



Air Quality Assessment: Heywood Business Park, Plot H4

July 2024



Experts in air quality
management & assessment

Document Control

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Executive Summary

The air quality impacts associated with the proposed commercial development on Plot H4 of Heywood Business Park have been assessed. The development will consist of industrial and storage and distribution uses.

The development will generate additional traffic on the local road network, but the assessment has shown that there will be no significant effects at any existing, sensitive receptor.

Overall, the operational air quality effects of the development are judged to be 'not significant'.

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1 Introduction

- 1.1 This report describes the potential air quality impacts associated with the proposed commercial development of Plot H4 of Heywood Business Park, in the borough of Rochdale. The proposed development is described as:

“Outline planning application for the development of land with Use Classes E(g)(iii) (industrial processes), B2 (general industrial), B8 (storage and distribution) and removal of existing structures and hard standing and associated works. All matters reserved for subsequent approval”.

- 1.2 The proposed development lies close to an Air Quality Management Area (AQMA) declared by the Greater Manchester Combined Authority (GMCA) for exceedances of the annual mean nitrogen dioxide (NO₂) objective. It will generate additional traffic on local roads, which may impact on air quality at existing residential properties along the affected road network. The main air pollutants of concern related to road traffic emissions are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).
- 1.3 The location and setting of the proposed development are shown in Figure 1, along with the relevant nearby AQMA.

