

8 Air Quality

8.1 Introduction

- 8.1.1 This chapter of the ES assesses the likely significant effects of the Proposed Development on the environment in respect of impacts on air quality.
- 8.1.2 The ES Chapter considers the worst case scenario for the development – Option 2. This scenario is worst case in terms of air quality as it demonstrates the highest traffic flows.
- 8.1.3 The chapter has been prepared by Tetra Tech RPS and, as required by the 2017 EIA Regulations (as amended), the authors are professional and competent air quality consultants and include a Member of the Institute of Air Quality Management (see **Appendix 1.2** Statement of Expertise).
- 8.1.4 This chapter is supported by the following appendices and figures:
- Appendix 8.1: Detailed Construction Dust Assessment Methodology
 - Appendix 8.2: Assessment of Ecological Impacts
 - Appendix 8.3: Model Verification
 - Appendix 8.4: Emissions Mitigation Statement
 - Figure 8.1: Construction Dust Buffers
 - Figures 8.2 and 8.3: Road Links and Receptors
 - Figure 8.4: Wind Rose – Charlwood 2024
 - Figures 8.5 to 8.8: Ecological Receptors

8.2 Policy Context

- 8.2.1 The assessment has been prepared with reference to the following national, regional and local planning documents, legislation, and guidance.

National Planning Policy

- 8.2.2 The Air Quality Standards Regulations, Defra, 2010ⁱ, amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020ⁱⁱ, sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.
- 8.2.3 The Environment Act 1995, as amended by the Environment Act 2021, established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007ⁱⁱⁱ. The Strategy sets UK air quality standards¹ and objectives²

¹ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

² Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality issue. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

- 8.2.4 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying locations where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAs) and implementing Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of the limit values in the Air Quality Standards Regulations.
- 8.2.5 The limit values and objectives relevant to this assessment are summarised in **Table 8.1**. Where the limit values and the AQS objectives differ, the more stringent has been used.

Table 8.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO ₂)	1 hour	200 µg.m ⁻³	18 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM ₁₀)	24 Hour	50 µg.m ⁻³	35 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM _{2.5})	Annual	20 µg.m ⁻³	-
		10 µg.m ⁻³ to be met by 31 st December 2040*	-

*The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 sets out an annual-mean PM_{2.5} target of 10 µg.m⁻³ to be met by the end of 2040. As the proposed opening year of the development is before 2040 this lower target has not been considered further.

- 8.2.6 On 14th January 2019, Defra published the '*Clean Air Strategy 2019*'. The report sets out actions that the Government intends to take to reduce emissions from transport, in the home, from farming and from industry.
- 8.2.7 In October 2024, Defra published Interim Planning Guidance for PM_{2.5} Targets. The interim guidance, which is in place until a finalised guidance document is published, provides Defra's provisional position whereby evidence should be provided, at the planning application stage, that key sources of air pollution have been identified and appropriate action taken to minimise emissions of PM_{2.5}, and its precursors, as far as is reasonably practicable.
- 8.2.8 Consideration should be given to how exposure to PM_{2.5} has been considered in site selection and what mitigation will be implemented to reduce emissions of PM_{2.5}, as well as reduce PM_{2.5} exposure.
- 8.2.9 The National Planning Policy Framework (NPPF)^{iv} is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF is a presumption in favour of sustainable development. For determining planning applications, this means approving development proposals if they accord with an up-to-date local development plan, unless material considerations indicate otherwise. If the development plan does not contain relevant policies, or the policies are out of date, then planning permission should be granted unless the application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development, or any adverse impacts would significantly outweigh the benefits.
- 8.2.10 The NPPF sets out three overarching objectives to achieve sustainable development. The relevant objective in the context of this air quality assessment is:

“an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution and mitigating and adapting to climate change, including moving to a low carbon economy” (Paragraph 8c)

8.2.11 Under the heading ‘Promoting sustainable transport’, the NPPF states:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.” (Paragraph 110)

8.2.12 Under the heading ‘Conserving and enhancing the natural environment’, the NPPF states:

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

...

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; ...” (Paragraph 187)

“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.” (Paragraph 199)

National Planning Practice Guidance

8.2.13 The National Planning Practice Guidance (NPPG)⁶ was issued on-line on 6 March 2014 and is updated periodically by government as a live document. The last major update was on 1 November 2019. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

8.2.14 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including

those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity. The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

“Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;

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

Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;

Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;

Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value.”

8.2.15 The NPPG provides advice on how air quality impacts can be mitigated and notes:

“Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.”

Local Planning Policy

8.2.16 Horsham District Planning Framework (November 2015)^{vi} states the following in relation to air quality.

Policy 24 Strategic Policy: Environmental Protection

“the high quality of the district’s environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to and the emission of pollutants including noise, odour, air and light pollution and ensure that they:

...

