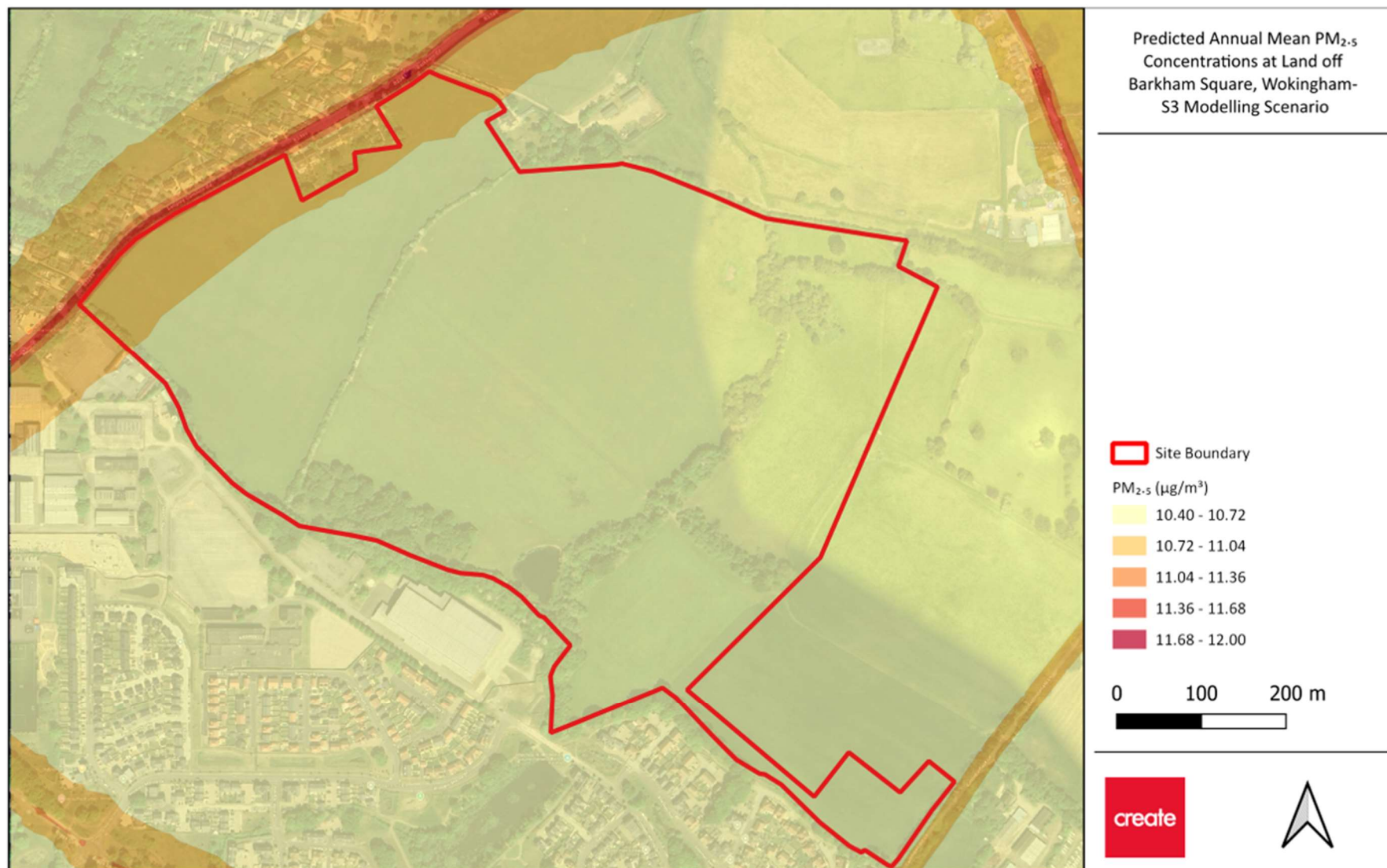


Figure 6.5: Predicted Annual PM_{2.5} Concentrations for S3

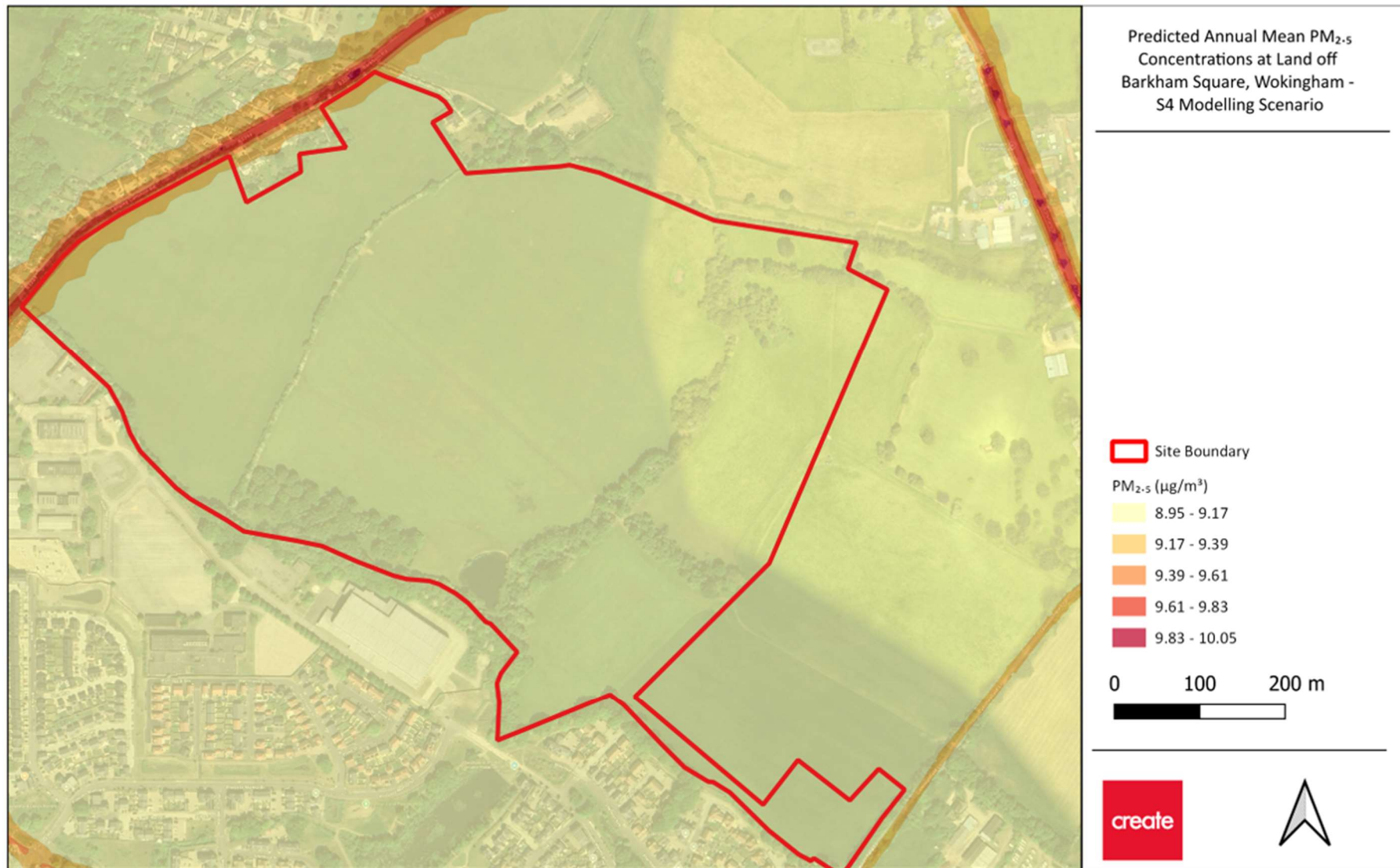


Figure 6.6a: Predicted Annual PM_{2.5} Concentrations for S4

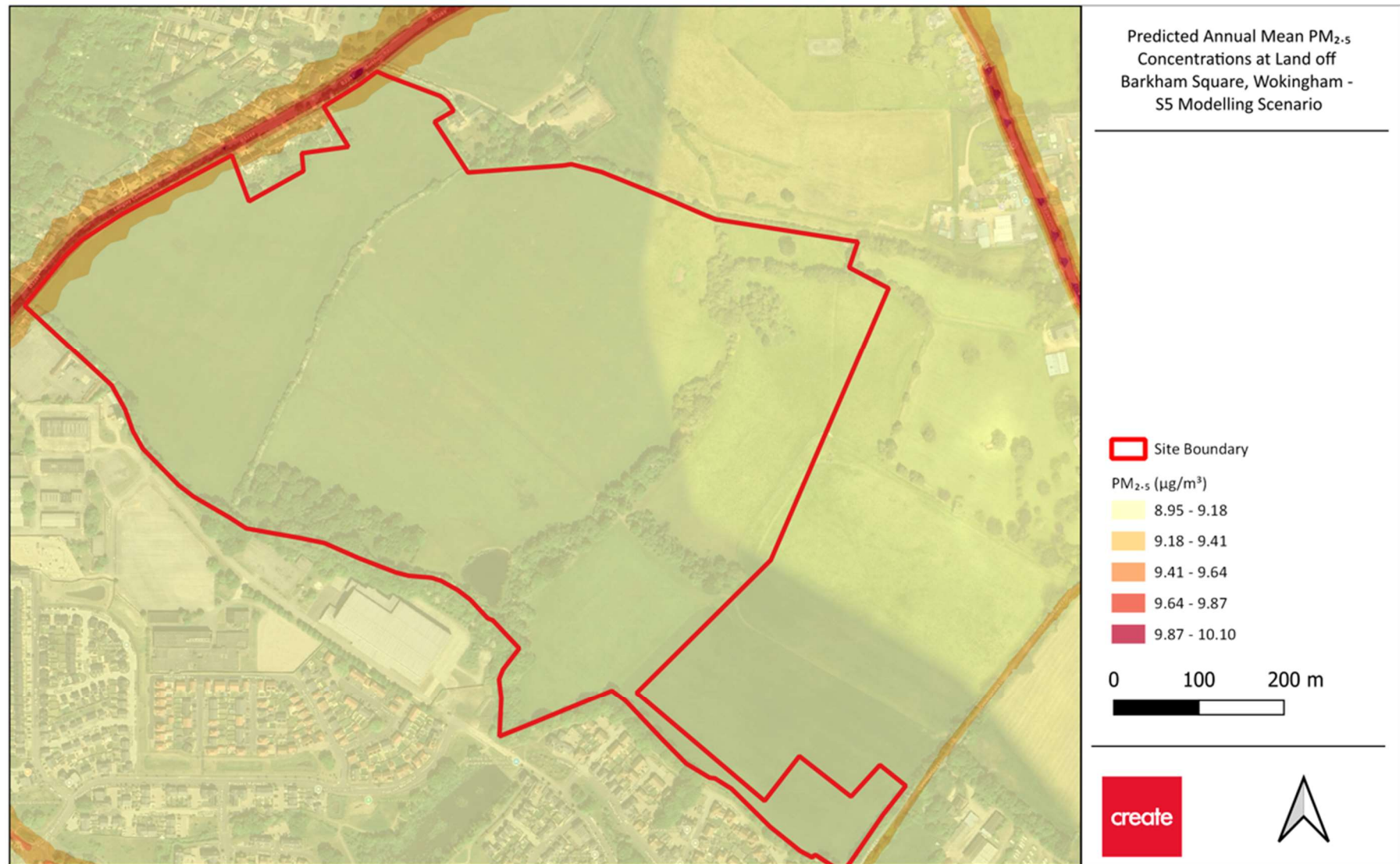


Figure 6.6b: Predicted Annual PM_{2.5} Concentrations for S5

Ecological Receptors

- 6.41 This section examines the impact of the proposed development on ecological receptors. The methodology is detailed in Appendix C.
- 6.42 The selected ecological receptor locations are detailed in section 4.

Significance Criteria

- 6.43 The designated habitats may contain species, habitats, or other receptors that are potentially sensitive to environmental pollution and for which indicative exposure thresholds have been determined by UK government to ensure their protection. These thresholds are known as Critical Levels (CL_e – for airborne concentrations) and Critical Loads (CL_o – for deposition rates).