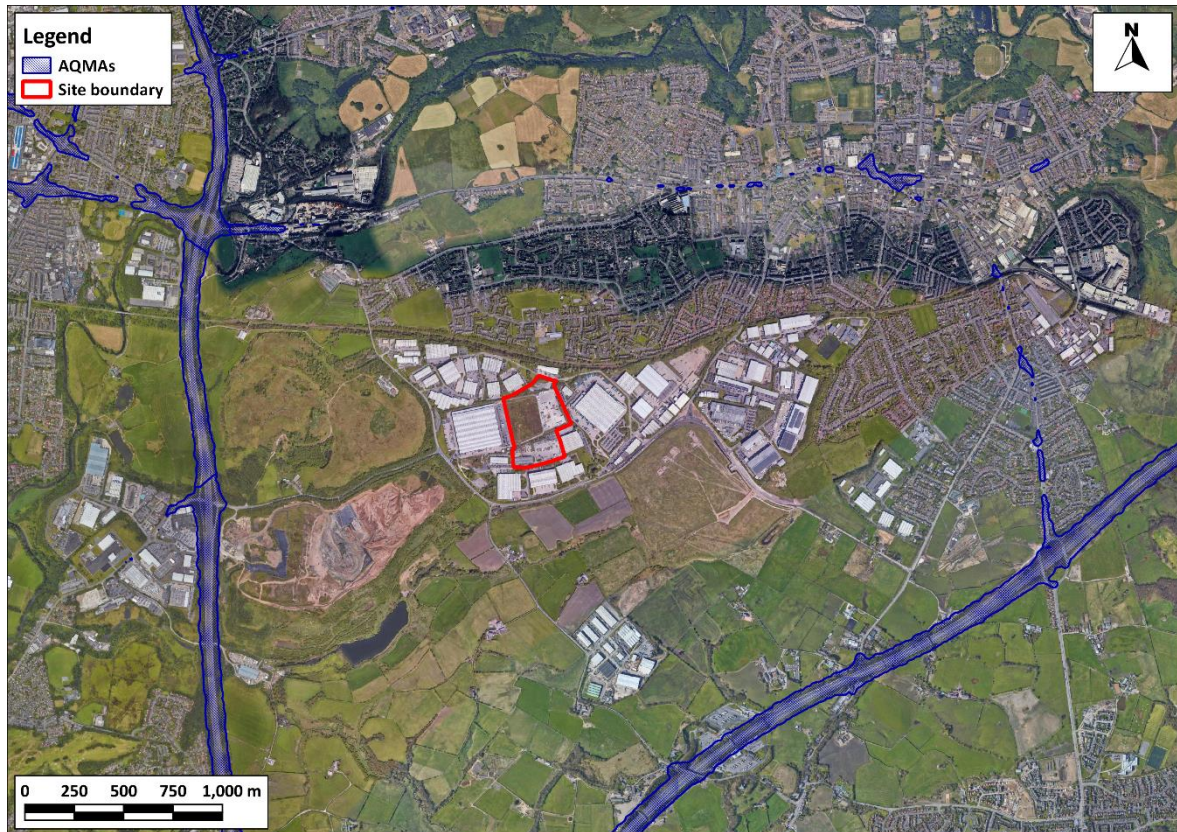


Figure 1: Proposed Development Setting in the Context of Air Quality

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- 1.4 Standard fit out by St Modwen does not include any gas combustion plant for heating or hot water; there will thus be no centralised combustion plant and no significant point sources of emissions within the proposed development. If the future occupiers of the development carry out any combustion processes, they will be required to operate within the relevant planning and permitting constraints. Emissions from point sources are thus not considered further.
- 1.5 This report describes existing local air quality conditions (base year 2022) and the predicted air quality in the future assuming that the proposed development does, or does not, proceed. The assessment of traffic-related impacts focuses on 2027, which is the anticipated year of opening.
- 1.6 This report has been prepared taking into account all relevant local and national guidance and regulations.

2 Policy Context

- 2.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy 2007

- 2.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an AQMA, and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Air Quality Strategy 2023

- 2.3 The Air Quality Strategy: Framework for Local Authority Delivery 2023 (Defra, 2023a) sets out the strategic air quality framework for local authorities and other Air Quality Partners in England. It sets out their powers and responsibilities, and actions the government expects them to take. It does not replace other air quality guidance documents relevant to local authorities.

Clean Air Strategy 2019

- 2.4 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

- 2.5 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have

zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

- 2.6 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has recently announced that 80% of new cars and 70% of new vans sold in Great Britain must be zero emission by 2030, increasing to 100% by 2035. If these ambitions are realised then road traffic-related NO_x emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Environment Act 2021

- 2.7 The UK's new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.
- 2.8 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) sets two new targets for future concentrations of PM_{2.5}. These targets are described in Paragraph 3.5.

Environmental Improvement Plan 2023

- 2.9 Defra published its 25 Year Environment Plan in 2018 (Defra, 2018a). The Environment Act (2021) requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2023 (Defra, 2023b) is the first revision. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan, including that of achieving clean air.
- 2.10 The Environmental Improvement Plan 2023 sets out the new air quality targets which have been set for concentrations of PM_{2.5}. These targets, which are described in more detail in Paragraph 3.5, include the long-term targets in the Statutory Instrument described in Paragraph 2.8, and interim targets to be achieved by 2028.
- 2.11 The 2023 Plan outlines the role of local authorities in helping it meet both its targets and existing commitments. It also outlines the respective roles of industry, agricultural sectors, and the Department for Transport in providing the coordinated action required to meet both its new, and pre-existing targets and commitments.

Planning Policy

National Policies

- 2.12 The National Planning Policy Framework (NPPF) (2023) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that 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”.

- 2.13 To prevent unacceptable risks from air pollution, Paragraph 180 of the NPPF states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air quality”.

- 2.14 Paragraph 191 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”.

- 2.15 More specifically, on air quality, Paragraph 192 makes clear that:

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

- 2.16 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified”.

2.17 Regarding plan-making, the PPG states:

“It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality”.

2.18 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan *“identifies measures that will be introduced in pursuit of the objectives and can have implications for planning”*.

2.19 Regarding the need for an air quality assessment, the PPG states that:

“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”.

2.20 The PPG sets out the information that may be required in an air quality assessment, making clear that:

“Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific”.

2.21 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that:

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

Local Policies

2.22 The Rochdale Core Strategy (Rochdale Borough Council, 2016) was adopted in 2016 and contains three policies which relate to air quality. Policy G9 – Reducing the impact of pollution, contamination and land instability states:

“We will reduce all forms of pollution, contamination and land instability in the borough, by:

- a. Focusing on measures that reduce air pollution in Air Quality Management Areas, and other areas where pollution levels are unacceptable, particularly around motorways and main roads;*
- b. Requiring that development does not have impacts that lead to an unacceptable increase in air, water, noise, light or other pollution;...”*

2.23 Policy DM1 – General development requirements states that:

“All development proposals, including change of use of land and buildings, extensions and alterations, will be expected to demonstrate that they:

...

- d. Mitigate against any impacts due to noise, air, dust, light and odour pollution, traffic generation or inadequate access, where such mitigation is identified as being necessary; ...*
- f. Do not have an adverse impact on health, through its impact or the effect of existing problems, e.g. land contamination, or poor air quality;*

...”

2.24 Policy DM2 – Delivering planning contributions and infrastructure states:

“For all types of development, including housing, we will seek contributions for any infrastructure or other measures necessary to mitigate any on site or off-site impacts from the development. These contributions may cover, dependent on need:

...