4. Minimise the air pollution... in order to protect human health and the environment;

5. *Contribute to the implementation of local Air Quality Action Plans and do not conflict with its objectives;*

6. *maintain or reduce the number of people exposed to poor air quality including odour. Consideration should be given to development that will result in new public exposure, particularly where vulnerable people, (e.g. the elderly, care homes or schools) would be exposed to the areas of poor air quality; and*

7. *Ensure that the cumulative impact of all relevant committed developments is appropriately assessed.*

Assessment Guidance

- Defra, April 2021, Local Air Quality Management Technical Guidance, 2022 (LAQM.TG22)^{vii}.
- Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM), January 2017, *Land-Use Planning & Development Control: Planning for Air Quality*^{viii}.
- IAQM, 2024, Guidance on the assessment of dust from demolition and construction^{ix}.
- IAQM, 2020, A guide to the assessment of air quality impacts on designated nature conservation sites^x.
- JNCC Report No. 696, 2021, Guidance on Decision-making Thresholds for Air Pollution^{xi}.

8.3 Assessment Methodology

8.3.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that “*Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific.*” It lists a number of areas that might be usefully agreed at the outset.

8.3.2 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK & IAQM Land-Use Planning & Development Control: Planning for Air Quality document^{xii}, the IAQM Guidance on the assessment of dust from demolition and construction^{xiii}, and, where relevant, Defra’s Local Air Quality Management Technical Guidance: LAQM.TG22^{xiv}. It includes the key elements listed below:

- Assessment of the existing and future air quality in the study area (i.e. existing and future baseline), using official government estimates from Defra, publicly available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
- A qualitative assessment of likely construction-phase impacts with mitigation and controls in place;
- A quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation), encompassing the impacts of the Proposed Development traffic on the local area; and
- An Emissions Mitigation Statement including a damage cost assessment for the Proposed Development.

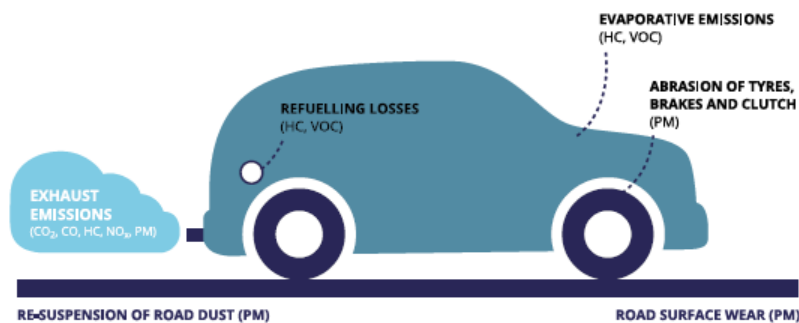
Summary of Key Pollutants Considered

8.3.3 For the construction phase of the Proposed Development the key pollutant is dust, covering both the PM₁₀ fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

- 8.3.4 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality, except for large, long-term construction sites: the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document^{xv} indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and by more than 100 elsewhere. These trip-generation criteria are not anticipated to be exceeded for the Proposed Development.
- 8.3.5 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM₁₀). Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO₂. The NO oxidises in the atmosphere to form NO₂. The assessment of operational impacts therefore focuses on changes in NO₂ and PM₁₀ concentrations. The impact from fine particulate matter, known as PM_{2.5} (a subset of PM₁₀), concentrations has also been considered.

Inset Figure 8.1: Type of Vehicle Emissions

The different types of emissions from vehicles, and a comparison of the relative amounts of selected pollutants released by the latest Euro 6 petrol and diesel vehicles



Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

Construction Phase - Methodology

- 8.3.6 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter^{xvi}. Particles greater than 75 µm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.
- 8.3.7 The effects of dust are linked to particle size and two main categories are usually considered:
- PM₁₀ particles, those up to 10 µm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
 - Dust, generally considered to be particles larger than 10 µm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.
- 8.3.8 The IAQM Guidance on the assessment of dust from demolition and construction sets out 250 m as the distance from the Site (as shown in **Figure 8.1**) and 50 m from the site traffic route(s) up to 250 m of the Site entrance, within which there could potentially be nuisance dust and PM₁₀ effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases (in this particular application, there are no ecological receptors within the distances and ecological effects

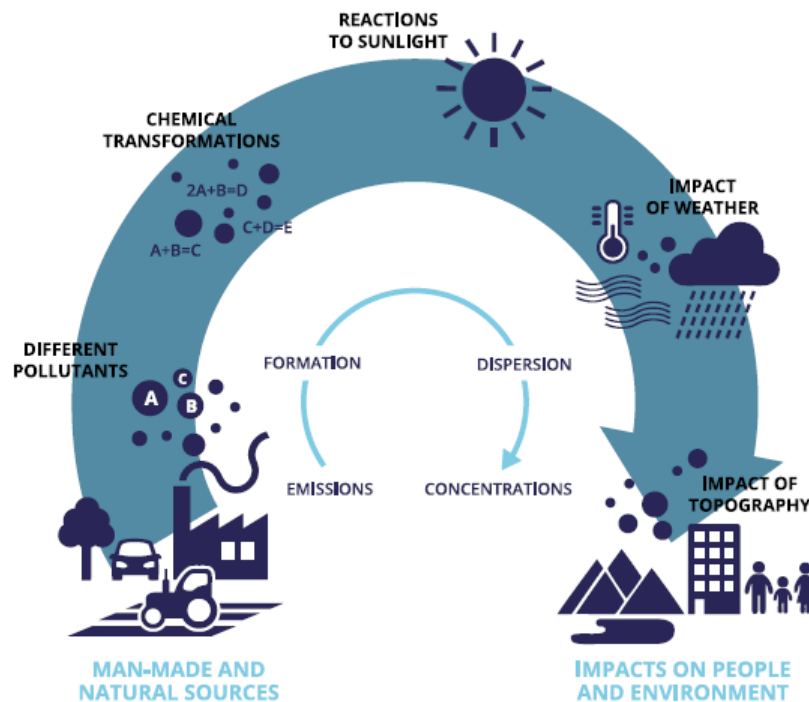
have been scoped out of the demolition and construction phase assessment). These distances are set to be deliberately conservative.