- 6.44 Critical Levels represent the pollutant concentrations below which no known adverse effects occur on ecosystems or vegetation. These have been defined for internationally designated sites (e.g., SACs, SPAs), nationally designated sites (e.g., SSSIs), and locally designated sites (e.g., Ancient Woodland).
- 6.45 The relevant critical levels are summarised in Table 6.13.

Pollutant	Air Quality Objective	
	Concentration (µg/m ³)	Measured as
NO _x	30	Annual mean

Table 6.13: Ecological Critical Levels

Nitrogen Oxide (NO_x) Impacts

- 6.46 Annual mean NO_x concentrations are predicted at eight ecological receptor locations for S2 and S3 modelling scenarios. The calculation of the process contribution (PC) to the CL_e has been carried out for operational development in 2035. The results are presented in Table 6.14.

Sensitive Receptor	Predicted Annual Mean NO _x Concentration (µg/m ³)		NO _x PC (µg/m ³)	Predicted Annual Mean NO _x Concentration (µg/m ³)		NO _x PC (µg/m ³)
	S2	S3		S4	S5	
Eco1	13.98	13.99	0.002	11.77	11.78	0.003
Eco2	14.24	14.27	0.027	12.85	12.90	0.047
Eco3	13.99	14.01	0.014	12.19	12.22	0.027
Eco4	13.83	13.83	0.000	11.69	11.70	0.001
Eco5	15.48	15.51	0.029	12.77	12.78	0.016
Eco6	14.69	14.69	0.002	12.60	12.61	0.012
Eco7	14.10	14.10	0.006	12.07	12.09	0.018
Eco8	14.50	14.50	0.000	12.46	12.50	0.035

Table 6.14: Predicted Annual Mean NO_x Concentrations and PC

6.47 As shown in Table 6.14, predicted annual mean NO_x concentrations are well below the NO_x critical levels (30 µg/m³) at all receptors for both 2035 and 2040 scenarios. All process contributions are below 0.3 µg/m³. Therefore, the proposed development is predicted to have insignificant impacts on ecological receptors with respect to NO_x concentrations.