- e. Mitigation or compensation against environmental impacts e.g. noise, air quality (particularly in Air Quality Management Areas);*

...”

A3.1 In addition to the Rochdale Core Strategy, the GMCA has published the Places for Everyone plan (GMCA, 2024). This is a plan of the nine Greater Manchester districts for growth that covers the period from 2022 to 2039. It was adopted in March 2024 and forms part of the Rochdale’s Local Plan. With respect to air quality and planning, there is one policy of relevance in the plan, JP-S5, which states:

“A comprehensive range of measures will be taken to support improvements in air quality, focusing particularly on locations where people live, where children learn and play, where there are impacts on the green infrastructure network and where air quality targets are not being met, including:

1. *Locating and designing development, and focusing transport investment, so as to reduce reliance on forms of transport that generate air pollution;*
2. *Determining planning applications having regard to the most recent development and planning control guidance published jointly by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK), and the most recent IAQM Guidance on the Assessment of Dust from Demolition and Construction, or relevant successor guidance, including the requirement for developers to submit construction management plans as appropriate;*
3. *Requiring applications for developments that could have an adverse impact on air quality to submit relevant air pollution data so that adverse impacts on air quality can be fully assessed and development only permitted where they are acceptable and/or suitable mitigation can be provided;*
4. *Restricting developments that would generate significant point source pollution such as some types of industrial activity and energy generation;*
-
11. *Development should be located in areas that maximise the use of sustainable travel modes and be designed to minimise exposure to high levels of air pollution, particularly for vulnerable users."*

Building Standards

- 2.25 Part F(1) of Schedule 1 of the Building Regulations 2010 as amended June 2022 (Ministry of Housing, Communities & Local Government, 2022) places a duty on building owners, or those responsible for relevant building work¹, to ensure adequate ventilation is provided to building occupants.
- 2.26 Approved Document F (HM Government, 2021a), which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. Specific steps should be taken to manage ventilation intakes where the building is near to a significant source of emissions, or if local ambient concentrations exceed values set in the Air Quality Standards Regulations 2010 (see Paragraph 3.10, later). These steps include maximising the distance between emission source and air intake, considering likely dispersion patterns, and considering the timing of pollution releases when designing the ventilation system.
- 2.27 Part S(1) of Schedule 1, and Regulation 44D, of the Building Regulations 2010 (Ministry of Housing, Communities & Local Government, 2022) define a requirement for the provision of infrastructure for charging electric vehicles. Precise requirements are explained further within Approved Document S

¹ Building work is a legal term for work covered by the Building Regulations. With limited exemptions, the Regulations apply to all significant building work, including erecting or extending a building.

(HM Government, 2021b) and depend on the overall number of parking spaces provided and the average financial cost of installation.

- 2.28 Compliance with the Building Regulations is not required for planning approval, but it is assumed that the Regulations will be complied with in the completed development.

Air Quality Action Plans

National Air Quality Plan

- 2.29 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018b) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a Clean Air Zone (CAZ). There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in the modelling undertaken for this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

- 2.30 The GMCA has declared an AQMA for nitrogen dioxide that covers the motorways and some of the main roads close to the proposed development site. Rochdale Borough Council has worked together with the GMCA and Transport for Greater Manchester to develop an Air Quality Action Plan (Greater Manchester Combined Authority, 2016). This mainly focuses on three “Key Performance Indicators (KPIs)” to help categorise improvement actions to improve air quality:

- *“Reduce Traffic – for instance by encouraging modal shift from private vehicle use to public transport, cycling and walking.*
- *Increase Efficiency – of traffic movement by reducing congestion and stop-start travel to achieve a smoother emission profile and overall lower emissions, which may be particularly significant at peak hours.*
- *Improve Fleet – by incentivising the replacement of older, more polluting vehicles with newer, smaller, cleaner, lower-emission vehicles”.*

- 2.31 The Action Plan also includes a number of actions specifically relating to freight and goods vehicles:

