

7. Air Quality and Dust

Introduction

- 7.1 This chapter of the EIA has been produced by Air and Acoustic Consultants Ltd (AAC) to assess the Proposed Development in relation to the effects it would have upon air quality.
- 7.2 During site clearance and construction activities, temporary impacts may arise from the emission of air pollutants and dust. During both the construction and occupation phase(s), vehicular traffic and emissions from stationary plant associated with the Proposed Development has the potential to lead to changes in the total air quality concentrations at human receptors.
- 7.3 The assessment will focus on air pollutants that are likely to arise from the construction and occupation of the Proposed Development. These pollutants are oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $\text{PM}_{2.5}$) and dust for human receptors. No considerations on impacts on ecological receptors have been undertaken due to lack of statutory sites located near to the Site.
- 7.4 This Chapter is supported by the following figures and appendices:
- Figure 7.1 – Manchester Meteorological Site Wind Rose
 - Figure 7.2 – Diurnal Profile
 - Figure 7.3 – Modelled Road Network
 - Figure 7.4 – Existing and Committed Receptors
 - Figure 7.5 – Future Receptors
 - Figure 7.6 – Local Authority Air Quality Monitoring Locations
 - Figure 7.7 – Demolition Dust Risk Buffers
 - Figure 7.8 – Earthworks and Construction Dust Risk Buffers
 - Figure 7.9 – Trackout Dust Risk Buffers
 - Appendix 7.1 – Construction Dust Assessment Methodology
 - Appendix 7.2 – EPUK & IAQM Planning for Air Quality Guidance
 - Appendix 7.3 – General Demolition and Construction Dust Mitigation Measures
 - Appendix 7.4 – Traffic Flows
 - Appendix 7.5 – Verification

Planning Policy Context

European Legislation

- 7.5 The following text is taken from the [legislation.gov.uk](https://www.legislation.gov.uk)¹ website and sets out how European Union (EU) Legislation will be retained in the United Kingdom after the Brexit transition:

"The UK is no longer a member of the European Union. EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation, under the control of the UK's Parliaments and Assemblies, and is published on [legislation.gov.uk](https://www.legislation.gov.uk).

[...]

EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16)."

- 7.6 European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include the three (now repealed) below:

- Directive 1999/30/EC – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO₂ and oxides of nitrogen, sulphur dioxide, lead and PM₁₀;
- Directive 2000/69/EC – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- Directive 2002/3/EC – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold, and an information threshold for concentrations of ozone in ambient air.

- 7.7 The fourth daughter Directive was not included within the consolidation and is described as:

¹ EU legislation and UK law. Accessible at: <https://www.legislation.gov.uk/eu-legislation-and-uk-law>

- Directive 2004/107/EC – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

7.8 The updated Directive, The Air Quality Standards (Amendment) Regulations 2016, came into force on 31st December 2016².

National Legislation, Planning Policy and Strategy

UK Air Quality Regulations

7.9 The Air Quality Standards (Amendments) Regulations 2016, seeks to simplify the air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives, but also the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. Statutory Instrument SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995)³, for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

UK Air Quality Strategy⁴

7.10 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS)⁵ for England, Scotland, Wales and Northern Ireland. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union Legislation. The Air Quality Strategy has since been updated⁶ and includes a range of actions, for both local authorities and the UK government, to improve air quality across the UK.

7.11 The AQS sets out national health-based standards and objectives for nine key air pollutants to protect human health and ecosystems. These pollutants are benzene, 1-3 butadiene, carbon

² Statutory Instrument, 2016. The Air Quality Standards Regulations, No. 1184.

³ Parliament of the United Kingdom, 1995. Environmental Act 1995, Chapter 25

⁴ Department for Environment, Food and Rural Affairs (July 2007) Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 & 2)

⁵ Department for Environment Food and Rural Affairs, 1997. The United Kingdom National Air Quality Strategy, Cm 3587.

⁶ Department for Environment Food and Rural Affairs, 2023. Air quality strategy: framework for local authority delivery.

monoxide, lead, nitrogen dioxide, ozone, particulate matter, sulphur dioxide and polycyclic aromatic hydrocarbons.

- 7.12 The pollutant standards relate to ambient pollutant concentrations in air, based on medical and scientific evidence regarding how each pollutant affects human health. Pollutant objectives are the future dates by which each standard is to be achieved, considering economic considerations, practical and technical feasibility.
- 7.13 The air quality objectives are managed through the Local Air Quality Management, (LAQM) regime, which is defined within the Air Quality (England) Regulations 2000, (SI 928) and The Air Quality (England) (Amendment) Regulations 2002, (SI 3043). **Table 7.1** below shows the national air quality objectives / targets and limits as set out in the Air Quality Standards (Amendment) Regulations 2016.

Table 7.1: Air Quality Objectives (England)

Pollutants	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
PM _{2.5}	25 µg/m ³ - Stage 1 limit value pre 2020 20 µg/m ³ - Indicative Stage 2 limit value post 2020. 15% reduction in background to be achieved between 2010 & 2020 at Urban Background sites.	Annual mean
	12 µg/m ³ - Target to be achieved by 2028.	Annual mean

Pollutants	Air Quality Objectives	
	Concentration	Measured as
	10 µg/m ³ - Target to be achieved by 2040.	Annual Mean

7.14 Further to the air quality standards set out above, the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023⁷ came into force in England on 30th January 2023 and set out two fine particulate matter targets to be achieved by 2040. These are:

- 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; and
- The population exposure reduction target is that there is at least a 35% reduction in population exposure by the end of 31st December 2040 ("the target date"), as compared with the average population exposure in the three-year period from 1st January 2016 to 31st December 2018.

7.15 To note, these central government targets primarily focus on tackling emissions, rather than requiring local authorities to assess concentrations against these new PM_{2.5} targets

Environment Act(s)

7.16 Part IV of the Environment Act 1995 requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy was adopted in 1997, with national health-based standards and objectives set out for the, then, nine key air pollutants.

7.17 Part IV of the Environment Act 2021⁸ amends both the Environment Act 1995 and the Clean Air Act 1993⁹. It builds on the foundations provided by Part IV of the Environment Act 1995 and strengthens the local air quality management framework. The act allows the Secretary of State to make provisions for, about or connect with the recall of relevant products that do not meet relevant environmental standards.

⁷ Statutory Instrument, 2023. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. No.96.

⁸ UK Public General Acts, 2021. Environment Act 2021, Chapter 30

⁹ UK Public General Acts, 1993. Clean Air Act 1993, Chapter 11.

- 7.18 The government have resisted calls for the adoption of the recently updated World Health Organisation (WHO) air quality guidelines, specifically targeting particulate matter pollution. The act does introduce a duty on the government to bring forward at least two air quality targets by October 2022 for consultation that will be set in secondary legislation, however this has been delayed¹⁰. The first will aim to reduce the annual average level of fine particulate matter (PM_{2.5}) in ambient air. The second will be a long-term target (set a minimum of 15 years in the future), which the government says, *“will encourage long-term investment and provide certainty for businesses and other stakeholders.”*

World Health Organisation Guidelines

- 7.19 The WHO guidelines were updated in September 2021¹¹, and are a set of evidence-based recommendations of limit values for specific air pollutants developed to help countries achieve air quality that protects public health. They are significantly lower than the current levels legislated within the Air Quality Objectives (as set out in **Table 7.1**). The WHO guideline levels are set out in **Table 7.2**.

Table 7.2: WHO Air Quality Guidelines

Pollutants	Air Quality Guidelines	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	25 µg/m ³	24-hour mean (99th percentile)
	10 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	45 µg/m ³	24-hour mean (99th percentile)
	15 µg/m ³	Annual mean
PM _{2.5}	15 µg/m ³	24-hour mean (99th percentile)
	5 µg/m ³	Annual mean

- 7.20 The Committee on the Medical Effects of Air Pollutants (COMEAP)¹² has concluded the following:

“The WHO’s revised AQGs for pollutants in outdoor air are suitable as long-term targets to inform policy development. We stress that the AQG values should not be regarded as thresholds below which

¹⁰ UK Government, Update on Progress on Environmental Targets. Accessible at: <https://www.gov.uk/government/news/update-on-progress-on-environmental-targets>

¹¹ World Health Organization, 2021. WHO global air quality guidelines.

¹² Committee on the Medical Effects of Air Pollutants (COMEAP), 2022. COMEAP statement: response to publication of the World Health Organization Air quality guidelines 2021

there are no impacts on health - the current evidence has not identified thresholds for effect at the population level, meaning that even low concentrations of pollutants are likely to be associated with adverse effects on health. Therefore, continued reductions, even where concentrations are below the AQGs, are also likely to be beneficial to health."

- 7.21 However, this assessment has considered the current legislation, and therefore the objectives set out in **Table 7.1** have been used to inform and assess the impact of the development against concentration at the modelled receptors chosen in this assessment. As previously noted, updates to the PM_{2.5} objective were due to be brought forward in October 2022, but this has been delayed.

National Planning Policy Framework

- 7.22 The National Planning Policy Framework (NPPF)¹³ (2023) sets out the planning policy for England, to help achieve sustainable development within the planning sector. The planning system has three overarching objectives, one of which (Paragraph 8c) 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"

- 7.23 Paragraph 105 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. 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."

- 7.24 Paragraph 174 states:

¹³ Department for Levelling Up, Housing, & Communities, 2023. National Planning Policy Framework.

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

[..]

e) 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.

[...]”

7.25 Paragraph 185 states:

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

7.26 Paragraph 186 states:

“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.”