- 8.3.9 Concentration-based limit values and objectives have been set for the PM₁₀ suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.
- 8.3.10 The IAQM dust guidance aims to estimate the impacts of both PM₁₀ and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *“The magnitude of impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.”*
- 8.3.11 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *“This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified.”*
- 8.3.12 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:
- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
 - The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.
- 8.3.13 The detailed construction dust assessment methodology is provided in **Appendix 8.1**.
- 8.3.14 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be ‘not significant’.
- 8.3.15 This assessment does not consider the air quality impacts of dust from any contaminated land or buildings. If contaminated land is identified on the Site, the impacts will be assessed in other technical discipline reports

Operational Phase - Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

- 8.3.16 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

Inset Figure 8.2: Air Pollution: From Emissions to Exposure

Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

8.3.17 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in **Section 8.4**.

8.3.18 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the UK by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

8.3.19 The following scenarios were modelled:

- Without Development – without the Proposed Development in the first year that the development is expected to be fully operational, 2032; and
- With Development – with the Proposed Development in the first year that the development is expected to be fully operational, 2032.

Model Input Data

Traffic Flow Data

8.3.20 Traffic data used in the assessment have been provided by the project's transport consultants, Glanville. The traffic flow data provided for this assessment are summarised in **Table 8.2**. The modelled road links are illustrated in **Figures 8.2** and **8.3**.

Table 8.2: Traffic Data Used Within the Assessment

Road Link ID	Speed (km.hr ⁻¹)	Daily Two-Way Vehicle Flow			
		Without Development		With Development	
		Total Vehicles	% HDV	Total Vehicles	% HDV
L2	112	37,228	3	37,610	4
L3	112	52,864	3	53,399	4
L4	112	49,161	3	49,854	4
L5	112	76,359	5	76,645	5
L6	80	24,387	5	24,768	6
L7	80	48,114	5	48,726	5
L10	112	34,189	4	34,470	4
L14	112	37,753	4	38,006	4
L17	112	68,143	5	68,337	5
L18	112	78,653	5	78,844	5
L19	112	43,844	3	44,037	3
L23	80	73,485	4	74,299	5
L24	80	62,102	4	62,998	5

Notes:

HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses

LDV = Light Duty Vehicle

- 8.3.21 The average speed on each road has been reduced by 10 km.hr⁻¹ (or to 20 km.hr⁻¹ for roads where the AADT > 10,000) to take into account the possibility of slow-moving traffic near junctions and at roundabouts in accordance with LAQM.TG22.

Vehicle Emission Factors

- 8.3.22 The modelling has been undertaken using Defra's 2025 emission factor toolkit (version 13) which draws on emissions generated by the European Environment Agency (EEA) COPERT 5.8 emission calculation tool.

Meteorological Data

- 8.3.23 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is Charlwood, approximately 7.5 km northeast of the Site. Meteorological data from that station for 2024 has been used within the dispersion model. The wind rose is presented in **Figure 8.4**.

Receptors

- 8.3.24 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG22^{xiv} provides examples of exposure locations and these are summarised in **Table 8.3**.

Table 8.3: Examples of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties.

		Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expected to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

8.3.25 Representative sensitive receptors for this assessment have been selected at properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in **Table 8.4**.

Table 8.4: Modelled Sensitive Receptors

ID	Description	Sensitivity	x	y
1	Residential	High	520041	132922
2	Residential	High	520325	133189
3	Residential	High	520761	133374
4	Residential	High	521203	133669
5	Residential	High	522083	134179
6	Residential	High	523246	134620
7	Residential	High	524118	134700
8	Residential	High	525073	134358
9	Residential	High	525986	132874
10	Residential	High	525975	132312
11	Residential	High	526145	129746
12	Residential	High	526673	125798
13	Residential	High	526684	125639
14	Residential	High	526561	121359
15	Residential	High	519154	133313
16	Residential	High	518366	133538
17	Residential	High	518083	133484
18	Residential	High	516902	133177
19	Residential	High	515626	131307
20	Residential	High	515519	131169
21	Residential	High	515293	130682
22	Residential	High	515621	129029
23	Residential	High	516270	127984

24	Residential	High	516409	127794
25	Residential	High	516577	126375
26	Residential	High	516665	126116
27	Residential	High	516241	125281
28	Residential	High	516789	123668
29	Residential	High	516619	122963
30	Residential	High	516542	122415
31	Residential	High	514918	118249
32	Residential	High	513237	115599
33	Residential	High	512833	115249
34	Residential	High	512208	113705

8.3.26 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

8.3.27 An assessment of the operational phase impacts on local ecological receptors has also been undertaken and is included in **Appendix 8.2**.