- Action 2.1: *“Air quality considerations will be incorporated into the DSP Toolkit² to reduce HGV/LGV movements, and hence emissions, in the key priority areas. The toolkit is designed to help private and public organisations better manage deliveries.”*
- Action 2.2: *“Locations for potential distribution centres will be identified in the Greater Manchester Spatial Framework, and where these are proposed to be constructed, they will use travel planning to ensure that local air quality benefits are realised.”*
- Action 2.3: *“The GM councils and TfGM will implement a policy to actively encourage and facilitate consolidation practices for freight deliveries and waste collection.”*
- Action 2.4: *“Where areas for freight facilities are identified in the GMSF or any local plans, they can be integrated with rail and water routes in order to reduce the numbers of road HGV movements.”*
- Action 2.5: *“TfGM will identify where mobile, digital and live information channels can be used to improve the efficiency of freight transport by providing accurate and up-to-date information to operators and drivers.”*
- Action 2.6: *“TfGM will support the development and uptake of the alternatives to Diesel Transport Refrigeration Units (TRUs) to ultimately achieve zero-emission transport refrigeration.”*
- Action 2.7: *“TfGM will promote anti idling policies with freight transport companies and more widely.”*
- Action 2.8: *“TfGM will work with the local authorities and other city regions with the aim of developing a consistent policy position in relation to alternative fuels and undertaking activities to encourage and facilitate the uptake of appropriate vehicles.”*

² Transport for Greater Manchester has developed a Delivery and Servicing Plan Toolkit (DSP) to help businesses to identify opportunities to better manage deliveries to ensure supplies are delivered when they are needed in order to save time and costs. The DSP will also help to reduce the negative impacts of delivery-related activities such as harmful emissions, congestion and collisions, including displacing freight from HGVs onto alternative low-emission vehicles.

3 Assessment Criteria

- 3.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).
- 3.2 The UK-wide objectives for nitrogen dioxide and PM₁₀ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m³ (Defra, 2022). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level. Measurements have also shown that the 24-hour mean PM₁₀ objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m³ (Defra, 2022). The predicted annual mean PM₁₀ concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM₁₀ objective. Where predicted annual mean concentrations are below 32 µg/m³ it is unlikely that the 24-hour mean objective will be exceeded.
- 3.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2022). The annual mean objectives for nitrogen dioxide and PM₁₀ are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM₁₀ is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.
- 3.4 For PM_{2.5}, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 3.10), originally set at 25 µg/m³ and currently set at 20 µg/m³.
- 3.5 Defra has also recently set two new targets, and two new interim targets, for PM_{2.5} concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean PM_{2.5} concentration of 10 µg/m³ by the end of 2040, with the interim target being a

value of $12 \mu\text{g}/\text{m}^3$ by the start of 2028³. The second set of targets relate to reducing overall population exposure to $\text{PM}_{2.5}$. By the end of 2040, overall population exposure to $\text{PM}_{2.5}$ should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.

3.6 Defra will assess compliance with the population exposure targets by averaging concentrations measured at its own background monitoring stations. This will not consider small changes over time to precisely where people are exposed (such as would relate to exposure introduced by a new development). Furthermore, as explained in Paragraph 2.11, all four new targets provide metrics against which central Government can assess its own progress. While local authorities have an important role delivering the required improvements, these are expected to relate to controlling emissions and not to directly assessing $\text{PM}_{2.5}$ concentrations against the targets.

3.7 In March 2023, the Department for Levelling Up, Housing and Communities (DLUHC, 2023) explained that the new $\text{PM}_{2.5}$ targets will:

“need to be integrated into the planning system, and in setting out planning guidance for local authorities and businesses, we will consider the specific characteristics of $\text{PM}_{2.5}$. The guidance will be forthcoming in due course, until then we expect local authorities to continue to assess local air quality impacts in accordance with existing guidance.”

3.8 Defra has also provided advice (Defra, 2023c) which explains that there is no current requirement to consider the new $\text{PM}_{2.5}$ targets in planning decisions and that guidance to local planning authorities will be forthcoming before this position changes. In the future, when planning decisions do need to consider the new targets, the expectation is that this will focus on reducing emissions from new development rather than there being a direct requirement for planning-related air quality assessments to predict $\text{PM}_{2.5}$ concentrations.

3.9 For the time being, therefore, no assessment is required, and indeed no robust assessment is possible, in relation to the new $\text{PM}_{2.5}$ targets and they are not considered further.

3.10 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $\text{PM}_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010)⁴. The limit values for nitrogen dioxide and PM_{10} are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally

³ Meaning that it will be assessed using measurements from 2027. The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of $10.4 \mu\text{g}/\text{m}^3$ would not exceed the $10 \mu\text{g}/\text{m}^3$ target.