7.27 Paragraph 188 states:

“The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to

separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

- 7.28 The NPPF also sets out the national planning policy on biodiversity and conservation. This emphasises that the planning system should seek to minimise effects on and provide net gains in biodiversity, wherever possible, as part of the Government's commitment to halting decline and establishing coherent and resilient ecological networks.
- 7.29 The NPPF is supported by Planning Practice Guidance (PPG)¹⁴ (DCLG, 2021), which sets out the principles on how planning can take account of the impacts of new developments on air quality.
- 7.30 Paragraph 001 Reference ID: 32-001-20191101 states:

"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:

- *fine particulate matter (PM_{2.5})*
- *ammonia (NH₃)*
- *nitrogen oxides (NO_x)*
- *sulphur dioxide (SO₂)*
- *non-methane volatile organic compounds (NMVOCs)*

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

¹⁴ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government. Planning Practice Guidance. Accessible at: <http://planningguidance.planningportal.gov.uk/>

7.31 Paragraph 005 Reference ID: 32-005-20191101 states:

“Whether 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.

Where air quality is a relevant consideration the local planning authority may need to establish:

- *The ‘baseline’ local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.”*

Any Other Relevant National Planning or Development Strategies

Environmental Improvement Plan

7.32 The Environmental Improvement Plan 2023 is the first revision of the 25 year Environment Plan¹⁵, and sets out how the 25 Year Environmental Plan goals, Environment Act targets, and other commitments that have been made domestically and internationally will combine to drive specific improvements in the natural environment. This is to be reviewed every five years, with the next review due in 2028.

7.33 Goal 2 – Clean Air sets out what the government has achieved since 2018, which includes publishing the Clean Air Strategy¹⁶ in 2019, reducing pollution from domestic burning and publishing the Transport Decarbonisation Plan¹⁷, all of which aim to improve air quality.

¹⁵ Department for Environment, Food and Rural Affairs, 2018. A Green Future: Our 25 Year Plan to Improve the Environment.

¹⁶ Department for Environment, Food and Rural Affairs, 2019. Clean Air Strategy 2019.

¹⁷ Department for Transport, 2021. Decarbonising Transport. A Better, Greener Britain.

7.34 The document sets out the following measures and interventions to be implemented in order to tackle poor air pollution:

- A legal target to reduce population exposure to PM_{2.5} by 35% in 2040 compared to 2018 levels, with a new interim target to reduce by 22% by the end of January 2028.
 - Interim target - Compared to 2018, the reduction in population exposure to PM_{2.5} in the most recent full calendar year must be 22% or greater.
- Legal concentration limits for a number of other key pollutants. The majority of these limits, including for sulphur dioxide and coarse particulate matter, are already met; however, nitrogen dioxide still exceeds its annual mean objective, therefore the government is working towards meeting compliance with the 40 µg/m³ limit.
- A legal target to require a maximum annual mean concentration of 10 micrograms of PM_{2.5} per cubic metre (µg/m³) by 2040, with a new interim target of 12 µg/m³ by the end of January 2028.
 - The highest annual mean concentration in the most recent full calendar year must not exceed 12 µg/m³ of PM_{2.5}.
- Legal emission reduction targets for five damaging pollutants by 2030 relative to 2005 levels:
 - Reduce emissions of nitrogen oxides by 73%.
 - Reduce emissions of sulphur dioxide by 88%.
 - Reduce emission of PM_{2.5} by 46%.
 - Reduce emissions of ammonia by 16%.
 - Reduce emissions of non-methane volatile organic compounds by 39%.

7.35 These measures will be monitored through the Annual Progress Report and the Outcome Indicator Framework. As noted previously, these targets have been set by central government, as opposed to local authorities directly assessing PM_{2.5} concentrations against these targets.

Clean Air Strategy

7.36 The Clean Air Strategy (CAS)¹⁸ was published in January 2019 and sets out how the government will improve air quality nationally. The document aims to tackle the issue of air quality across all parts of government and society to protect public health and the environment, and identifies

¹⁸ Department for Environment, Food and Rural Affairs, 2019. Clean Air Strategy 2019.

what needs to be done to achieve this. The document complements the Industrial Strategy (archived), the Clean Growth Strategy¹⁹ and the 25 Year Environment Plan²⁰ and is a key part of delivering the government's 25 Year Environmental Plan.

- 7.37 The document has adopted international targets to reduce emissions of fine particulate matter, ammonia, nitrogen oxides, sulphur dioxide and non-methane volatile organic compounds by 2020 and 2030. The document proposes tougher goals to cut public exposure to particulate matter pollution, as recommended by the World Health Organisation (WHO).
- 7.38 The strategy not only targets the reduction of emissions, but also a reduction in exposure.

Reducing Emissions from Road Transport: Road to Zero Strategy

- 7.39 The Reducing emissions from road transport: Road to Zero Strategy²¹ (2018) document produced by the Office for Low Emission Vehicles (OLEV), Office for Zero Emission Vehicles (OZEV) and the Department for Transport (DfT) sets out how the government aims to end the sale of new conventional petrol and diesel cars and vans by 2040, with almost every car and van having zero emissions by 2050. Furthermore, the aim of the government is to see at least 50%, and as many as 70%, of new car sales being ultra-low emission by 2030 (and up to 40% of new van sales).
- 7.40 A number of measures have been set out in the document which outline how the government will support this gradual transition, some of which are consumer incentives, research and development and innovation support based.
- 7.41 Since this document was released, the then Prime Minister has announced that, as part of the Ten Point Plan for a Green Industrial Revolution (2020)²², the government will end the sale of new petrol and diesel cars and vans from 2030, 10 years earlier than set out in the document above. This has since been pushed back, with the end of the sale of new petrol and diesel cars and vans due to be achieved by 2035.

¹⁹ Department for Business, Energy and Industrial Strategy, 2017. The Clean Growth Strategy.

²⁰ Department for Environment, Food and Rural Affairs, 2018. A Green Future: Our 25 Year Plan to Improve the Environment.

²¹ Department for Transport, Office for Low Emission vehicles and Office for Zero Emission Vehicles, 2018. Reducing emissions from road transport: Road to Zero Strategy

²² Department for Transport and Office for Zero Emission Vehicles, 2020. The Ten Point Plan for a Green Industrial Revolution

- 7.42 This plan will see road traffic-related NO_x emissions to reduce significantly over the coming decades, and likely beyond the scale of reductions forecast in the air quality tools used to assess air quality impacts.

Local Planning Policy

- 7.43 The Knowsley Local Plan Core Strategy²³ was published in January 2016 and sets out the vision, objectives and policies which will guide development within Knowsley up to the year 2028. The Core Strategy contains the following policies which are related to air quality:

- 7.44 Policy CS2, *Development Principles* states:

- 1) *"New development in Knowsley and the preparation of subsequent stages of the Local Plan will be expected to support the following development principles:*

[...]

Principle 4: Recognise environmental limits, protect and enhance environmental assets, enhance local character and promote quality of place by:

[...]

e) Mitigating potential negative impacts of traffic growth and road traffic on highway safety, air quality, noise and health;

[...]

j) minimising negative impact upon flood risk, air quality, water quality, land quality, soil quality, and noise or vibration levels and ensuring any negative impacts are appropriately mitigated.

Development that will have an unacceptable impact upon any of the above will only be permitted where the benefits of the proposal clearly outweigh the harm

[...]"

²³ Knowsley Council (2016) Core Strategy

7.45 Policy CS8, *Green Infrastructure*, states:

"Maintenance and Enhancement of Knowsley's Existing Green Infrastructure

- 1) *Knowsley's existing Green Infrastructure and its beneficial functions will be protected, managed and/or enhanced, primarily to:*

[...]

- e) *Mitigate air, water and noise pollution"*

[...]"

7.46 Policy CS23, *Renewable and Low Carbon Infrastructure* states:

- 1) *"The Council will support proposals that will produce and distribute decentralised, low carbon and renewable energy, provided that they do not cause significant harm (in terms of their number, scale, siting or cumulative impacts) to:*

- a) *Natural resources, biodiversity, geodiversity, water and air quality and, landscape quality;*

[...]"

Site Specific Policies

7.47 It is noted within the Local Plan Policies Map²⁴, that the proposed development will be situated on "Urban Greenspace/Education land", which is covered by Policy CS21, *Greenspaces and Trees*, within the Core Strategy. To note, air quality is not considered within this policy.

Other Relevant Policy, Standards and Guidance

Local Air Quality Management Technical Guidance (LAQM.TG22)²⁵

7.48 The Department for Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their review and assessment work. This guidance,

²⁴ Knowsley Council, 2015. Local Plan Policies Map

²⁵ Department for Environment, Food & Rural Affairs, 2022. Local Air Quality Management. Technical Guidance (TG22).

referred to in this document as LAQM.TG22, has been used where appropriate in the assessment.

Guidance on the Assessment of Dust from Demolition and Construction (2023)²⁶

- 7.49 The Institute of Air Quality Management (IAQM) have published this guidance. The guidance provides a methodology to undertake a qualitative assessment of the potential dust / emission risks during the construction phase of a proposed development. The assessment consists of a five step process to assess the potential level of risks, (Large, Medium, Small or Negligible), regarding the four main phases of development, (demolition, earthworks, construction, and trackout). The assessment includes consideration of pre-mitigation, and post-mitigation impacts, based upon the scale and nature of the development.

Land-Use Planning & Development Control: Planning for Air Quality (2017)²⁷

- 7.50 The Environmental Protection UK (EPUK) and IAQM have published guidance that offers comprehensive advice on when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and the possible mitigation measures that may be implemented to minimise these impacts.

Assessment Methodology and Significance Criteria

Baseline Data Collection

- 7.51 The existing baseline NO_x, NO₂, PM₁₀ and PM_{2.5}, concentrations, on and in the vicinity of the Proposed Development have been assessed using the Knowsley Metropolitan Borough Council (KMBC) air quality review and assessment reports and monitoring data.

²⁶ Institute of Air Quality Management, 2023. Guidance on the Assessment of Dust from Demolition and Construction.

²⁷ Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM), 2017. Land-use Planning & Development Control: Planning for Air Quality

- 7.52 The DEFRA background mapping website²⁸ has also been utilised to provide background NO_x, NO₂, PM₁₀ and PM_{2.5} concentrations. The website has mapped background concentrations at a resolution of 1x1km for the whole of the UK. Estimated concentrations are available for all years between 2018 and 2030.
- 7.53 To identify any sensitive ecological designated sites, a review of the DEFRA Magic Map website²⁹ and the UK Air Pollution Information System³⁰, (APIS) website has been undertaken.