Nitrogen Deposition Impacts

6.48 Of the modelled ecological receptors, only E4 lies within the boundary of the Longmoor Bog SSSI and represents the qualifying bog habitat. Therefore, nitrogen and acid deposition calculations have been undertaken for E4 only. The remaining receptors (E1–E3 and E5–E9) are located outside designated ecological sites and have been assessed for NO_x concentrations only.

6.49 Annual mean NO_x concentrations, nutrient nitrogen deposition, and acid deposition were predicted at identified ecological receptors for S2 to S5 scenarios.

6.50 Nitrogen deposition was derived from the modelled annual mean NO₂ concentrations by applying a dry deposition velocity of 0.0015 m/s, representative of short vegetation typical of bog habitats, and a unit conversion factor of 0.315 to express the result in kg N/ha/yr.

6.51 The PC was calculated as the difference between the predicted nitrogen deposition under the *with development* and *without development* scenarios.

6.52 The Predicted Environmental Concentration (PEC) was obtained by adding the background nitrogen deposition of 15.4 kg N/ha/yr (2019 mid-year average from APIS) to the calculated PC. The results for receptor E4 are presented in Tables 6.15. and 6.16 for both 2035 and 2040 scenarios.

6.53 For both 2035 and 2040 operational years, the PC and PEC were compared against the relevant critical loads to determine significance.

6.54 The APIS identifies three qualifying habitats within Longmoor Bog SSSI:

- Betula pubescens–Molinia caerulea Woodland
- Erica tetralix–Sphagnum compactum Wet Heath
- Molinia caerulea–Potentilla erecta Mire

6.55 All three are characterised by wet, acidic vegetation communities that are sensitive to atmospheric nitrogen and acid deposition.

6.56 The corresponding critical loads for acid deposition range from 0.142 to 1.058 keq N/ha/yr and 0.1865 to 1.200 keq S/ha/yr, as summarised in Table 6.16. Nitrogen and acid deposition calculations were undertaken for E4, representing the most sensitive of these habitats.

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		Dry Nitrogen Deposition (KgN/ha/yr)		N Dep PC (KgN/ha/yr)	Ndep Background (KgN/ha/yr)	PEC	1% CL of 5 (KgN/ha/yr)
	S2	S3	S2	S3				
Eco4	11.74	11.74	0.0055	0.0055	3.5x10 ⁻⁰⁸	12.3	12.3	0.05

Table 6.15: Predicted Annual Mean NO₂ Concentrations, PC, PEC, Dry Nitrogen and Acid Depositions at Identified Ecological Receptors for S2 and S3 Scenarios

Sensitive Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)		Dry Nitrogen Deposition (KgN/ha/yr)		N Dep PC (KgN/ha/yr)	Ndep Background (KgN/ha/yr)	PEC	1% CL of 5 (KgN/ha/yr)
	S4	S5	S4	S5				
Eco4	9.883	9.883	0.00467	0.00467	1.0x10 ⁻⁰⁷	12.3	12.3	0.05

Table 6.16: Predicted Annual Mean NO₂ Concentrations, PC, PEC, Dry Nitrogen and Acid Depositions at Identified Ecological Receptors for S4 and S5 Scenarios

6.57 As shown in Tables 6.15 and 6.16, the PC from the development, 1.0×10^{-8} kg N/ha/yr in 2035 and 1.0×10^{-7} kg N/ha/yr in 2040 are substantially below 1 % of the critical load (0.05 kg N/ha/yr). The total nitrogen deposition (PEC = 12.3 kg N/ha/yr) remains unchanged from the background value, indicating that the development makes no measurable addition to existing nitrogen deposition levels. The impact of the development on nitrogen and acid deposition at Longmoor Bog SSSI is therefore considered insignificant.

7.0 BEST PRACTICE MEASURES

Construction Phase

- 7.1 The IAQM guidance provides a number of potential mitigation measures to reduce impacts from the construction phases. A high risk of dust impacts from all activities was identified. As a result, mitigation measures are required. These have been adapted for the development site as summarised in Table 5.5.
- 7.2 These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan (CEMP) if required by WBC.