⁴ As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

- 3.11 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM₁₀ and PM_{2.5}

Pollutant	Time Period	Value
Nitrogen Dioxide	1-hour Mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
PM ₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³ ^a
PM _{2.5}	Annual Mean	20 µg/m ³ ^b

^a A proxy value of 32 µg/m³ as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM₁₀ objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM₁₀ objective are possible (Defra, 2022).

^b There is no numerical PM_{2.5} objective for local authorities (see Paragraph 3.4). Convention is to assess against the UK limit value which is currently 20 µg/m³.

Screening Criteria

- 3.12 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)⁵ recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix 11, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m² of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment.
- 3.13 The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in Appendix 11) inside an AQMA are a change in flows of more than 25 Heavy Duty Vehicles (HDVs) or 100 Light Duty Vehicles (LDVs) per day; outside of an AQMA the thresholds are 100 HDVs or 500 LDVs. Where these criteria are exceeded, a detailed assessment is likely to be required, although the guidance advises that *"the criteria provided are precautionary and should be treated as indicative"*, and *"it may be appropriate to amend them on the basis of professional judgement"*.

⁵ The IAQM is the professional body for air quality practitioners in the UK.

- 3.14 While these screening criteria are specifically intended to act as a trigger for a detailed assessment, they can also sometimes be used to identify the extent of the road network that requires assessment. Where the change in traffic on a given road link is less than the relevant screening threshold, it is unlikely that a significant impact would occur, and these links can be disregarded unless there are additional development-related emissions affecting receptors along the link.

4 Assessment Approach

Study Area

- 4.1 The study area for the assessment has been identified using professional judgement, focussing on the areas where impacts are anticipated to be greatest. It includes all of the roads along which the development will lead to a potentially significant change in traffic flows. Specifically, the assessment has focussed on Pilsworth Road, Moss Hall Road, Bury New Road, Rochdale Road, Queen Elizabeth II Way and Middleton Road. Figure 1 in Section 1 of this report effectively shows the study area.

Receptors

- 4.2 Concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} have been predicted at a number of locations which could be affected by the proposed development. Receptors have been identified to represent worst-case locations (these being at the façades of the residential properties closest to the sources). When selecting receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested and where there is a combined effect of several road links, and close to those roads where the traffic increases as a result of the proposed development will be greatest. Attention has also been paid to selecting receptors at locations where the impacts of the energy plant emissions are likely to be greatest, to ensure that the combined effects of road traffic and energy plant emissions are considered.
- 4.3 Twenty-three (23) existing residential properties have been identified as receptors for the assessment. These locations are described in Table 2 and shown in Figure 2. In addition, concentrations have been modelled at the diffusion tube monitoring sites located on Rochdale Road (BU12NO, BU13NO, BUR-D1 and BUR-D2), in order to verify the model outputs (see Appendix A3 for verification method).

Table 2: Description of Receptor Locations

Receptor	X coordinate	Y coordinate	Height Modelled (m) ^a
R1	382521	409228	1.5
R2	382964	409908	1.5
R3	385629	408872	1.5
R4	385543	408912	1.5
R5	385491	408948	1.5
R6	385434	408979	1.5
R7	386355	408977	2.0
R8	386390	408996	1.5
R9	386389	408721	1.5
R10	384823	410078	2.5
R11	384846	410118	1.5
R12	381333	408598	1.5
R13	381240	408487	1.5
R14	382924	410134	1.5
R15	382675	410438	1.5
R16	382305	410531	1.5
R17	382253	410550	1.5
R18	381981	410560	0
R19	381883	410617	1.5
R20	381810	410668	2.0
R21	381412	410741	1.5
R22	381332	410726	1.5
R23	381289	410767	1.5

^a A height of 1.5 m is used to represent ground-floor level exposure. Heights of 0 m, 2.0 m and 2.5 m have been modelled where the road is higher or lower relative to the ground floor.