Construction Phase

- 7.54 To assess the potential impacts associated with dust and PM₁₀ release during the construction phase of the Proposed Development and determine required mitigation to feed into the inherent mitigation measures in the 'Additional Mitigation / Enhancement Measures' of this ES Chapter. The dust risk assessment is based upon the IAQM (2023) guidance.
- 7.55 The criteria developed by the IAQM (2023) divides the activities on construction sites into the four main activity types to assess their different level of impacts upon receptors. These are:
- Demolition;
 - Earthworks;
 - Construction; and
 - Trackout
- 7.56 The risk of dust effects (Low, Medium or High) is determined by the scale (magnitude) and nature of the works being undertaken, along with the distance to the receptor.
- 7.57 The full methodology is set out in **Appendix 7.1**, and the full assessment of the Proposed Development dust risk assessment in isolation of any ongoing works or committed developments has been undertaken in the 'Assessment of Likely Significant Effects' section of this ES Chapter, with no allowance for inherent mitigation set out in the 'Additional Mitigation / Enhancement Measures' section and in **Appendix 7.3**.

²⁸ Department for Environmental Food and Rural Affairs. Accessible at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

²⁹ Natural England. MAGIC. Accessible at: <https://magic.defra.gov.uk/>

³⁰ Centre for Ecology and Hydrology. Air Pollution Information Systems. Accessible at: <http://www.apis.ac.uk/>

Construction and Operational Phase Vehicular Impact Methodology for Human Receptors

- 7.58 The number of daily vehicular movements associated with the construction phase of the Proposed Development will vary on a daily basis, depending upon the construction activity being undertaken at the time. Therefore, reasonable estimates have been provided by mode transport planning, the project transport consultant.
- 7.59 The peak construction and operational phase(s) for the Proposed Development is anticipated to be 2025 and 2028 respectively.
- 7.60 The traffic predictions provided by mode transport planning, as set out in **Appendix 7.5**, have been compared to the EPUK & IAQM (2017) criterion thresholds for impacts on human receptors, set out in **Appendix 7.2**, with the assessment of the Proposed Development construction and operational traffic set out in the 'Assessment of Likely Significant Effects' section to determine if a full impact assessment of the potential impacts on human receptors is required.

Modelling Parameters

Air Quality Model

- 7.61 Air quality at specified receptor locations have been predicted using the industry recognised ADMS-Roads (v5.0.1.3) dispersion model. The model is recognised and validated for this type of assessment. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions of air pollutant concentrations. It can predict long-term and short-term concentrations, including percentile concentrations.
- 7.62 The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width, where applicable), and meteorological data. To note, the meteorological data used within the model has been taken from Manchester Meteorological Site for 2022, as the closest two meteorological sites (Crosby and Liverpool) will be influenced by coastal conditions, which are not representative of the Site location. This was agreed with the KMBC Environmental Protection Officer on the 24/11/2022. The windrose is illustrated in **Figure 7.1**.

- 7.63 A standard diurnal profile from the DfT website³¹ has been utilised as part of the modelling process for an average 7-day week. The 2022 diurnal profile is illustrated in **Figure 7.2**.
- 7.64 The model has been utilised to predict concentrations of NO_x, PM₁₀ and PM_{2.5}, based upon vehicle flow, composition and speed data. The NO_x concentrations have been post processed to derive NO₂ concentrations using the NO_x to NO₂ calculator (v8.1) available on the DEFRA air quality website³².

Modelling Scenarios

- 7.65 The following scenarios have been modelled / assessed:
- Scenario 1 – 2022 Baseline (Verification);
 - Scenario 2 – 2025 Construction Year (incl. Committed Developments);
 - Scenario 3 – 2025 Construction Year (incl. Committed Developments) + Proposed Development Construction Traffic;
 - Scenario 4 – 2028 Future Baseline (incl. Committed Developments); and
 - Scenario 5 – 2028 Future Baseline (incl. Committed Developments) + Proposed Development.
- 7.66 To note, the following committed developments have been included within Scenarios 2 to 5:
- 20/00193/FUL – Residential development comprising 266no. dwellings;
 - 20/00124/FUL – Erection of B8 warehousing/distribution centre, c.79,187 sqm; and
 - 19/00337/OUT – Erection of a c.97,000 sqm mixed-use development.

Emission Factors

- 7.67 There are numerous sources of NO₂, PM₁₀ and PM_{2.5} which include, for example, industry and domestic origins. However, the main source is usually road transport. For the purpose of this

³¹ Department for Transport. Road Traffic Statistics (TRA). Accessible at <https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra>.

³² Department for Environment, Food and Rural Affairs. NO_x to NO₂ Calculator. Accessible at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>

impact assessment and due to the absence of other sources in the area, only road traffic emissions have been modelled.

- 7.68 The potential impacts have been modelled using the ADMS-Roads model atmospheric dispersion model, with Emission Factor Toolkit v11.0 (the most recently available emission factor toolkit) which is built into the ADMS-Roads model.
- 7.69 The most recently available emission factor tool kit (EFT) (Version 11.0), released by DEFRA in November 2021, have been used to predict the traffic related emissions in 2022, 2025, and 2028.
- 7.70 It has been widely known for some time that NO_x/NO₂ levels are not reducing as quickly as anticipated and this was identified by DEFRA in 2011. This was reiterated in an IAQM Interim Position Statement (v1.1)³³ released in July 2018 recognising that emissions from diesel vehicles have not declined as expected by DEFRA. This document has since been formally withdrawn, stating:

“There is a growing body of evidence to suggest that the latest COPERT vehicle emission factors, which feed into the EFT (v9 and onwards), reflect the real-world NO_x emissions more accurately.

It is judged that an exclusively vehicle emissions-based sensitivity test is no longer necessary.

On this basis, the EFT may be used for future year modelling with greater confidence when considering the per vehicle emission, provided that the assessment is verified against measurements made in the year 2016 or later.”

- 7.71 On this basis it is anticipated the most up to date (EFT) v11.0 could be relied upon to provide a good representation of the air quality concentrations and impacts, and no sensitivity test has therefore been undertaken.
- 7.72 Vehicles emit NO_x with different proportions of NO₂. Following release into the atmosphere, chemical reactions take place between nitric oxide (NO), NO₂ and Ozone (O₃). In this assessment, the screening of NO_x emissions has taken place and the resulting NO₂ concentration has been

³³ Institute of Air Quality Management, 2018. Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments.

calculated post modelling using the DEFRA NO_x to NO₂ Calculator (v8.1)³⁴, which derives NO₂ from the modelled NO_x concentrations.

Modelled Road Network

- 7.73 The modelled road network is consistent with the traffic data provided by mode transport planning, as set out in **Appendix 7.4**. Roads Junctions have been modelled in line with the LAQM Technical Guidance (TG(22)), which states:

“For junctions, common sense, driving experience and local knowledge are helpful to estimate speeds. For example, for a section of road leading up to traffic lights, the aim should be to estimate average speeds over a 50 m section of road:

- *Traffic pulling away from the lights, e.g. 40-50 kph;*
- *Traffic approaching the lights when green, e.g. 20-50 kph; and*
- *Traffic on the carriageway approaching the lights when red, e.g. 5-20 kph, depending on the time of day and how congested the junction is.*

It is considered that the combined effect of these three conditions is likely in most instances to be a two-way average speed for all vehicles of 20 to 40 kph. Speeds in similar ranges would also apply at roundabouts, although on sections of large roundabouts, speeds may well average between 40-50 kph.”

- 7.74 The modelled road network for the 2022, 2025 and 2028 assessment year scenarios, including the modelled speeds, are illustrated in **Figure 7.3**.

Sensitive Receptors

- 7.75 The concentration of NO₂, PM₁₀, and PM_{2.5} have been considered as part of this assessment. While selecting the receptor locations, careful consideration was made to receptors located near key road junctions, where congestion may occur, or where a number of highway links merge.
- 7.76 The sensitive locations at which the standards and objectives apply are places where the population is expected to be exposed to the various pollutants over the particular averaging

³⁴ Department for Environment, Food and Rural Affairs. NO_x to No₂ Calculator. Accessible at: <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>

period. Thus, for those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to measure concentrations against the set standards are areas of residential housing, since it is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.

7.77 Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time, such as on public footways or residential amenity areas.

7.78 DEFRA (2022) LAQM TG22 states:

"Dispersion models cannot predict short-term concentrations as reliably as annual mean concentrations

[...]

Previous research carried out on behalf of Defra and the Devolved Administrations identified that exceedances of the NO₂ 1-hour mean are unlikely to occur where the annual mean is below 60 µg/m³. This assumption is still considered valid; therefore local authorities should refer to it."

7.79 The modelling receptor locations are set out in **Table 7.3** and illustrated in **Figure 7.4** for existing and committed receptors (Planning Application 20/00193/FUL), and in **Figure 7.5** for the future receptors.