Operational Phase

- 7.3 The modelled results show predicted annual mean NO₂, PM₁₀, and PM_{2.5} concentrations at all human receptor locations were below the relevant AQO in the proposed operational year, 2035. Additionally, the development will have a negligible impact at all receptor locations, in line with EPUK-IAQM guidance. However, in 2040, the development is predicted to result in slight effects at some receptors and a moderate effect at one receptor.
- 7.4 It should be noted that PM_{2.5} concentrations are predicted to slightly exceed the legally binding target in 2035. However, pollutant concentrations have been decreasing year on year due to changes in traffic patterns following the COVID-19 pandemic and ongoing improvements in vehicle technologies. This trend is supported by the monitored data presented in Section 3, which show a reduction in annual pollutant concentrations between the pre-pandemic years (2018 and 2019) and post-pandemic years (2022). By 2040, concentrations are predicted to remain below the legally binding target for PM_{2.5}, providing further evidence of a continuing improvement in local air quality and a reduced impact at existing receptor locations.
- 7.5 Additionally, the development will have an insignificant impact on ecological receptor locations in relation to NO₂, PM₁₀, and PM_{2.5} emissions.
- 7.6 The slight and moderate effects predicted in 2040 represent a conservative, worst-case assessment, as the modelled receptor locations are positioned immediately adjacent to the road network and therefore do not reflect actual exposure conditions. Furthermore, each of the committed developments included in the 2040 scenario is likely to incorporate its own mitigation measures, while the local authority continues to implement air quality action plans aimed at improving overall air quality across the area. Nevertheless, the best practice measures outlined below will help to further minimise any residual effects associated with the proposed development.
- 7.7 Potential best practice mitigation options to further reduce operational effects are listed below, as suggested by IAQM. It is acknowledged that this is not an exhaustive list but sets out a range of mitigation measures which could be explored at the reserved matters stage of the development:
- At least 1 Electric Vehicle charging point per 10 dwellings – This shall be based on the best technology available at the time of planning approval,
 - Travel Plan (where required) including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies,
 - A Welcome Pack available to all residents online and as a booklet, containing information and incentives to encourage the use of sustainable transport modes, and

- Car club provision within the Development or support given to local car club/Electric vehicle car clubs.

7.8 With the implementation of the best practice measures outlined above, the potential impacts associated with the development are expected to be further reduced. Therefore, the development is considered suitable for the proposed use without the need for additional air quality mitigation techniques.

8.0 CONCLUSIONS

- 8.1 Create Consulting Engineers Limited have been appointed by Crest Nicolson to undertake an Air Quality Assessment in support of the planning application at and off Barkham Square, Wokingham.
- 8.2 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM 2024 methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be negligible. The residual effects of dust and PM₁₀ generated by construction activities are therefore not significant.
- 8.3 Additionally, a quantitative assessment of the potential construction and operational phase impacts was carried out using ADMS-Roads (version 5.0.1.3) dispersion modelling software. This was used to predict the changes in NO₂, PM₁₀, and PM_{2.5} concentrations resulting from traffic generated by the Proposed Development.
- 8.4 The modelled results show predicted annual mean NO₂, PM₁₀, and PM_{2.5} concentrations at all human and ecological receptor locations were below the relevant AQO and CLe in the proposed operational year, 2035. Additionally, in line with EPUK-IAQM guidance, the development will have a negligible impact on all human receptor locations, with the residual effect considered not significant. The development will also have an insignificant impact on ecological receptor locations.
- 8.5 In the 2040 scenarios, when Local Plan infrastructure growth is included, the development is predicted to result in slight effects at some human receptors and a moderate effect at one receptor; however, these represent a conservative, worst-case assessment.
- 8.6 Additional mitigation measures are detailed in Section 7 to further reduce pollutant concentrations. With the implementation of these measures, air quality should not be considered a constraint to planning consent for the proposed development scenarios.

9.0 DISCLAIMER

- 9.1 Create Consulting Engineers Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.
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- 10.10 *Local Air Quality Management Technical Guidance (LAQM.TG22)*. Department for Environment, Food and Rural Affairs (2022)
- 10.11 *Guidance on the assessment of dust from demolition and construction (version 2.2)*. IAQM (2024)
- 10.12 *National Planning Policy Framework*. Ministry of Housing, Communities and Local Government (2024)
- 10.13 *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1)*. Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland (2007)
- 10.14 *National Planning Practice Guidance – Air quality*, Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2019)
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APPENDIX A

Construction Phase Assessment Methodology

There is the potential for fugitive dust emissions to occur as a result of construction activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management's *"Guidance on the Assessment of Dust from Demolition and Construction (Version 2.2)"*, 2024.

Construction Phase Assessment

Activities on the construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

- Annoyance due to dust soiling;
- The risk of health effects due to an increase in exposure to PM₁₀; and
- Harm to ecological receptors with account being taken of the sensitivity of the area that may experience these effects.