Long-Term Pollutant Predictions

8.3.28 Annual-mean NO_x and PM₁₀ concentrations have been predicted at representative sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_x emissions is converted to NO₂ to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO₂ concentrations have been derived from the modelled road-related annual-mean NO_x concentration using Defra's calculator [xvii].

Short-Term Pollutant Predictions

8.3.29 In order to predict the likelihood of exceedances of the hourly-mean AQS objectives for NO₂ and the daily-mean AQS objective for PM₁₀, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

Hourly-Mean AQS Objective for NO₂

8.3.30 Research undertaken in support of LAQM.TG22 has indicated that the hourly-mean limit value and objective for NO₂ is unlikely to be exceeded at a roadside location where the annual-mean NO₂ concentration is less than 60 µg.m⁻³. The threshold of 60 µg.m⁻³ NO₂ has been used as the guideline for considering a likely exceedance of the hourly-mean nitrogen dioxide objective.

Daily-Mean AQS Objective for PM₁₀

8.3.31 The number of exceedances of the daily-mean AQS objective for PM₁₀ of 50 µg.m⁻³ may be estimated using the relationship set out in LAQM.TG22:

$$\text{Number of Exceedances of Daily Mean of } 50 \mu\text{g.m}^{-3} = -18.5 + 0.00145 * (\text{Predicted Annual-mean PM}_{10})^3 + (206 / \text{Predicted Annual-mean PM}_{10} \text{ Concentration})$$

8.3.32 This relationship indicates that the daily-mean AQS objective for PM₁₀ is likely to be met if the predicted annual-mean PM₁₀ concentration is 31.8 µg.m⁻³ or less.

8.3.33 The daily mean objective is therefore not considered further within this assessment if the annual-mean PM₁₀ concentration is predicted to be less than 31.5 µg.m⁻³.

Fugitive PM₁₀ Emissions

- 8.3.34 Transport PM₁₀ emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM₁₀ exhaust emissions; therefore, the relative importance of fugitive PM₁₀ emissions is increasing. Current official vehicle emission factors for particulate matter include brake dust and tyre wear which studies suggest may account for approximately one-third of the total particulate emissions from road transport; but not re-suspended road dust (which remains unquantified).

Significance Criteria for Development Impacts on the Local Area

- 8.3.35 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document ^{xii} advises that:

“The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation.”

- 8.3.36 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. **Table 8.5** provides the EPUK & IAQM approach for describing the long-term air quality impacts at sensitive human-health receptors in the surrounding area.

Table 8.5: Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year (2030)	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, limit value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.

3. The table is only designed to be used with annual mean concentrations.

4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

- 8.3.37 The human-health impact descriptors above apply at individual receptors. The EPUK & IAQM guidance states that the impact descriptors *“are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are ‘slight’, ‘moderate’ or ‘substantial’ impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.”*
- 8.3.38 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Limitations and Assumptions

- 8.3.39 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).
- 8.3.40 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.
- 8.3.41 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the uncertainty range informed by an analysis of relevant, available data.
- 8.3.42 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.
- 8.3.43 LAQM.TG22 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.
- 8.3.44 For the verification and adjustment of NO_x/NO₂ concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.
- 8.3.45 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Notwithstanding this, a number of monitoring locations have been identified within the study area and a model verification study has been undertaken for the modelling assessment and is included at **Appendix 8.3**.

8.3.46 The main components of uncertainty for this study include those summarised in **Table 8.6**.

Table 8.6: Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most conservative value from a comparison of measured and Defra mapped concentration estimate.	The background concentration is the major proportion of the total predicted concentration.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The conservative assumptions adopted ensure that the background concentration used within the model contributes to the result being towards the top of the uncertainty range, rather than a central estimate.
Fraction from Modelled Sources	Traffic flow estimates	Growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration.
	Traffic speed estimates	Traffic speed limits have been used within the model. The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly. The fractional bias indicates that the adjusted model is performing well.	

- 8.3.47 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the Proposed Development is operational are unlikely to be higher than those presented within this chapter.

8.4 Baseline Conditions

- 8.4.1 National Planning Practice Guidance and EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LAQM.TG22 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *"Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality."*
- 8.4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:
- Defra maps, which show estimated pollutant concentrations across the UK in 1 km grid squares; and
 - published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.
- 8.4.3 A detailed description of how the baseline air quality has been derived for the Site is summarised in the following paragraphs.