Table 7.3: Receptor Locations

Receptor	Type	Coordinates (m)		
		X	Y	Z
Existing				
R.1	Residential	341376	398529	1.5
R.2	Residential	341382	398544	1.5
R.3	Residential	341572	398651	1.5

Receptor	Type	Coordinates (m)		
		X	Y	Z
R.4	Residential	341330	398013	1.5
R.5	Residential	341297	398001	1.5
R.6	Residential	340873	398072	1.5
R.7	Residential	341428	398944	1.5
R.8	Residential	341317	399009	1.5
R.9	Residential	341445	398996	1.5
R.10	Residential	342420	397764	1.5
R.11	Residential	342103	397178	1.5
R.12	Residential	341410	398174	1.5
R.13	Residential	340937	398104	1.5
R.14	Residential	339077	397366	1.5
R.15	Residential	339055	397418	1.5
R.16	Residential	339989	397714	1.5
R.17	Residential	340681	398286	1.5
R.18	Residential	339799	398505	1.5
R.19	Residential	340220	398013	1.5
R.20	Residential	341561	397437	1.5
R.21	Residential	342026	398372	1.5
R.22	Residential	340495	397760	1.5
R.23	Residential	340953	397259	1.5
R.24	Residential	340373	397797	1.5
R.25	Residential	340217	397703	1.5
S.1	School	341009	398092	1.0
S.2	School	341548	398994	1.0
S.3	School	338725	397389	1.0
H.1	Hospital	341187	398055	1.0
CH.1	Care Home	340681	398696	1.0
S.4	School	342409	398031	1.0
Committed (20/00193/FUL)				
CR.1	Residential	340428	397908	1.5
CR.2	Residential	340575	398075	1.5

Receptor	Type	Coordinates (m)		
		X	Y	Z
Future				
FR.1	Residential	340952	398713	1.5
FR.2	Residential	341327	398548	1.5
FR.3	Residential	341392	398190	1.5
FR.4	Residential	340885	398098	1.5
FR.5	Residential	341309	398033	1.5
FR.6	Residential	340804	398634	1.5
FR.7	Residential	340874	398743	1.5

Dust Impacts – Assessment of Significance

- 7.80 The IAQM (2023) guidance does not provide a method for assessing the significance of effects before mitigation and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, (as set out in the Additional Mitigation / Enhancement Measures' section and in **Appendix 7.3**) the IAQM (2023) guidance is clear that the residual effect will normally be 'not significant.'

Traffic Emissions – Impact Descriptors and Assessment of Significance

- 7.81 Currently there is no official guidance in the UK on how to describe the nature of air quality impacts, nor how to assess their significance. The approach developed by EPUK & IAQM (2017) has therefore been used. This approach involves a two-stage process:
- A quantitative description of the impacts on local air quality arising from a proposed development; and
 - A judgement on the overall significance of the effects of any impact.

Impact Descriptors for Human Receptor Impacts

- 7.82 The guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table 7.4**.

Table 7.4: Operational Impact Descriptors

Long Term Average Concentration at Receptor in Assessment Year	% Change in concentration relative to Air Quality Action Level (AQAL)				
	<0.5	1	2 – 5	6 – 10	>10
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial
Notes: Values are rounded to the nearest whole number. 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. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL).' 					

7.83 The EPUK & IAQM (2017) advice provides guidance on the severity of an impact as a descriptor. However, although the impacts might be considered 'Slight,' 'Moderate' or 'Substantial' at one or more receptor location, the overall effects of a proposed development may not always be judged as being 'significant.' Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole including the extent to which receptors represent sensitive locations and whether this wider impact is significant or not.

7.84 The EPUK & IAQM (2017) guidance goes on to state:

"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."

7.85 To note, when considering this, careful considerations has been made of the World Health Organisation (WHO) guidelines. The current air quality objectives were set based on NO₂ in particular being a "threshold" pollutant – i.e. that there is a "safe" level of NO₂ in the ambient air that will not damage the health of an average person. In recent years this has been called into question, and the WHO Guidelines, while not statutory, are considerably lower (10 µg/m³ compared to 40 µg/m³ for NO₂). While using the current objectives is not technically incorrect,

there is an argument to be made that any worsening of air quality, particularly within an AQMA and/or CAZ, should not be allowed to occur as the potential to damage health is clear.

- 7.86 Air Quality is now the leading environmental risk factor globally, and the issue is rising in prominence all the time. As such worsening the air quality within an existing AQMA / CAZ, even by a small amount should be carefully considered.
- 7.87 The guidance believes that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme / proposed development described as either significant or not significant. In drawing this conclusion, the following factors should be taken into account:
- The number of properties/receptors affected by different levels of impacts;
 - The magnitude of any changes and descriptors;
 - Whether a new exceedance of an objective or limit value is predicted to arise or an existing exceedance is removed, or an existing exceedance is substantially increased or reduced;
 - The level of uncertainty, including the extent to which worst case assumptions have been made; and
 - The extent of any exceedance of an objective or limit value.
- 7.88 The judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Chapter 2: Approach.

Introduction of Residential Receptors

- 7.89 The significance of emissions for the introduction of residential receptors will be determined by comparing the predicted results to the Air Pollution Exposure Criteria (APEC) detailed in the Air Quality and Planning Guidance³⁵ written by the London Air Pollution Planning and the Local Environment (APPLE) working group. The Air Pollution Exposure Criteria is a recognised approach to describe the significance of the impacts predicted, together with an indication as to the level of mitigation required in order for a development to be approved. The APEC table is replicated in **Table 7.5** below.

³⁵ The London Air Pollution Planning and the Local Environment (APPLE) working group, 2007. Air Quality and Planning Guidance.

Table 7.5: Air Pollution Exposure Criteria (APEC)

APEC	NO ₂	PM ₁₀	Recommendations
A	>5% below national annual mean objective	>5% below national annual mean objective >1-day less than national 24-hour objective	No air quality grounds for refusal; however, mitigation of any emissions should be considered.
B	Between 5% below or above national annual mean objective	Between 5% above or below national annual mean objective Between 1-day above or below national 24- hour objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered.
C	>5% above national annual mean objective	>5% above national annual mean objective >1-day more than national 24-hour objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated

Assumptions/Limitations

- 7.90 There are many uncertainties when considering both measured and predicted pollution concentrations. The model is dependent upon the traffic data provided for the project, and should this be subject to change, so may the resulting pollution concentrations.
- 7.91 The background air quality concentrations have been taken from the DEFRA background mapping. The DEFRA website³⁶ includes estimated background air pollution data for NO_x, NO₂, PM₁₀ and PM_{2.5} for each 1km by 1km OS grid square. Background pollutant concentrations are modelled from the base year of 2018 and based on ambient monitoring and meteorological data from 2018. The 2018 mapping includes projections for future years, up to currently 2030.

³⁶ Department for Environmental Food and Rural Affairs. Accessible at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Furthermore, the concentrations are modelled at a standard 'living height,' which has been averaged across the grid square.

- 7.92 There is discrepancy between the concentrations mapped by DEFRA and those recorded at local background sites. NO₂ concentrations have been calibrated using the local monitoring data. In the absence of background monitoring data for PM₁₀ and PM_{2.5}, background concentrations for these pollutants have been adjusted using the NO₂ calibration factor. This is supported by LAQM.TG(22), which states:

"Where a model has been used to predict background concentrations (for example based on an emissions inventory), the modelled background concentrations should also be verified and where necessary adjusted.

If national background maps are used, these should first be compared against any local monitoring to check they are representative of the area. In most cases there is good agreement with local monitoring, but some locations may not agree. Local authorities are not expected to verify and adjust the national background maps. Where these estimates do not agree with local monitoring, either local monitoring may be used, or local authorities may consider adjusting the background maps."

- 7.93 The verification process has used 2022 monitoring data as the most recent representative year after the COVID-19 pandemic, where no national or local 'lockdowns' were enforced.
- 7.94 The emissions factors within the latest DEFRA EFT are based on assumptions which were current before the occurrence of the COVID-19 pandemic. As such, this data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

- 7.95 This is highlighted by a recent statement published by DEFRA, which states:

"Users of the updated LAQM tools should be aware that the projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these tools do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns."

- 7.96 In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(22) and is set out in **Appendix 7.5**. To note, due to no data being published for the automatic monitoring in 2022, it was not possible to complete a verification at this monitoring location.

Consultation

- 7.97 Prior to submission the following consultation was undertaken with KMBC.

Table 7.6: Consultation

Consultee	Date and Time	Comments	Actions
Knowsley Environmental Protection Officer	12 th September 2022	Air quality scope accepted	-
Knowsley Environmental Protection Officer	16 th November 2022	Query on use of Meteorological Site	Updated models to use Manchester Meteorological site.

Baseline Conditions

Local Air Quality Management

- 7.98 Under the Air Quality Strategy there is a duty on all Local Authorities to consider the air quality within their boundaries and to report annually to DEFRA. Local Air Quality Management in the Kirkby area has been assessed by KMBC, through the national Review and Assessment process and, in fulfilment of Part IV of the Environment Act 1995.
- 7.99 Although KMBC have not declared any Air Quality Management Areas (AQMAs), they have a number of automatic and non-automatic monitoring locations across Knowsley, including within Kirkby. The nearest AQMA is approximately 900 m southwest of the Site and is the Liverpool City AQMA, declared by Liverpool City Council for exceedances of the NO₂ annual mean objective.
- 7.100 The latest annual air quality results were published by KMBC in 2022. KMBC undertook automatic monitoring at three sites for the period 2018 – 2021, measuring concentrations of

NO₂, PM₁₀ and PM_{2.5}, although the latest ASR did not publish results from these monitors in 2022. NO₂ diffusion tube monitoring was also carried out at various locations across the jurisdiction during the period 2018 - 2022, including some in close proximity to the Site. The local monitored data is set out in **Table(s) 7.7 to 7.10** and illustrated in **Figure 7.3**.

Table 7.7: Monitored Annual Mean NO₂ Concentrations

ID	Type	Annual Mean (µg/m³)			
		2019	2020	2021	2022
Automatic Monitoring					
Kirkby	Roadside	24.8	25.8	30.8	
Diffusion Tubes					
K1a, K1b	Roadside	45.4	38.0	33.3	34.0
K2a, K2b	Roadside	26.9	22.1	20.1	19.6
K3a, K3b	Roadside	25.3	22.5	19.8	20.1
K4a, K4b	Roadside	32.5	26.9	26.3	23.6
K5a, K5b	Roadside	35.1	30.9	28.1	28.9
K6a, K6b	Roadside	35.3	28.1	26.6	28.7
K7a, K7b	Roadside	29.6	24.1	21.7	20.0
K8a, K8b	Roadside	32.4	28.7	25.8	24.7
K9a, K9b	Roadside	35.3	27.7	27.1	28.6
K10, K10b	Roadside	29.4	24.1	22.9	20.6
Notes:					
Bold indicates exceedances of the NO ₂ annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m ³ (which is an indication the hourly mean objective could be being breached).					