The assessment steps are detailed below.

STEP 1

STEP 1 screens the requirement for a more detailed assessment. An assessment will normally be required where there is:

- a 'human receptor' within:
 - 250 m of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).
- an 'ecological receptor' within:
 - 50 m of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).

STEP 2

STEP 2 assesses the risk of potential dust impacts separately for demolition, earthworks, construction and trackout activities. Each activity is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (STEP 2A); and
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (STEP 2B).

The two factors are combined in STEP 2C to determine the risk of dust impacts without mitigation applied.

STEP 2A defines the potential magnitude of dust emission through the demolition phase. The relevant criteria are summarised in Table A1.

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume >75,000 m³, • Potentially dusty construction material (e.g. Concrete), • On-site crushing and screening, • Demolition activities >12 m above ground level
	Earthworks	• Total site area >110,000 m², • Potentially dusty soil type (e.g. Clay, which will be prone to suspension when dry due to small particle size), • >10 heavy earth moving vehicles active at any one time, • Formation of bunds >6 m in height
	Construction	• Total building volume >75,000m³, • On site concrete batching, • Sandblasting.
	Trackout	• > 50 (>3.5t) outward movements in any one day, • Potentially dusty surface material (e.g. High clay content), • Unpaved road length >100 m.
Medium	Demolition	• Total building volume 12,000 m³ – 75,000 m³, • Potentially dusty construction material, • Demolition activities 6–12 m above ground level
	Earthworks	• Total site area 18,000 m² – 110,000 m², • Moderately dusty soil type (e.g. Silt), • 5–10 heavy earth moving vehicles active at any one time, • Formation of bunds 3 m – 6 m in height
	Construction	• Total building volume 12,000 m³ – 75,000 m³, • Potentially dusty construction material (e.g. Concrete), • On-site concrete batching.
	Trackout	• 20 – 50 (>3.5t) outward movements in any one day, • Moderately dusty surface material (e.g. High clay content) • Unpaved road length 50 m – 100 m.
Small	Demolition	• Total volume of building to be demolished <12,000 m³, • Construction material with low potential for dust release (e.g. metal, cladding, or timber), • Demolition activities <6 m above ground, • Demolition during wetter months.
	Earthworks	• Total site area < 18,000m², • Soil type with large grain size (e.g. Sand), • <5 heavy earth moving vehicles active at any one time, • Formation of bunds <3 m in height.

Magnitude	Activity	Criteria
	Construction	• Total building volume <12,000 m³, • Construction material with low potential for dust release (e.g. Metal cladding or timber).
	Trackout	• < 20 HDV (>3.5t) outward movements in any one day, • Surface material with low potential for dust release, • Unpaved road length <50 m.

Table A1: Potential Dust Emission Magnitude

Step 2B defines the sensitivity of the area. The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM₁₀, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Sensitivity	Examples		
	Dust Soiling Effects	Health Effects of PM ₁₀	Ecological Effects
High	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).^c • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations with an international or national designation and the designated features may be affected by dust soiling; or • Locations where there is a community of a particularly dust sensitive species, such as vascular species included in the red data list for Great Britain. • Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Users would expect^a to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.	• Locations where the people exposed are workers^d, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to pm10, as protection is covered by health and safety at work legislation.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.

Sensitivity	Examples		
	Dust Soiling Effects	Health Effects of PM ₁₀	Ecological Effects
Low	• The enjoyment of amenity would not reasonably be expected^a; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected^a to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks^b and	• Locations where human exposure is transient.^e • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition. • Indicative example is a local nature reserve with dust sensitive features.

NOTES:

- People's expectations will vary depending on the existing dust deposition in the area.
- Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with a workplace or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.
- This follows Defra guidance as set out in LAQM.TG(22).
- The air quality objectives and limit values do not apply to people in the workplace, although, such people can be affected by exposure of PM₁₀. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers.
- There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

Ecological Receptors: The advice of an ecologist should be sought to determine the need for an assessment of dust impacts on sensitive habitats and plants. A Habitat Regulation Assessment of the site may be required as part of the planning process, if the site lies close to an internationally designated site i.e. Special Conservation Areas (SACs), Special Protection Areas (SPAs) designated under the Habitats Directive (92/43/EEC) and RAMSAR sites.

Table A2: Sensitivity of Different Types of Receptors

The guidance also provides the following additional factors to consider when determining the sensitivity of an area:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant
- The season during which the works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in this document.

The sensitivity of the area to dust soiling effects on people and property is shown in Table A3.

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		> 20	> 50	> 100	> 350
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table A3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Table A4 outlines the sensitivity of the area to human health impacts.