Local Urban Background Monitoring

- 8.4.4 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an appropriate source of data for the purposes of describing baseline air quality for the Site.
- 8.4.5 HDC manually monitors NO₂ concentrations using passive diffusion tubes at two urban background locations within five kilometres of the site and the most recently measured annual-mean concentrations are presented in **Table 8.7**.

Table 8.7 Passively Monitored Urban Background Annual-Mean NO₂ Concentrations

Monitor Name	Approximate Distance from the Site (km)	Concentration (µg.m ⁻³)		
		2022	2023	2024
Horsham 4N	4.4	8.8	7.6	7.2
Horsham 3N	3.7	8.7	-	-

All concentrations have been adjusted for bias.

Defra Mapped Concentration Estimates

- 8.4.6 Defra's total annual-mean NO₂ concentration estimates (2021 base year) have been collected for the 1 km grid squares of the monitoring site's study area and the Site and are summarised in **Table 8.8**.

Table 8.8 Defra Mapped Annual-Mean Background NO₂ Concentration Estimates

Monitor Name	Approximate Distance from the Site (km)	Concentration (µg.m-3)	
		Range of Monitored	Estimated Defra Mapped
Horsham 4N	4.4	7.2 – 8.8	10.5
Horsham 3N	3.7	8.7	11.3
Site			9.8

Appropriate Background Concentrations for the Development Site

- 8.4.7 For NO₂, the Defra mapped background concentration estimates are higher than the range of the results from monitoring and so the use of these data would be conservative. The background annual-mean NO₂ concentration has therefore been derived from the 9.8 µg.m⁻³, obtained from Defra mapped estimates at the Site.
- 8.4.8 In the absence of representative PM_{2.5} and PM₁₀ monitoring, the background annual-mean concentration at the Site has been derived from the Defra mapped background concentration estimates.
- 8.4.9 Historically the view has been that background traffic-related NO₂ concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. After a prolonged period through the last decade where background annual-mean NO₂ concentrations did not generally decrease in line with expectations, the most recent monitoring studies indicate ambient traffic-related NO₂ concentrations are now falling. To ensure that the assessment presents conservative results, however, no reduction in the background has been applied for future years.
- 8.4.10 **Table 8.9** summarises the annual-mean background concentrations for NO₂, PM₁₀ and PM_{2.5} used in this assessment.

Table 8.9 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration (µg.m-3)
NO ₂	Defra Mapped (2021)	9.8
PM ₁₀		12.4
PM _{2.5}		7.1

Future Baseline

- 8.4.11 In a no-development scenario (i.e. without the Proposed Development), background pollutant concentrations in the UK would likely reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, to ensure that the assessment presents conservative results, no reduction in the background pollutant levels has been considered.

8.5 Potential Significant Impacts**Construction**

- 8.5.1 The main effect of any dust emissions during the construction phase, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry and the effects on human health from suspended particulate matter.

Operation

- 8.5.2 Emissions of NO₂, PM₁₀ and PM_{2.5} generated by traffic associated with the Proposed Development, once operational, could have detrimental effects on surrounding sensitive receptors.

Primary and Tertiary Mitigation

- 8.5.3 For the purpose of the air quality assessment, there are no primary or tertiary mitigation measures.

8.6 Likely Significant Effects

Construction Phase

- 8.6.1 The assessment is based on the indicative activities set out in **Chapter 5 Construction Methodology & Phasing**. The type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.
- 8.6.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.
- 8.6.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is “not significant”.

Risk of Dust Impacts

Source

- 8.6.4 The volume of the buildings on site that would be demolished has been estimated to be below 12,000 m³. The dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as small.
- 8.6.5 The Site area is approximately 254,000 m². As this is larger than 110,000 m², the dust emission magnitude for the earthworks phase is classified as large.
- 8.6.6 The total volume of the buildings to be constructed would be over 75,000 m³. The dust emission magnitude for the construction phase is therefore classified as large.
- 8.6.7 The maximum number of outwards movements in any one day is likely to be over 50 HDVs, and so the dust emission magnitude for trackout would be classified as large.

Table 8.10 Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Small	Large	Large	Large

Pathway and Receptor - Sensitivity of the Area

- 8.6.8 All demolition, earthworks and construction activities are assumed to occur within the Site. As such, receptors at distances within 20 m, 50 m, 100 m and 250 m of the Site have been identified and are

illustrated in **Appendix 8.2**. The sensitivity of the area has been classified, and the results are provided in **Table 8.11**.

Table 8.11 Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Impacts	High	Approx. 20 residential properties on land to the north of the site (future residential units secured by way of existing planning permission as part of the wider development site). 10 – 100 high sensitivity receptors located within 20 m of the Site (Appendix 8.1).
Human Health	Low	Approx. 20 residential properties on land to the north of the site (future residential units secured by way of existing planning permission as part of the wider development site). Background PM ₁₀ concentrations for the assessment = 12.4 µg.m ⁻³ 10 – 100 high sensitivity receptors located within 20 m of the Site and PM ₁₀ concentrations below 24 µg.m ⁻³ (Appendix 8.1).

- 8.6.9 The dust emission magnitude for trackout is classified as large and trackout may occur on roads up to 250 m from the site. The major routes within 250 m of the site are along the A264. The sensitivity of the area has been classified and the results are provided in **Table 8.12**.