Table 7.8: Monitored NO₂ 1-Hour Mean Exceedances

ID	Type	NO ₂ 1-hour mean > 200 µg/m ³			
		2019	2020	2021	2022
Automatic Monitoring					
Kirkby (new)	Roadside	0	0	0	
Notes: Bold indicates exceedances of the NO ₂ 1-hour mean objective (200µg/m ³ not to be exceeded more than 18 times/year)					

Table 7.9: Monitored Annual Mean PM₁₀ Concentration

ID	Type	Annual Mean (µg/m ³)
----	------	----------------------------------

		2019	2020	2021	2022
Automatic Monitoring					
Kirkby (new)	Roadside	37.6	33.3	32.2	
Notes: Bold indicates exceedances of the NO ₂ annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m ³ (which is an indication the hourly mean objective could be being breached).					

Table 7.10: Monitored PM₁₀ 24-Hour Mean Exceedances

ID	Type	PM ₁₀ 24-hour mean > 50 µg/m ³			
		2019	2020	2021	2022
Automatic Monitoring					
Kirkby (new)	Roadside	9	35	18	
Notes: Bold indicates exceedances of the PM ₁₀ 24-hour mean objective (50µg/m ³ not to be exceeded more than 35 times/year)					

- 7.101 The air quality monitoring carried out closest to the Proposed Development shows a compliance of the NO₂ annual mean objective in 2022, the latest representative year. The closest automatic monitor to the Site was compliant with the NO₂ annual mean and 1-hour mean objectives and the PM₁₀ annual mean and 24-hour mean objectives in 2019, the latest representative year for this monitor.

Background Concentrations

Mapped Background Concentrations

- 7.102 As set out in the 'Assumptions/Limitations' section, the DEFRA background concentrations have been calibrated against local background monitoring data.
- 7.103 The background calibration factor for NO₂, is set out in **Table 7.11**. The adjusted projected pollutant concentrations for 2022, 2025 and 2028 are set out in **Table 7.12**.

Table 7.11: NO₂ Background Calibration Factor

NO ₂	Monitoring Sites	
	H10	H11
Measured Concentration (µg/m ³)	18.5	21.6
Mapped Concentration (µg/m ³)	16.9	20.3
Calibration Factor	1.1	1.1
Average Calibration Factor	1.1	

Table 7.12: Estimated Annual Mean Background Pollutant Concentrations (µg/m³)

Pollutant	2022	2025	2028
NO ₂	13.2 – 17.0	11.9 – 15.7	11.1 – 15.0
PM ₁₀	12.6 – 15.4	12.3 – 15.0	12.2 – 15.0
PM _{2.5}	8.8 – 10.9	8.5 – 10.6	8.5 – 10.5
Notes: Data presented are derived from the ordnance survey grid reference set out in Table 7.3			
Pollutant	2022	2025	2028
NO ₂	13.2 – 17.0	11.9 – 15.7	11.1 – 15.0
PM ₁₀	12.6 – 15.4	12.3 – 15.0	12.2 – 15.0
PM _{2.5}	8.8 – 10.9	8.5 – 10.6	8.5 – 10.5
Notes: Data presented are derived from the ordnance survey grid reference set out in Table 7.3			

Existing and Future Baseline Conditions

7.104 Baseline concentrations of NO₂, PM₁₀ and PM_{2.5} have been modelled at each of the previously identified receptor locations, including the ecological receptors. The results, which cover the baseline years of Scenario 1 (2022), Scenario 2 - 3 (2025) and Scenario 4 - 5 (2028), are set out in **Table(s) 7.13 to 7.15**.

Table 7.13: Predicted 2022 Baseline Annual Mean Concentrations (µg/m³)

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.1	21.8	14.6	9.9
R.2	19.9	14.2	9.7
R.3	19.8	14.4	9.8
R.4	20.9	14.8	10.0
R.5	17.1	13.8	9.4
R.6	19.0	14.4	9.8
R.7	27.7	15.7	10.5
R.8	20.6	15.2	9.8
R.9	22.9	14.8	10.0
R.10	21.8	16.8	11.7
R.11	22.6	16.5	11.5
R.12	16.8	13.7	9.4
R.13	20.7	14.8	10.1
R.14	20.0	14.4	9.9
R.15	24.2	15.8	10.6
R.16	21.3	14.8	10.1
R.17	21.7	15.0	10.2
R.18	27.5	16.2	10.6
R.19	22.7	15.1	10.2
R.20	19.9	15.3	10.4
R.21	19.6	14.6	9.6

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.22	22.7	15.8	10.3
R.23	21.7	15.6	10.2
R.24	29.1	17.3	11.2
R.25	24.2	16.1	10.5
S.1	18.8	14.2	9.7
S.2	24.9	15.8	10.6
S.3	29.7	16.6	11.0
H.1	16.9	13.7	9.4
CH.1	17.5	14.0	9.6
S.4	16.9	14.1	9.4
CR.1	27.3	17.2	11.1
CR.2	25.6	15.7	10.6
Annual Mean Objective/Limit	40	40	20
Notes: Bold indicates an exceedance of the annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m ³ for NO ₂ (which is an indication the hourly mean objective could be being breached).			

Table 7.14: Predicted 2025 Baseline Annual Mean Concentrations (µg/m³)

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.1	18.3	14.2	9.6
R.2	17.0	13.8	9.4
R.3	16.7	14.0	9.5
R.4	17.6	14.3	9.7
R.5	14.9	13.3	9.1
R.6	16.4	13.9	9.5
R.7	22.6	15.2	10.2
R.8	17.8	14.8	9.5

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.9	19.4	14.4	9.7
R.10	18.9	16.4	11.3
R.11	19.4	16.1	11.1
R.12	14.7	13.3	9.1
R.13	17.6	14.4	9.7
R.14	17.1	14.0	9.6
R.15	20.2	15.4	10.3
R.16	18.1	14.4	9.7
R.17	18.3	14.5	9.8
R.18	23.1	14.7	9.7
R.19	19.3	14.2	9.7
R.20	17.0	14.9	10.1
R.21	16.9	14.2	9.3
R.22	19.2	15.0	9.8
R.23	18.5	14.8	9.7
R.24	24.2	16.1	10.5
R.25	20.2	15.4	10.1
S.1	16.1	13.8	9.3
S.2	24.2	15.5	10.3
S.3	25.0	16.1	10.6
H.1	14.7	13.3	9.1
CH.1	15.2	13.6	9.3
S.4	14.9	13.8	9.1
CR.1	22.5	16.5	10.6
CR.2	21.2	15.2	10.2

Receptor	NO ₂	PM ₁₀	PM _{2.5}
Annual Mean Objective/Limit	40	40	20
Notes: Bold indicates an exceedance of the annual mean objective. Bold and underlined indicates exceedances of 60 µg/m ³ for NO ₂ (which is an indication the hourly mean objective could be being breached).			

Table 7.15: Predicted 2028 Baseline Annual Mean Concentrations (µg/m³)

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.1	16.0	14.2	9.6
R.2	15.0	13.8	9.4
R.3	14.8	13.9	9.4
R.4	15.5	14.3	9.7
R.5	13.4	13.4	9.1
R.6	14.5	14.0	9.5
R.7	19.3	15.2	10.2
R.8	15.5	14.8	9.5
R.9	16.8	14.4	9.7
R.10	17.0	16.3	11.2
R.11	17.4	16.0	11.1
R.12	13.2	13.3	9.1
R.13	15.4	14.4	9.7
R.14	15.2	14.0	9.5
R.15	17.5	15.4	10.3
R.16	15.9	14.4	9.7
R.17	16.0	14.6	9.8
R.18	18.9	15.8	10.2
R.19	16.4	14.6	9.8
R.20	15.0	14.9	10.1

Receptor	NO ₂	PM ₁₀	PM _{2.5}
R.21	15.2	14.1	9.3
R.22	16.5	15.2	9.9
R.23	15.9	15.2	9.9
R.24	20.2	16.3	10.6
R.25	17.4	15.4	10.0
S.1	14.4	13.8	9.3
S.2	20.6	15.5	10.3
S.3	21.8	16.2	10.7
H.1	13.3	13.3	9.1
CH.1	13.7	13.6	9.3
S.4	13.6	13.7	9.1
CR.1	18.0	15.6	10.4
CR.2	17.7	14.2	10.0
Annual Mean Objective/Limit	40	40	20
Notes: Bold indicates an exceedances of the annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m ³ for NO ₂ (which is an indication the hourly mean objective could be being breached).			

- 7.105 The predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} are all below their respective annual mean objectives in 2022, 2025 and 2028 at all modelled receptor locations.
- 7.106 These annual mean NO₂ concentrations are all below 60 µg/m³, which is regarded to be an indicator that the hourly mean objective will also not be breached.
- 7.107 The annual mean PM₁₀ concentrations are below 32 µg/m³, which is an indication of potential exceedances of the 24-hour mean PM₁₀ objective and it is, therefore, unlikely that the 24-hour mean PM₁₀ objective will be exceeded.

Embedded Mitigation

7.108 This section describes the measures which have been 'embedded' into the development.

Construction

7.109 No embedded mitigation is anticipated to be in place for the construction phase.

The Completed and Operational Development

7.110 A variety of inherent operational mitigation measures have been proposed within Chapter 6: Traffic and Access which will aid in reducing vehicular trips, and therefore emissions. These include (but are not potentially limited to):

- Cycle parking to be provided in line with locally adopted standards;
- Network of pedestrian and cycle routes throughout the Proposed Development;
- Provision of electric vehicle (EV) charging; and,
- Framework Travel Plan to promote and stimulate modal shift.