Receptor Sensitivity	Annual Mean P M ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			> 20	> 50	> 100	> 250
High	>32 µg/m ³ (>18 µg/m ³ in Scotland)	>100	High	High	High	Medium
		10 – 100	High	High	Medium	Low
		1 – 10	High	Medium	Low	Low
	28 – 32 µg/m ³ (16 – 18 µg/m ³ in Scotland)	>100	High	High	Medium	Low
		10 – 100	High	Medium	Low	Low
		1 – 10	High	Medium	Low	Low
High	24 – 28 µg/m ³ (14 – 16 µg/m ³ in Scotland)	>100	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean P M ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			> 20	> 50	> 100	> 250
Medium	>18 µg/m ³ in Scotland)	10 – 100	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	>32 µg/m ³ (>18 µg/m ³ in Scotland)	>10	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	28 – 32 µg/m ³ (16 – 18 µg/m ³ in Scotland)	>10	Medium	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	24 – 28 µg/m ³ (14 – 16 µg/m ³ in Scotland)	>10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	<24 µg/m ³ (>18 µg/m ³ in Scotland)	>10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
Low	–	>1	Low	Low	Low	Low

Table A4: Sensitivity of the Area to Human Health Impacts

Table A5 outlines the sensitivity of the area to ecological impacts.

Receptor Sensitivity	Distance from the Source (m)	
	> 20	> 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table A5: Sensitivity of the Area to Ecological Impacts

STEP 2C combines the dust emission magnitude (STEP 2A) with the sensitivity of the area (STEP 2B) to determine the risk of unmitigated impacts. Tables A6 to A9 provide a method of assigning the level of risk for each activity. This is used to determine the level of mitigation that must be applied. Where the risk category is 'negligible', no mitigation measures beyond those required by legislation will be required.

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table A6: Risk of Dust Impacts from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table A7: Risk of Dust Impacts from Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table A8: Risk of Dust Impacts from Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table A9: Risk of Dust Impacts from Trackout

STEP 3

The dust risk categories for each of the four activities determined in STEP 2C should be used to define the appropriate, site-specific, mitigation measures to be adopted. For those mitigation measures that are general, the highest risk category should be applied.

For those cases where the risk is assigned as 'negligible', no mitigation measures beyond those required by legislation are required, however, additional mitigation measures may be applied as part of good practice. Where a local authority has issued guidance on measures to be adopted at demolition/ construction sites, these should also be taken into account.

STEP 4

Once the appropriate dust mitigation measures have been identified in STEP 3, the final step is to determine whether there are significant effects arising from the construction phase of a proposed development.

For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.

There may be cases where, for example, there is inadequate access to water for dust suppression to be effective, and even with other mitigation measures in place there may be a significant effect. Therefore, it is important to consider the specific characteristics of the site and the surrounding area to ensure that the conclusion of no significant effect is robust.

APPENDIX B

Operational Phase Assessment Methodology

This section details the methodology and criteria used to assess the operational phase assessment in conjunction with EPUK-IAQM and LAQM.TG22 guidance.

Operational Phase Assessment

The proposed development includes sensitive land uses. As such, the proposed development has the potential to introduce the poor quality of air in the area and worsen the current local air quality.

Detailed dispersion modelling is therefore to be undertaken to quantify NO₂, PM₁₀ and PM_{2.5} concentrations across the site and determine suitability for the proposed use, using the following scenarios:

- Baseline scenario (2022): Represents anticipated traffic data for a baseline year of 2022 based on data collected from Department for Transport's Traffic Count Website. Used to compare modelled results with local monitoring data to verify model performance.
- S2 scenario (2035): Represents anticipated traffic data with predicted variations in traffic flow patterns without the development, in 2035.
- S3 (i.e. with development) scenario (2035): Represents anticipated traffic data with the addition of predicted variations in traffic flow patterns as a result of the proposals, for the completed development, 2035.
- S4 – WBC Local Plan growth without the development (2040): Represents traffic conditions for the year 2040, incorporating cumulative traffic growth associated with the WBC Local Plan infrastructure projects, but excluding the proposed development.
- S5 – WBC Local Plan growth with the development (2040): Represents traffic conditions for the year 2040, including both the cumulative growth associated with the WBC Local Plan infrastructure and the traffic generated by the proposed development.

It should be noted that air quality is predicted to improve in the future. However, in order to provide a robust assessment, background concentrations for 2022 were utilised within the dispersion model. The use of 2035/2040 traffic data with 2022 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Receptors potentially sensitive to changes in NO₂, PM₁₀ and PM_{2.5} concentrations were identified within 500 m of the affected highway network in accordance with the guidance provided within the IAQM guidance on the likely limits of pollutant dispersion from road sources. LAQM.TG22 provides the following examples of where annual mean AQOs should apply:

- Residential properties,
- Schools,
- Hospitals, and
- Care homes.