Table 8.12 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Impacts	Low	No high sensitivity receptors located within 20 m of the site access routes along the A264. 1-10 high sensitivity receptors located within 50 m of the site access routes along the A264. 1 low sensitivity receptor located within 20 m of the site access routes along the A264 (Appendix 8.1).
Human Health	Low	Background PM ₁₀ concentrations for the assessment = 12.4 µg.m ⁻³ No high sensitivity receptors located within 20 m of the site access routes along the A264. 1-10 high sensitivity receptors located within 50 m of the site access routes along the A264. 1 low sensitivity receptor located within 20 m of the site access routes along the A264 (Appendix 8.1).

Overall Dust Risk

- 8.6.10 The dust emission magnitude has been considered in the context of the sensitivity of the area (**Appendix 8.1**) to give the Dust Impact Risk. **Table 8.13** summarises the Dust Impact Risk for the four activities.

Table 8.13 Dust Impact Risk for Demolition, Earthworks, Construction and Trackout

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	High	High	Low
Human Health	Negligible	Low	Low	Low
Risk	Medium	High	High	Low

- 8.6.11 Taking the Site as a whole, the overall risk is deemed to be high. The mitigation measures appropriate to a level of risk for the Site as a whole and for each of the phases are set out in **section 8.7**.

Operational Phase*Assessment of Air Quality Impacts on Surrounding Area*

- 8.6.12 This section of the report summarises the future operational-phase air quality impacts of the key pollutants associated with the traffic generated by the Proposed Development.

Nitrogen Dioxide (NO₂)

- 8.6.13 **Table 8.14** presents the annual-mean NO₂ concentrations predicted at the façades of existing receptors.

Table 8.14 Predicted Annual-Mean NO₂ Impacts at Existing Receptors

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	10.9	11.0	<1	Negligible
2	11.7	11.8	<1	Negligible
3	14.0	14.2	<1	Negligible
4	14.6	14.7	<1	Negligible
5	18.6	18.9	1	Negligible
6	15.4	15.7	1	Negligible
7	15.3	15.5	1	Negligible
8	12.4	12.5	<1	Negligible
9	18.0	18.1	<1	Negligible
10	20.8	20.9	<1	Negligible
11	24.0	24.1	<1	Negligible
12	17.8	17.9	<1	Negligible
13	20.7	20.8	<1	Negligible
14	14.8	14.8	<1	Negligible
15	12.4	12.5	<1	Negligible

16	14.3	14.5	<1	Negligible
17	13.6	13.7	<1	Negligible
18	13.5	13.7	<1	Negligible
19	14.5	14.6	<1	Negligible
20	15.7	15.8	<1	Negligible
21	15.1	15.2	<1	Negligible
22	12.7	12.7	<1	Negligible
23	11.7	11.8	<1	Negligible
24	14.4	14.5	<1	Negligible
25	11.9	11.9	<1	Negligible
26	15.8	15.9	<1	Negligible
27	12.4	12.5	<1	Negligible
28	14.4	14.5	<1	Negligible
29	17.4	17.5	<1	Negligible
30	19.0	19.1	<1	Negligible
31	13.5	13.6	<1	Negligible
32	14.1	14.1	<1	Negligible
33	18.1	18.2	<1	Negligible
34	15.9	16.0	<1	Negligible
Maximum	24.0	24.1	-	-
Minimum	10.9	11.0	-	-

8.6.14 Predicted annual-mean NO₂ concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO₂. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible'.

8.6.15 As all predicted annual-mean NO₂ concentrations are below 60 µg.m⁻³, the hourly-mean objective for NO₂ is likely to be met at all receptors. The short-term NO₂ impact can be considered 'negligible' and is not considered further within this assessment.

8.6.16 Overall, the impact on the surrounding area from NO₂ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM₁₀)

8.6.17 **Table 8.15** presents the annual-mean PM₁₀ concentrations predicted at the façades of existing receptors.

Table 8.15 Predicted Annual-Mean PM₁₀ Impacts at Existing Receptors

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	13.0	13.1	<1	Negligible
2	13.5	13.6	<1	Negligible
3	14.9	15.0	<1	Negligible
4	15.3	15.4	<1	Negligible
5	17.9	18.0	<1	Negligible
6	16.0	16.1	<1	Negligible
7	15.9	16.0	<1	Negligible