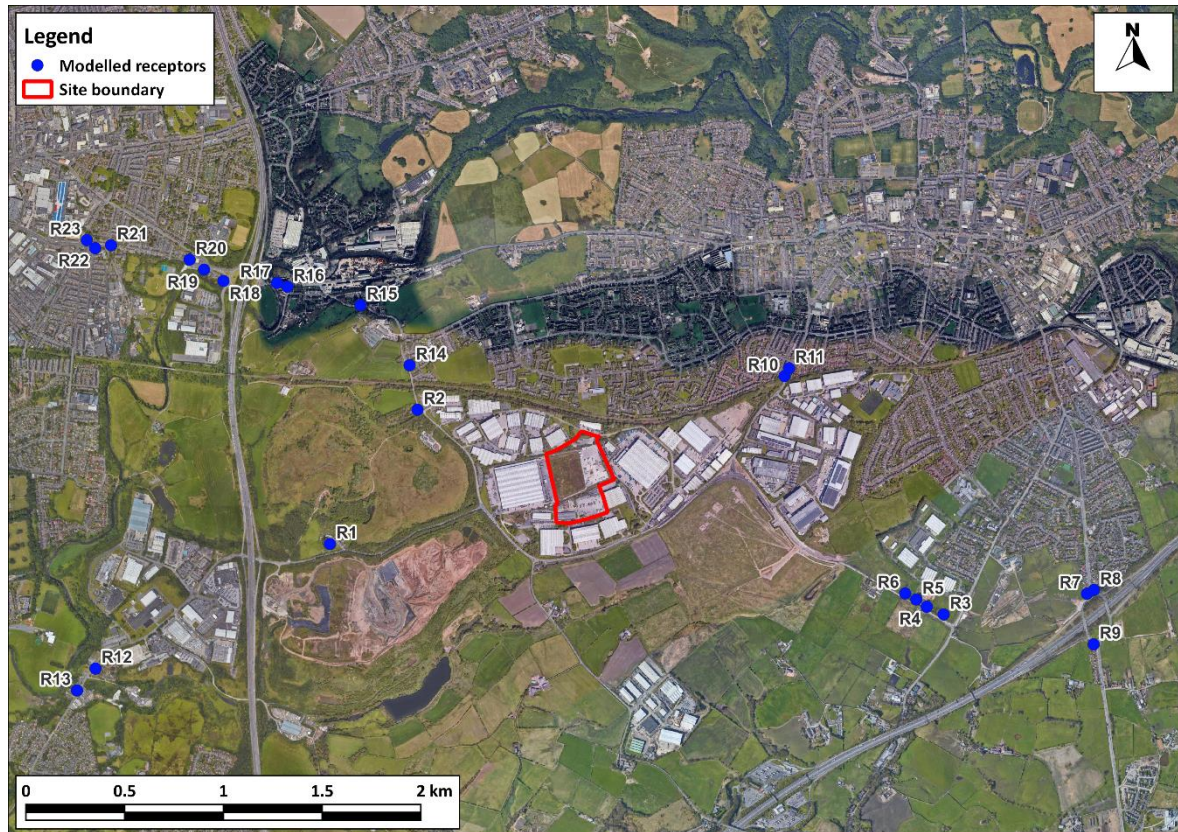


Figure 2: Receptor Locations

Imagery ©2024 Airbus, Maxar Technologies.

- 4.4 Selected receptors may be representative of air quality conditions at a number of properties; consideration has been given to how many sensitive locations each modelled receptor represents when considering the impacts of the proposed development and the overall significance of effects.

Existing Conditions

- 4.5 Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:

- information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers both the study area and nearby sites, the latter being used to provide context for the assessment;
- background concentrations have been defined using Defra's 2018-based background maps (Defra, 2024a). These cover the whole of the UK on a 1x1 km grid; and
- whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra (2020; 2024b), as well as from any nearby Automatic Urban and Rural Network (AURN) monitoring sites (which operate to the required data quality standards).

These are the maps used by the UK Government, together with the AURN results, to identify and report exceedances of the limit value. The national maps of roadside PM₁₀ and PM_{2.5} concentrations (Defra, 2024b), which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Road Traffic Impacts

Screening

- 4.6 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 3.12 and detailed further in Appendix 11. Where impacts can be screened out there is no need to progress to a more detailed assessment. The following sections describe the approach to dispersion modelling of road traffic emissions, which has been required for this project.

Modelling Methodology

- 4.7 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emission Factor Toolkit (EFT) (v12.0) (Defra, 2024a). Details of the model inputs and the model verification are provided in Appendix A3.

Assessment Scenarios

- 4.8 Nitrogen dioxide, PM₁₀ and PM_{2.5} concentrations have been predicted for the following scenarios:
- base year 2022;
 - the proposed year of opening (2027) without the development; and
 - 2027 with the development.

Impact Description

- 4.9 The approach developed jointly by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) has been used in describing the modelled impacts. The approach identifies impacts at individual receptors based on the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. Table 3 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table 3: Air Quality Impact Descriptors for Individual Receptors for All Pollutants ^a

Long-Term Average Concentration At Receptor In Assessment Year ^b	Change in concentration relative to AQAL ^c				
	0%	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

^a Values are rounded to the nearest whole number.