Assessment of Likely Significant Effects

Construction

Proposed Development Construction Traffic

7.111 A review of the predicted traffic numbers associated with the construction phase have been screened against the EPUK & IAQM (2017) thresholds set out in **Appendix 7.2**. The predicted traffic impacts indicate a potential breach of the EPUK & IAQM (2017) thresholds. Therefore, a full impact assessment has been undertaken.

7.112 The predicted impacts of the proposed development construction traffic upon the annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} during the peak year of 2025 for the previously specified receptors are set out in **Table(s) 7.16 to 7.18**. These also describe the impacts at each receptor using the impact descriptors given in **Table 7.4**.

Table 7.16: Predicted Impacts in 2025 on Baseline Annual Mean NO₂ Concentrations (µg/m³)

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	18.3	18.4	0%	Negligible
R.2	17.0	17.0	0%	Negligible
R.3	16.7	16.7	0%	Negligible
R.4	17.6	17.6	0%	Negligible
R.5	14.9	14.9	0%	Negligible
R.6	16.4	16.4	0%	Negligible
R.7	22.6	22.6	0%	Negligible
R.8	17.8	17.8	0%	Negligible
R.9	19.4	19.4	0%	Negligible
R.10	18.9	18.9	0%	Negligible
R.11	19.4	19.4	0%	Negligible
R.12	14.7	14.7	0%	Negligible
R.13	17.6	17.6	0%	Negligible
R.14	17.1	17.1	0%	Negligible
R.15	20.2	20.2	0%	Negligible
R.16	18.1	18.1	0%	Negligible
R.17	18.3	18.3	0%	Negligible
R.18	23.1	23.1	0%	Negligible
R.19	19.3	19.3	0%	Negligible
R.20	17.0	17.0	0%	Negligible
R.21	16.9	16.9	0%	Negligible
R.22	19.2	19.3	0%	Negligible
R.23	18.5	18.5	0%	Negligible
R.24	24.2	24.3	0%	Negligible

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.25	20.2	20.3	0%	Negligible
S.1	16.1	16.2	0%	Negligible
S.2	24.2	24.2	0%	Negligible
S.3	25.0	25.0	0%	Negligible
H.1	14.7	14.7	0%	Negligible
CH.1	15.2	15.3	0%	Negligible
S.4	14.9	14.9	0%	Negligible
CR.1	22.5	22.6	0%	Negligible
CR.2	21.2	21.2	0%	Negligible
Annual Mean Objective		40		
Notes: Bold indicates an exceedance of the annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m ³ for NO ₂ (which is an indication the hourly mean objective could be being breached).				

Table 7.17: Predicted Impacts in 2025 on Baseline Annual Mean PM₁₀ Concentrations (µg/m³)

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	14.2	14.2	0%	Negligible
R.2	13.8	13.8	0%	Negligible
R.3	14.0	14.0	0%	Negligible
R.4	14.3	14.3	0%	Negligible
R.5	13.3	13.3	0%	Negligible
R.6	13.9	13.9	0%	Negligible
R.7	15.2	15.2	0%	Negligible
R.8	14.8	14.8	0%	Negligible
R.9	14.4	14.4	0%	Negligible

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.10	16.4	16.4	0%	Negligible
R.11	16.1	16.1	0%	Negligible
R.12	13.3	13.3	0%	Negligible
R.13	14.4	14.4	0%	Negligible
R.14	14.0	14.0	0%	Negligible
R.15	15.4	15.4	0%	Negligible
R.16	14.4	14.4	0%	Negligible
R.17	14.5	14.6	0%	Negligible
R.18	14.7	14.7	0%	Negligible
R.19	14.2	14.2	0%	Negligible
R.20	14.9	14.9	0%	Negligible
R.21	14.2	14.2	0%	Negligible
R.22	15.0	15.0	0%	Negligible
R.23	14.8	14.8	0%	Negligible
R.24	16.1	16.2	0%	Negligible
R.25	15.4	15.4	0%	Negligible
S.1	13.8	13.8	0%	Negligible
S.2	15.5	15.5	0%	Negligible
S.3	16.1	16.1	0%	Negligible
H.1	13.3	13.3	0%	Negligible
CH.1	13.6	13.6	0%	Negligible
S.4	13.8	13.8	0%	Negligible
CR.1	16.5	16.5	0%	Negligible
CR.2	15.2	15.2	0%	Negligible

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
Annual Mean Objective		40		
Notes: Bold indicates an exceedance of the annual mean objective.				

Table 7.18: Predicted Impacts in 2025 on Baseline Annual Mean PM_{2.5} Concentrations (µg/m³)

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	9.6	9.6	0%	Negligible
R.2	9.4	9.4	0%	Negligible
R.3	9.5	9.5	0%	Negligible
R.4	9.7	9.7	0%	Negligible
R.5	9.1	9.1	0%	Negligible
R.6	9.5	9.5	0%	Negligible
R.7	10.2	10.2	0%	Negligible
R.8	9.5	9.5	0%	Negligible
R.9	9.7	9.7	0%	Negligible
R.10	11.3	11.3	0%	Negligible
R.11	11.1	11.1	0%	Negligible
R.12	9.1	9.1	0%	Negligible
R.13	9.7	9.7	0%	Negligible
R.14	9.6	9.6	0%	Negligible
R.15	10.3	10.3	0%	Negligible
R.16	9.7	9.7	0%	Negligible
R.17	9.8	9.8	0%	Negligible
R.18	9.7	9.7	0%	Negligible
R.19	9.7	9.7	0%	Negligible

Receptor	2025 Baseline	2025 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.20	10.1	10.1	0%	Negligible
R.21	9.3	9.3	0%	Negligible
R.22	9.8	9.8	0%	Negligible
R.23	9.7	9.7	0%	Negligible
R.24	10.5	10.5	0%	Negligible
R.25	10.1	10.1	0%	Negligible
S.1	9.3	9.3	0%	Negligible
S.2	10.3	10.3	0%	Negligible
S.3	10.6	10.6	0%	Negligible
H.1	9.1	9.1	0%	Negligible
CH.1	9.3	9.3	0%	Negligible
S.4	9.1	9.1	0%	Negligible
CR.1	10.6	10.7	0%	Negligible
CR.2	10.2	10.2	0%	Negligible
Annual Mean Limit		20		
Notes: Bold indicates an exceedance of the annual mean objective.				

- 7.113 The modelled NO₂ concentrations in **Table 7.16** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations.
- 7.114 Using the matrix in **Table 7.4**, it can be seen that the impacts associated with the proposed development are anticipated to be temporary **negligible (adverse)** at all modelled receptors.
- 7.115 Based on the annual average mean concentration at all receptors being below 60 µg/m³, it is unlikely that any modelled receptor identified would experience an exceedance of the 1-hour mean objective.

7.116 The modelled PM₁₀ concentrations in **Table 7.17** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations. Using the matrix in **Table 7.4**, it can be seen that the impacts are anticipated to be temporary **negligible (adverse)** at all modelled receptors.

7.117 For PM₁₀, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m³) is likely to be exceeded:

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$

7.118 There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

"The relationship does have limitations in so far that it should not be applied when the annual mean PM₁₀ concentration is lower than 14.8 µg/m³".

7.119 The highest concentration, predicted at Receptor CR1, is 16.5 µg/m³; therefore, the formula can be used to predict the number of 24-hour mean exceedances predicted. Based on the formula above, this predicts 0.5 exceedance days at this receptor, which is below the 35-days annual limit. It is therefore thought that none of the receptors would be exposed to any material impact from the short-term concentrations of PM₁₀.

7.120 The modelled PM_{2.5} concentrations in **Table 7.18** do not predict any exceedances of the Stage 2 Post 2020 annual mean limit (20 µg/m³) at any of the specified receptor locations. Using the matrix in **Table 7.4**, it can be seen that the impacts are anticipated to be temporary **negligible (adverse)** at all modelled receptors.

7.121 As set out above, the impacts on the receptors associated with the proposed development are anticipated to be **negligible (adverse)** for NO₂, PM₁₀ and PM_{2.5} concentrations. The concentrations do not exceed the relevant national objectives as set out in **Table 7.1**. Based on this, and in accordance with the IAQM (2017) guidance and professional judgement, the temporary impacts can be considered '**not significant.**'

Proposed Development Construction Dust Risk Assessment

7.122 The main air quality impacts associated with construction activities relate to the potential release of particulate matter of both PM₁₀ size fractions. There is also the potential for the evolution of other air quality pollutants (known as secondary pollutants). The sources of potential construction impacts specifically associated with the Proposed Development are set out below:

- Potential for generation of airborne dusts from exposure and movement of soils and construction materials;
- Generation of fumes on-site by construction plant and tools throughout the construction phase;
- Increase in vehicle emissions (smoke/fumes) from vehicles (and potentially as a result of slow-moving traffic, should local congestion ensue); and
- Re-suspension of dust as a result of vehicle tyres travelling over dusty surfaces.

7.123 A construction dust assessment has been undertaken in line with the IAQM (2023) guidance methodology as set out in **Appendix 7.1** and a summary of the process is provided below.

Screening for a Full Assessment

7.124 Having reviewed the Site location, it is evident that there are a number of human receptors within 250 m of the Site, therefore a detailed dust impact assessment is required.

7.125 A review of the DEFRA Magic website³⁷ indicates that no ecological site is present within the immediate surrounding area. The closest ecological site is Acornfield Plantation Local Nature Reserve (LNR), which sits approximately 2 km east of the Site. As per box 1 of the IAQM (2023) guidance, it is not within 50 m of the boundary of the Site or construction vehicular routes (up to 250 m from the Site), therefore, an assessment of the impact of the construction phase on this receptor has been scoped out.

Potential Dust Emission Magnitude

Demolition

7.126 A review of the Site indicates that while the majority of the Site is vacant and undeveloped, the Knowsley Community College as well as some smaller buildings in the North West of the Site will need to be demolished. The volume of these buildings is unknown; however it is anticipated that the volume of these buildings is < 12,000 m³, but is potentially made of dusty construction

³⁷ Natural England. MAGIC. Accessible at: <https://magic.defra.gov.uk/>

material. Therefore, in line **Table 7.1.1** as set out in **Appendix 7.1**, and professional judgment, the magnitude of potential dust release from demolition activities is classified as **Medium**.