The sensitivity impact significance of each receptor was defined in accordance with the criteria are shown in Tables A3 to A5 in Appendix A.

A desk-top study was undertaken to identify any existing and future sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment.

The sensitive receptors are identified in Section 4 and represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above.

The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41 µg/m³ should attract less significance than an annual mean of 51 µg/m³.

These factors were considered, and an overall significance determined for the impact of operational phase road traffic emissions.

It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

The criteria shown in Table B1, is adapted from the EPUK-IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality with sensitivity descriptors included to allow comparisons of various air quality impacts.

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

Table B1: Operational Traffic Exhaust Emissions – Assessment of Impacts

It should be noted that changes of up to 0.5% will be described as negligible in accordance with the EPUK-IAQM guidance.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table B1, the EPUK-IAQM document states that this framework is to be used as a starting point to make a judgement on significance of effect, but other influences might need to be accounted for.

Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances.

The descriptors of impact significance for the annual mean concentration for both NO₂ and PM₁₀ that take account of the magnitude of changes for the proposed development based on guidance from EPUK-IAQM are shown in Table B2.

Total Concentration Related to Objective/Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme ($>40 \mu\text{g m}^{-3}$)	Minor Adverse	Moderate Adverse	Major Adverse
Just Below Objective/Limit Value with Scheme ($36\text{--}40 \mu\text{g m}^{-3}$)	Minor Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme ($30\text{--}36 \mu\text{g m}^{-3}$)	Negligible	Minor Adverse	Minor Adverse
Well Below Objective/Limit Value with Scheme ($<30 \mu\text{g m}^{-3}$)	Negligible	Negligible	Minor Adverse
Decrease with Scheme			
Above Objective/Limit Value with Scheme ($>40 \mu\text{g m}^{-3}$)	Minor Beneficial	Moderate Beneficial	Major Beneficial
Just Below Objective/Limit Value with Scheme ($36\text{--}40 \mu\text{g m}^{-3}$)	Minor Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with Scheme ($30\text{--}36 \mu\text{g m}^{-3}$)	Negligible	Minor Beneficial	Minor Beneficial
Well Below Objective/Limit Value with Scheme ($<30 \mu\text{g m}^{-3}$)	Negligible	Negligible	Minor Beneficial

Table B2: Impact Descriptors for Changes to Annual Mean Concentration of NO_2 and PM_{10}

Once the magnitude of the change has been established, the impact at each relevant receptor needs to be described. The impact magnitude at each receptor location can be described using the changes stated above as Negligible, Minor, Moderate or Major, as either Adverse or Beneficial, and either Temporary or Permanent.

The overall significance should be described separately for both the impact of emissions related to the proposed development on existing receptors, and for the impacts of emissions from existing source(s) on new exposure being introduced from the proposed development.

APPENDIX C

Ecological Impact Assessment Methodology

The IAQM's '*A guide to the assessment of air quality impacts on designated nature conservation sites*' and the Environment Agency-DEFRA's '*Air emissions risk assessment for your environmental permit*' have been used to assess the air quality risk to ecological receptors as a result of the proposed development.

Air Emissions Risk Assessment

The change in pollutant concentrations due to a polluting activity is often determined by modelling the dispersion of the emissions. This is known as the process contribution (PC).

The maximum PC calculated as a percentage of the relevant critical level is used to determine whether the impacts will be significant or insignificant. If the impact is insignificant, the activity can be screened out.

The PC must meet both of the following criteria for Ramsar, European and national designated sites to have an insignificant impact and be screened out:

- The short-term PC is less than 10% of the short-term environmental standard; and
- The long-term PC is less than 1% of the long-term environmental standard.

The Assessment has been conducted as follows:

1. Calculate the environmental concentration of each substance you release into the air – known as the PC.
2. Identify PCs with insignificant environmental impact so that they can be 'screened out' – this means that you do not have to assess them any further.
3. For substances not screened out in step 2, calculate the PEC for each substance you release to air – the PEC is the PC plus the concentration of the substance already present in the environment.
4. Identify emissions that have insignificant environmental impact – these can be screened out.
5. Get 'detailed modelling' (also known as detailed assessment or computer modelling) done for the emissions you cannot screen out.
6. For each substance you've released to air, compare the PC and PEC with the relevant environmental standard and summarise your results.
7. Check if you need to take further action.
8. Check if you need to do any other risk assessments.

Crest Nicholson Operations Ltd

LAND OFF BARKHAM SQUARE, WOKINGHAM

Air Quality Assessment

The information contained within this report and any appendices or supporting information provided are to be treated as confidential.



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