^b This is the “Without Scheme” concentration where there is a decrease in pollutant concentration and the “With Scheme” concentration where there is an increase.

^c AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, GLA target or an Environment Agency ‘Environmental Assessment Level (EAL)’.

Uncertainty

- 4.10 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.
- 4.11 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A3). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2022) concentrations.
- 4.12 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions. Historic versions of Defra’s EFT tended to over-state emissions reductions into the future. However, analyses of the more recent versions of Defra’s EFT carried out by AQC (2020a; 2020b) suggest that, on balance, these versions are unlikely to over-state the rate at which NO_x emissions decline in the future at an ‘average’ site in the UK. In practice, the balance of evidence suggests that NO_x concentrations are most likely to decline more quickly in the future, on average, than predicted by previous versions of the EFT, especially against a base year of 2016 or later. Whilst such an analysis has not been undertaken by AQC for EFT v12.0, it is considered that using EFT v12.0 for future-year forecasts in this report provides a robust assessment, given that the model has been verified against measurements made in 2022.

Assumptions

- 4.13 It is necessary to make a number of assumptions when carrying out an air quality assessment; in order to account for some of the uncertainty in the approach, as described above, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:
- that the Rochdale meteorological monitoring station appropriately represents conditions in the study area (this is discussed further in Appendix A3); and
 - that all development-related traffic travelling north on Moss Hall Road will continue east onto Rochdale Road.

Assessment of Significance

- 4.14 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors; the experience of the consultants preparing the report is set out in Appendix A2. Full details of the EPUK/IAQM approach are provided in Appendix 11.

5 Baseline Conditions

Relevant Features

- 5.1 The proposed development is located within Heywood Distribution Park, immediately to the south west of the town of Heywood and approximately 7 km to the south west of Rochdale town centre. It is currently comprised of hardstanding and scrub land. The nearest residential properties are located 130 m north east of the proposed development, on Dunbar Grove.
- 5.2 The proposed development is located near to the GMCA AQMA, as highlighted in Figure 1.

Local Air Quality Monitoring

- 5.3 GMCA operates 21 automatic monitoring stations within its area, the closest of which is an AURN site located in Whitefield, 3.6 km to the south west (BURW). It also operates a number of NO₂ monitoring sites using diffusion tubes prepared and analysed by Staffordshire Scientific Services (using the 20% TEA in water method) under the LAQM requirements. Diffusion tube monitoring is also undertaken to support the Greater Manchester Clean Air Plan (CAP).
- 5.4 Annual mean results for the years 2017 to 2022 for monitoring sites within 2.5 km of the proposed development location are summarised in Table 4, while results relating to the 1-hour mean objective are summarised in Table 5. Exceedances of the objectives are shown in bold. The monitoring locations are shown in Figure 3. The CAP monitoring data have been downloaded from the Clean Air Greater Manchester website (Clean Air Greater Manchester, 2023). The LAQM data for 2017 have been taken from the GMCA 2021 Air Quality Annual Status Report (ASR) (Greater Manchester Combined Authority, 2022), with the remaining data taken from the GMCA 2022 ASR (Greater Manchester Combined Authority, 2023).

Table 4: Summary of Annual Mean NO₂ Monitoring (2017-2022) (µg/m³)^a

Site No.	Site Type	Location	2017	2018	2019	2020	2021	2022
BURW	Roadside (Automatic)	Bury Whitefield	28	25	27	19	20	21
BUR-D1^b	Roadside	A58 (Rochdale Road)	-	-	55.9	29.5	34.0	32.4
BUR-D2^b	Roadside	A58 (Rochdale Road)	-	-	55.4	32.8	32.1	36.1
BU12NO	Kerbside	Rochdale Road	-	-	53.6	35.0	40.9	38.7
BU13NO	Kerbside	Rochdale Road	-	-	49.7	34.0	39.8	36.9
BU18NO	Roadside	Rochdale Old Road	-	-	38.2	27.9	30.3	30.3
RO6ANO	Kerbside	Heywood Old Road	47.2	41.9	42.5	31.8	32.3	34.7
RO20ANO	Roadside	Manchester Road	-	27.2	31.3	23.9	24.9	24.3
RO21ANO	Roadside	York Street	-	28.6	37.4	28.3	28.2	27.7
RO32ANO	Roadside	Heywood Old Road	-	-	-	-	26.6	30.3
Objective			40					

^a Exceedances of the objectives are shown in bold.