Earthworks

- 7.127 The total area where earthworks will occur is greater than 10,000 m². It is anticipated that the soil exiting in the ground has a 'Sandy and Loamy'³⁸ texture. Therefore, in line with **Table 7.1.1** as set out in **Appendix 7.1**, and professional judgment, the magnitude of potential dust release from earthworks activities is classified as **Large**.

Construction

- 7.128 The total building volume to be constructed is unknown, however on the basis that 781 houses are to be constructed, it is expected to be > 75,000 m². Furthermore, the material used anticipated to be of high dust potential. Therefore, in line with **Table 7.1.1** as set out in **Appendix 7.1**, and professional judgement, the magnitude of potential dust release from construction activities is classified as **Large**.

Trackout

- 7.129 During the construction year (2025) there is expected to be 47 two-way (AADT) HDV movements on the local highway network, and thus, as a reasonable worst case assumption, it is predicted that 24 one-way movements (AADT) are created. Therefore, in line with **Table 7.1.1** as set out in **Appendix 7.1** and professional judgment, the magnitude of potential dust release from trackout activities is classified as **Medium**.

Summary

Table 7.19 Summary of Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Medium
Earthworks	Large
Construction	Large
Trackout	Medium

³⁸ Cranfield Soil and Agrifood Institute. Soilscales. Accessible at: <http://www.landis.org.uk/soilscales/>

Sensitivity of Area

- 7.130 Having established the emission magnitude for dust above, the sensitivity of the area is considered to establish the significance of effects. The effect of the dust (i.e. the result of the change in dust levels) depends on the sensitivity of the receptor to change. High sensitivity human receptors include residential dwellings, schools and hospitals.
- 7.131 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20 m of the Site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100 m from the construction site there may still be a high risk, particularly if the receptor is downwind of the dust source.
- 7.132 With the exponential decline in dust with distance from dust generating activities, it is considered that for receptors more than 350 m from the Proposed Development boundary, the risk is negligible. Furthermore, the risks at over 100 m are only likely to be significant in certain weather conditions, e.g. downwind of the source during dry periods.
- 7.133 The approximate number of high sensitivity human receptors in the vicinity of the Proposed Development boundary is detailed in **Table 7.20** below and are highlighted in **Figure(s) 7.7 to 7.9** for demolition, earthworks and construction and for trackout. The main existing receptors within the Assessment Area are existing commercial, educational, health care and residential buildings along:
- A506 Valley Road;
 - Cherryfield Drive;
 - Whinberry Drive;
 - Pondwater Drive;
 - Bewley Drive;
 - Bracknell Avenue;
 - Tennyson Way;
 - Shakespeare Avenue; and
 - The Barn Lane

Table 7.20 High Sensitive Human Receptors

Distance to Site (m)	No. of High Sensitivity Receptors	Details
<20	10 - 100	-Residential dwellings located off the residential estate bordering the central area of the southern boundary. Residential dwellings located to the north and east of the Proposed Development boundary.
20 – 100	> 100	Residential dwellings along the highways highlighted above. St Joseph The Worker RC School south of the Site.

7.134 The prevailing wind is from the south-west, as indicated by the Manchester wind rose in **Figure 7.1**. The Site boundary is surrounded with sensitive receptors to the east, south and south-west of the Site. Some areas are potentially upwind of the prevailing south-westerly wind. Due to the number of high sensitive receptors in such close proximity to the Site, the risk of dust soiling effects in line with IAQM (2023) are considered '**Medium**' for demolition and '**High**' for earthworks, construction and trackout.

7.135 The background annual mean concentration of PM₁₀ is well below 24 µg/m³. Based upon this and the number of receptors within 20 m being between 10 – 100 the potential health impacts in line with IAQM (2023) are considered as '**Low**' for all activities.

Risk and Significance

7.136 Having established the likely dust emission magnitude and sensitivity of the area, the risk of impacts can be determined in accordance with the IAQM (2023) guidance; these are summarised in **Table 7.21**.

Table 7.21: Summary of Dust Risk to Define Site-Specific Mitigation

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

The Completed and Operational Development

Proposed Development Operational Traffic

- 7.137 A review of the predicted traffic numbers associated with the operational phase have been screened against the EPUK & IAQM (2017) thresholds set out in **Appendix 7.2**. The predicted traffic impacts indicate a potential breach of the EPUK & IAQM (2017) thresholds. Therefore, a full impact assessment has been undertaken.
- 7.138 The predicted impacts of the proposed development operational traffic upon the annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} during the operational year of 2028 for the previously specified receptors are set out in **Table(s) 7.22 to 7.24**. These also describe the impacts at each receptor using the impact descriptors given in **Table 7.4**.

Table 7.22: Predicted Impacts in 2028 on Baseline Annual Mean NO₂ Concentrations (µg/m³)

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	16.0	16.2	0%	Negligible
R.2	15.0	15.2	0%	Negligible
R.3	14.8	14.9	0%	Negligible
R.4	15.5	15.6	0%	Negligible
R.5	13.4	13.4	0%	Negligible
R.6	14.5	14.6	0%	Negligible
R.7	19.3	19.3	0%	Negligible
R.8	15.5	15.6	0%	Negligible
R.9	16.8	16.9	0%	Negligible
R.10	17.0	17.1	0%	Negligible
R.11	17.4	17.4	0%	Negligible
R.12	13.2	13.4	0%	Negligible
R.13	15.4	15.5	0%	Negligible

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.14	15.2	15.3	0%	Negligible
R.15	17.5	17.6	0%	Negligible
R.16	15.9	16.0	0%	Negligible
R.17	16.0	16.1	0%	Negligible
R.18	18.9	19.0	0%	Negligible
R.19	16.4	16.5	0%	Negligible
R.20	15.0	15.1	0%	Negligible
R.21	15.2	15.2	0%	Negligible
R.22	16.5	16.6	0%	Negligible
R.23	15.9	15.9	0%	Negligible
R.24	20.2	20.5	1%	Negligible
R.25	17.4	17.5	0%	Negligible
S.1	14.4	14.4	0%	Negligible
S.2	20.6	20.7	0%	Negligible
S.3	21.8	22.0	0%	Negligible
H.1	13.3	13.3	0%	Negligible
CH.1	13.7	13.7	0%	Negligible
S.4	13.6	13.6	0%	Negligible
CR.1	18.0	18.3	0%	Negligible
CR.2	17.7	17.9	0%	Negligible
Annual Mean Objective		40		
Notes: Bold indicates an exceedances of the annual mean objective. <u>Bold and underlined</u> indicates exceedances of 60 µg/m³ for NO₂ (which is an indication the hourly mean objective could be being breached).				

Table 7.23: Predicted Impacts in 2028 on Baseline Annual Mean PM₁₀ Concentrations (µg/m³)

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	14.2	14.3	0%	Negligible
R.2	13.8	13.9	0%	Negligible
R.3	13.9	14.0	0%	Negligible
R.4	14.3	14.4	0%	Negligible
R.5	13.4	13.4	0%	Negligible
R.6	14.0	14.0	0%	Negligible
R.7	15.2	15.2	0%	Negligible
R.8	14.8	14.8	0%	Negligible
R.9	14.4	14.4	0%	Negligible
R.10	16.3	16.3	0%	Negligible
R.11	16.0	16.0	0%	Negligible
R.12	13.3	13.4	0%	Negligible
R.13	14.4	14.5	0%	Negligible
R.14	14.0	14.1	0%	Negligible
R.15	15.4	15.4	0%	Negligible
R.16	14.4	14.5	0%	Negligible
R.17	14.6	14.7	0%	Negligible
R.18	15.8	15.8	0%	Negligible
R.19	14.6	14.6	0%	Negligible
R.20	14.9	15.0	0%	Negligible
R.21	14.1	14.2	0%	Negligible
R.22	15.2	15.3	0%	Negligible
R.23	15.2	15.2	0%	Negligible

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.24	16.3	16.4	0%	Negligible
R.25	15.4	15.4	0%	Negligible
S.1	13.8	13.8	0%	Negligible
S.2	15.5	15.5	0%	Negligible
S.3	16.2	16.2	0%	Negligible
H.1	13.3	13.3	0%	Negligible
CH.1	13.6	13.6	0%	Negligible
S.4	13.7	13.7	0%	Negligible
CR.1	15.6	15.7	0%	Negligible
CR.2	14.9	15.0	0%	Negligible
Annual Mean Objective		40		
Notes: Bold indicates an exceedance of the annual mean objective.				

Table 7.24: Predicted Impacts in 2028 on Baseline Annual Mean PM_{2.5} Concentrations (µg/m³)

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.1	9.6	9.6	0%	Negligible
R.2	9.4	9.4	0%	Negligible
R.3	9.4	9.5	0%	Negligible
R.4	9.7	9.7	0%	Negligible
R.5	9.1	9.1	0%	Negligible
R.6	9.5	9.5	0%	Negligible
R.7	10.2	10.2	0%	Negligible
R.8	9.5	9.5	0%	Negligible
R.9	9.7	9.7	0%	Negligible

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
R.10	11.2	11.3	0%	Negligible
R.11	11.1	11.1	0%	Negligible
R.12	9.1	9.1	0%	Negligible
R.13	9.7	9.8	0%	Negligible
R.14	9.5	9.6	0%	Negligible
R.15	10.3	10.3	0%	Negligible
R.16	9.7	9.8	0%	Negligible
R.17	9.8	9.9	0%	Negligible
R.18	10.2	10.2	0%	Negligible
R.19	9.8	9.9	0%	Negligible
R.20	10.1	10.1	0%	Negligible
R.21	9.3	9.3	0%	Negligible
R.22	9.9	10.0	0%	Negligible
R.23	9.9	9.9	0%	Negligible
R.24	10.6	10.6	0%	Negligible
R.25	10.0	10.1	0%	Negligible
S.1	9.3	9.4	0%	Negligible
S.2	10.3	10.3	0%	Negligible
S.3	10.7	10.7	0%	Negligible
H.1	9.1	9.1	0%	Negligible
CH.1	9.3	9.3	0%	Negligible
S.4	9.1	9.1	0%	Negligible
CR.1	10.4	10.5	0%	Negligible
CR.2	10.0	10.0	0%	Negligible

Receptor	2028 Baseline	2028 Baseline + Proposed Development	% Change of Objective	Impact Descriptor
Annual Mean Limit			20	
Notes: Bold indicates an exceedances of the annual mean objective.				