8	13.9	13.9	<1	Negligible
9	15.4	15.5	<1	Negligible
10	16.4	16.4	<1	Negligible
11	17.7	17.7	<1	Negligible
12	15.3	15.3	<1	Negligible
13	16.3	16.3	<1	Negligible
14	14.1	14.1	<1	Negligible
15	13.9	14.0	<1	Negligible
16	15.1	15.2	<1	Negligible
17	14.7	14.7	<1	Negligible
18	14.1	14.1	<1	Negligible
19	14.0	14.1	<1	Negligible
20	14.4	14.5	<1	Negligible
21	14.2	14.3	<1	Negligible
22	13.4	13.4	<1	Negligible
23	13.1	13.1	<1	Negligible
24	14.0	14.0	<1	Negligible
25	13.1	13.1	<1	Negligible
26	14.5	14.5	<1	Negligible
27	13.4	13.5	<1	Negligible
28	14.0	14.0	<1	Negligible
29	15.1	15.2	<1	Negligible
30	15.7	15.7	<1	Negligible
31	13.7	13.7	<1	Negligible
32	13.9	13.9	<1	Negligible
33	15.3	15.4	<1	Negligible
34	15.0	15.0	<1	Negligible
Maximum	17.9	18.0	-	-
Minimum	13.0	13.1	-	-

8.6.18 Predicted annual-mean PM₁₀ concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM₁₀. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

8.6.19 As all predicted annual mean PM₁₀ concentrations are below 31.5 µg.m⁻³, the daily-mean PM₁₀ objective is expected to be met at all receptors and the short-term PM₁₀ impact is not considered further within this assessment.

8.6.20 Overall, the impact on the surrounding area from PM₁₀ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement

Fine Particulate Matter (PM_{2.5})

8.6.21 **Table 8.16** presents the annual-mean PM_{2.5} concentrations predicted at the façades of existing receptors.

Table 8.16 Predicted Annual-Mean PM_{2.5} Impacts at Existing Receptors

Receptor ID	Concentration (µg.m ⁻³)		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	7.5	7.5	<1	Negligible
2	7.7	7.8	<1	Negligible
3	8.5	8.6	<1	Negligible
4	8.7	8.8	<1	Negligible
5	10.2	10.3	1	Negligible
6	9.0	9.1	<1	Negligible
7	9.0	9.0	<1	Negligible
8	7.9	8.0	<1	Negligible
9	8.9	8.9	<1	Negligible
10	9.5	9.5	<1	Negligible
11	10.3	10.3	<1	Negligible
12	8.8	8.8	<1	Negligible
13	9.5	9.5	<1	Negligible
14	8.1	8.1	<1	Negligible
15	8.0	8.0	<1	Negligible
16	8.6	8.7	<1	Negligible
17	8.4	8.4	<1	Negligible
18	8.0	8.1	<1	Negligible
19	8.1	8.1	<1	Negligible
20	8.3	8.4	<1	Negligible
21	8.2	8.2	<1	Negligible
22	7.7	7.7	<1	Negligible
23	7.5	7.5	<1	Negligible
24	8.1	8.1	<1	Negligible
25	7.5	7.5	<1	Negligible
26	8.4	8.4	<1	Negligible
27	7.7	7.7	<1	Negligible
28	8.1	8.1	<1	Negligible
29	8.7	8.8	<1	Negligible
30	9.1	9.1	<1	Negligible
31	7.9	7.9	<1	Negligible
32	8.0	8.0	<1	Negligible
33	8.9	8.9	<1	Negligible
34	8.6	8.6	<1	Negligible
Maximum	10.3	10.3	-	-
Minimum	7.5	7.5	-	-

AQS objective = 20µg.m⁻³

8.6.22 Predicted annual-mean PM_{2.5} concentrations in the opening year at the façades of the existing receptors are below the AQS objective for PM_{2.5} at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

- 8.6.23 Overall, the impact on the surrounding area from PM_{2.5} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Significance of Effects

- 8.6.24 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 8.6.25 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, "*Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances.*" and "...a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."
- 8.6.26 The results of the modelling indicate that with the Proposed Development, the predicted NO₂, PM₁₀ and PM_{2.5} concentrations at existing receptors are below the relevant long and short-term AQS objectives. When the magnitude of change in annual-mean NO₂, PM₁₀ and PM_{2.5} concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on existing receptors are categorised as 'negligible'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'negligible', using the descriptors adopted for this assessment.
- 8.6.27 Using professional judgement, the resulting air quality effect is considered to be 'negligible' and 'not significant' overall.

8.7 Secondary Mitigation

Construction Phase

- 8.7.1 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.
- 8.7.2 As summarised in **Table 8.13**, the predicted Dust Impact Risk is classified as Medium for demolition, High for earthworks and construction and Low for trackout. The general site measures described as 'highly recommended' for high risk sites are listed below. The 'highly recommended' measures for Medium risk demolition sites and High risk construction and earthwork sites are also listed. There are no 'highly recommended' measures for Low risk trackout.

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. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information

Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust.

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 off- site, and the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 500m of the Site, 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 100m of the Site, with cleaning to be provided if necessary.
- Carry out regular dust soiling checks of surfaces such as street furniture, cars and window-sills within 100 m of Site.
- 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. Commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction ^{xviii}.

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. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors.
- Erect solid screens or barriers around the Site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extended period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean.
- 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.
- Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water to prevent wind whipping.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as soon as practicable any material tracked out of the site.

- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site).
- 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.

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 un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips, where practicable.
- 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.

Medium Risk Measures Specific to Demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

High Risk Measures Specific to 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.

High Risk Measures Specific to 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.