7.139 The modelled NO₂ concentrations in **Table 7.22** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations.

7.140 Using the matrix in **Table 7.4**, it can be seen that the impacts associated with the proposed development are anticipated to be **negligible (adverse)** at all modelled receptors.

7.141 Based on the annual average mean concentration at all receptors being below 60 µg/m³, it is unlikely that any modelled receptor identified would experience an exceedance of the 1-hour mean objective.

7.142 The modelled PM₁₀ concentrations in **Table 7.23** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations. Using the matrix in **Table 7.4**, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled receptors.

7.143 For PM₁₀, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m³) is likely to be exceeded:

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$

7.144 There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

"The relationship does have limitations in so far that it should not be applied when the annual mean PM₁₀ concentration is lower than 14.8 µg/m³".

7.145 The highest concentration, predicted at Receptor R.24 is 16.4 µg/m³; therefore, the formula can be used to predict the number of 24-hour mean exceedances predicted. Based on the formula above, this predicts 0.4 exceedance days at this receptor, which is below the 35-days annual

limit. It is therefore thought that none of the receptors would be exposed to any material impact from the short-term concentrations of PM₁₀.

- 7.146 The modelled PM_{2.5} concentrations in **Table 7.24** do not predict any exceedances of the Stage 2 Post 2020 annual mean objective (20 µg/m³) at any of the specified receptor locations. Using the matrix in **Table 7.4**, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled receptors.
- 7.147 As set out above, the impacts on the receptors associated with the proposed development are anticipated to be **negligible (adverse)** for NO₂, PM₁₀ and PM_{2.5} concentrations. The concentrations do not exceed the relevant national objectives as set out in **Table 7.1**. Based on this, and in accordance with the IAQM (2017) guidance and professional judgement, the temporary impacts can be considered '**not significant.**'
- 7.148 The predicted overall NO₂, PM₁₀ and PM_{2.5} annual mean concentrations at the worst case specified future receptor locations are set out in **Table(s) 7.25 to 7.27**. The tables also set out the percentage above or below the respective annual mean objective/target at each receptor location.

Table 7.25: Predicted 2028 NO₂ Concentrations at Future Receptors

Receptor	Predicted Concentration	% of Objective
FR.1	17.5	44
FR.2	16.9	42
FR.3	16.2	40
FR.4	17.6	44
FR.5	17.0	43
FR.6	17.3	43
FR.7	17.0	43

Table 7.26: Predicted 2028 PM₁₀ Concentrations at Future Receptors

Receptor	Predicted Concentration	% of Objective
FR.1	14.3	36
FR.2	13.9	35
FR.3	13.9	35
FR.4	14.5	36
FR.5	14.2	36
FR.6	14.4	36
FR.7	14.1	35

Table 7.27: Predicted 2028 PM_{2.5} Concentrations at Future Receptors

Receptor	Predicted Concentration	% of Objective
FR.1	9.8	49
FR.2	9.5	48
FR.3	9.5	47
FR.4	9.9	49
FR.5	9.7	48
FR.6	9.8	49
FR.7	9.7	48

7.149 The modelled NO₂ concentrations in **Table 7.25** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations.

7.150 Based on the annual average mean concentration at all receptors being below 60 µg/m³, it is unlikely that any modelled receptor identified would experience an exceedance of the 1-hour mean objective.

7.151 The modelled PM₁₀ concentrations in **Table 7.26** do not predict any exceedances of the annual mean objective (40 µg/m³) at any of the specified receptor locations.

- 7.152 For PM₁₀, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m³) is likely to be exceeded:

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}} \right)$$

- 7.153 There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

"The relationship does have limitations in so far that it should not be applied when the annual mean PM₁₀ concentration is lower than 14.8 µg/m³".

- 7.154 On the basis none of the concentrations exceed 14.8 µg/m³, it is not deemed appropriate to apply the above calculation, and it is therefore thought that none of the receptors would be exposed to any material impact from the short-term concentrations of PM₁₀.
- 7.155 The modelled PM_{2.5} concentrations in **Table 7.27** do not predict any exceedances of the Stage 2 Post 2020 annual mean objective (20 µg/m³) at any of the specified receptor locations.
- 7.156 The concentrations do not exceed the relevant national objectives as set out in **Table 7.1**. Using the APPLE working group Air Pollution Exposure Criteria, as set out in **Table 7.5**, the modelled air quality concentrations of NO₂ and PM₁₀ for these receptors in 2028 fall within APEC A, which states:

"No air quality grounds for refusal; however, mitigation of any emissions should be considered."

Additional Mitigation / Enhancement Measures

Construction

- 7.157 A construction dust assessment has been undertaken for the Proposed Development and is presented in 'Assessment of Likely Significant Effects' section of this ES Chapter. The assessment has been used to identify the need for standard and best practice mitigation measures to be implemented during the construction phase of the Proposed Development. These measures will be controlled and implemented through a Construction Environmental Management Plan (CEMP), which is anticipated to be secured via a suitably worded planning condition.

7.158 A range of measures are suggested and summarised below, which would typically be utilised during the construction phases, further detail is provided in **Appendix 7.4**.

7.159 The following potential mitigation measures are anticipated (but are not limited to):

- Cutting, grinding and sawing will not be conducted on-site and pre-fabricated material and modules will be brought in where possible;
- Where cutting, grinding and sawing takes place, water suppression will be used to reduce the amount of dust generated;
- Skips, chutes and conveyors will be completely covered and, if necessary enclosed to ensure that dust does not escape;
- No burning of any materials will be permitted on site;
- Any excess material will be reused or recycled on-site where practicable in accordance with appropriate legislation;
- The Principal Contractor will produce a waste or recycling plan;
- Following earthworks, exposed areas and soil stockpiles will be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;
- Stockpiles will be stored in enclosed or bunded containers or silos and kept damp where necessary;
- Hard surfaces will be used for haul routes where possible;
- Haul routes will be swept/washed regularly;
- Vehicle wheels will be washed on leaving the Site;
- All vehicles carrying dusty materials will be securely covered; and
- Delivery areas, stockpiles and particularly dusty items of construction plant will be kept as far away from neighbouring properties as possible.

7.160 Mitigation measures specific to the demolition and construction phases of the Proposed Development (Demolition, Earthworks, Construction and Trackout) can be found in **Appendix 13.3. Table 13.33** at the end of this document sets out how these demolition and construction related inherent mitigation measures are proposed.

The Completed and Operational Development

7.161 In addition to the mitigation measures set out in 'Embedded Mitigation' section, the EPUK & IAQM (2017) recommends a number of further mitigation measures that could be considered for the Proposed Development. These include (in addition to a number of further examples):

- Set back dwelling as far as possible from the main highway network to reduce exposure for new receptors;
- Locating habitable rooms away from busy roads, or directing combustion generated pollutants through well sited vents or chimney stacks;
- All gas-fired boilers to meet a minimum standard of $<40\text{mgNO}_x/\text{kWh}$;
- All gas-fired CHP plant to meet a minimum emissions standard of $250\text{ mgNO}_x/\text{Nm}^3$ for spark ignition engines.

Residual Effects

7.162 The overall residual effects are summarised below and set out **Table 7.28**.

Construction

7.163 With the CEMP in place the residual air quality effects are '**not significant**' for all receptors.

Operational

7.164 The residual impacts remain unchanged as the effect without mitigation, which are **negligible** and '**not significant**' for all receptors.

Table 7.28: Residual Effects Summary

Description of Effect	Embedded Mitigation	Potential Effect (inc. Significance)	Further Mitigation	Residual Effect (inc. Significance)
Construction				
Dust Soiling	N/A	Not Significant	CEMP	Not Significant
Human Health	N/A	Not Significant	CEMP	Not Significant
Traffic	N/A	Not Significant	CEMP / Construction Logistics Plan	Not Significant
Operation				
Traffic	Travel Planning / Sustainable Transport Links	Not Significant	Network of pedestrian and cycle routes throughout the Proposed Development; Provision of electric vehicle charging; Framework Travel Plan to promote and stimulate modal shift.	Not Significant

Conclusions

- 7.165 This ES Chapter has assessed the impacts of both the construction and operational phase of the Proposed Development in isolation against the appropriate baseline conditions.
- 7.166 A construction dust assessment has been undertaken for the construction phase associated with the Proposed Development and in accordance with IAQM (2023) guidance. Following the successful implementation of the suggested inherent mitigation measures, the impacts of the Proposed Development construction dust and emissions from construction activities upon the local area and sensitive receptors although adverse, the impacts will be temporary, and **'not significant'**.
- 7.167 The change in predicted NO₂, PM₁₀ and PM_{2.5} concentrations at existing and future receptors in 2025 during peak construction of the Proposed Development are anticipated to be temporary, **negligible** and **'not significant'**.
- 7.168 The change in predicted NO₂, PM₁₀ and PM_{2.5} concentrations at existing and future receptors in 2028 during the operational year of the Proposed Development are anticipated to be **negligible** and **'not significant'**.

Assessment of Cumulative Effects

- 7.169 As previously set in this ES Chapter, AAC have been advised that certain committed developments have been factored into the baseline traffic scenarios and cannot be separated out and compared in isolation to the Proposed Development traffic. These are set out in paragraph 7.66 of this ES Chapter

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