8.8 Residual Effects

Construction Phase

- 8.8.1 Provided the package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that *“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’.”* The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

Operational Phase

- 8.8.2 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 8.8.3 Given that change in concentration at existing sensitive receptors is categorised as “negligible”, using professional judgement, the overall residual air quality effect is considered to be “not significant”.

8.9 Cumulative Effects

Construction Phase

- 8.9.1 During the construction phase, there is the potential for cumulative effects where two or more proposed developments are within 500m of each other; and then only for receptors within 250 m of both developments. Cumulative effects would then only be experienced if construction works on multiple schemes were to take place simultaneously. It is assumed that any surrounding construction sites and developments would implement dust mitigation and controls proportionate to the level of risk as set out in IAQM guidance, as appropriate, to be secured by planning condition through a CEMP. *With this mitigation, together with regular liaison with other high risk construction sites, there will be no significant residual cumulative air quality effect*

Operational Phase

- 8.9.2 During the operational phase, cumulative effects have been considered to the extent that the traffic from other developments has been included in the traffic data provided for this assessment (including

the use of traffic growth factors). The other developments included within the traffic data provided are described in the Transport Assessment. As outlined previously in this chapter, the resulting air quality effect is considered to be 'negligible' and 'not significant' overall.

8.10 Summary

- 8.10.1 This Air Quality Assessment considers the air quality impacts as a result of the Proposed Development.

Baseline

- 8.10.2 The background concentrations were drawn from Defra maps and the published results of local authority Review and Assessment studies of air quality. No reduction has been assumed for the future baseline.

Construction

- 8.10.3 For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars, and laundry. The mitigation measures provided within this chapter should ensure that the risk of adverse dust effects is reduced to a level categorised as "not significant". These measures will be delivered as part of the CEMP for the Proposed Development.

Operation

- 8.10.4 For existing receptors in the local area, the operational impact of the Proposed Development is predicted to be 'negligible' taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the overall impact on the area as a whole is described as 'negligible'.
- 8.10.5 Note that an assessment of the operational phase impacts at ecological receptors has also been undertaken and is provided in **Appendix 8.2**.

Mitigation Measures

- 8.10.6 The key mitigation measures that relate to air quality for the construction phase have been derived from IAQM guidance and broadly cover: communications, requirement for a dust management plan, site management, monitoring, preparing and maintaining the site, operating vehicle/machinery and sustainable travel, operations, waste management, demolition, earthworks, construction, and trackout.
- 8.10.7 No mitigation measures are deemed necessary for the operational phase.
- 8.10.8 Note that an Emissions Mitigation Statement, which includes a damage cost assessment, has been prepared and can be found in **Appendix 8.4**.
- 8.10.9 **Table 8.17** contains a summary of the likely significant effects of the Proposed Development.

Table 8.17: Table of Significance – Air Quality

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*						Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)
				I	UK	E	R	C	L	
Construction										
Impact of suspended particulate matter on human-health and deposited dust (nuisance)	Temporary	Minor to Major	Mitigation measures are outlined in Section 8.7, in line with IAQM guidance.						x	Negligible to Minor
Completed Development										
Impact of concentrations of NO ₂ , PM ₁₀ and PM _{2.5} on existing receptors.	Permanent	Negligible	None					x		Negligible
Cumulative Effects										
Construction										
Impact of suspended particulate matter on human-health and deposited dust (nuisance)	Temporary	Minor to Major	Mitigation measures are outlined in Section 8.7, in line with IAQM guidance.						x	Negligible to Minor
Completed Development										
Impact of concentrations of NO ₂ , PM ₁₀ and PM _{2.5} on existing receptors	Permanent	Negligible	None					x		Negligible

*** Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = Council; L = Local

References

- i Defra, 2010, The Air Quality Standards Regulations.
- ii The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020
- iii Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.
- iv Communities and Local Government, December 2024, National Planning Policy Framework
- v National Planning Guidance NPPG
- vi Horsham District Planning Framework, November 2015
- vii Defra, April 2021, Local Air Quality Management Technical Guidance, 2022 (LAQM.TG22)
- viii Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM), January 2017, *Land-Use Planning & Development Control: Planning for Air Quality*.
- ix IAQM, 2024, Guidance on the assessment of dust from demolition and construction
- x IAQM, 2020, A guide to the assessment of air quality impacts on designated nature conservation sites.
- xi JNCC Report No. 696, 2021, Guidance on Decision-making Thresholds for Air Pollution
- xii EPUK & IAQM, January 2017, Land-Use Planning & Development Control: Planning For Air Quality
- xiii IAQM, 2024, Guidance on the assessment of dust from demolition and construction
- xiv Defra, 2022, Local Air Quality Management Technical Guidance, 2022 (LAQM.TG22)
- xv EPUK & IAQM, January 2017, Land-Use Planning & Development Control: Planning For Air Quality
- xvi British Standard Institute, 1983, BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary
- xvii <http://laqm.defra.gov.uk/review-and-assessment/tools/tools.html>
- xviii IAQM, 2012, Air Quality Monitoring in the Vicinity of Demolition and Construction Sites