^b CAP monitoring.

Table 5: Number of Hours With NO₂ Concentrations Above 200 µg/m³

Site No.	Site Type	Location	2017	2018	2019	2020	2021	2022
BURW	Roadside (Automatic)	Bury Whitefield	0	0	2	0	0	0
Objective			18					

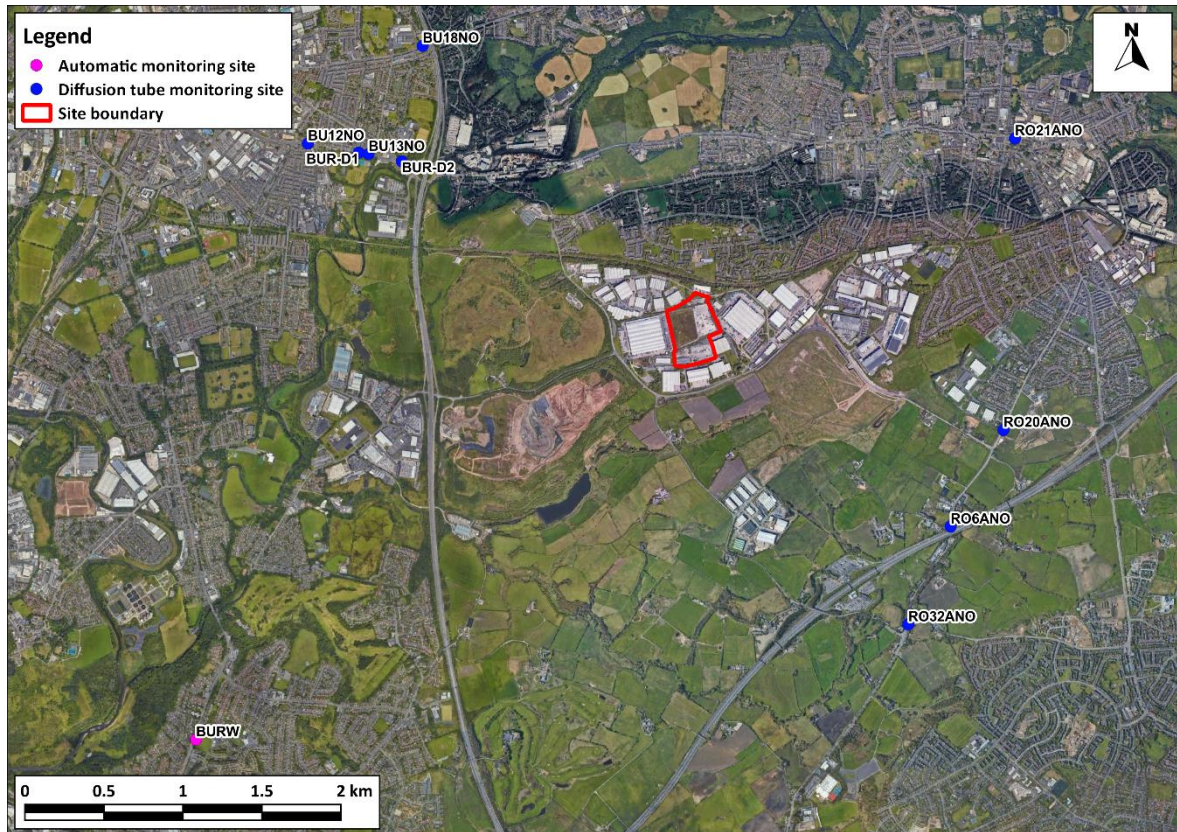


Figure 3: Monitoring Locations

Imagery ©2024 Airbus, Landsat / Copernicus, Maxar Technologies.

- 5.5 Annual mean NO₂ concentrations in 2019 exceeded the objective at the majority of diffusion tube sites within 2.5 km of the proposed development. However, no exceedances were measured at these sites in 2022.
- 5.6 Annual mean NO₂ concentrations have not exceeded 60 µg/m³ at any of the monitoring site presented between 2017 and 2022. It is therefore unlikely that the 1-hour mean objective has been exceeded (see paragraph 3.2 for more information). Furthermore, the roadside automatic monitoring site BURW did not recorded any exceedances of the 1-hour mean objective between 2017 and 2022 (Table 5).
- 5.7 While 2020 and 2021 results have been presented in this Section for completeness, they are not relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations. Due to the influence of the Covid-10 pandemic there is insufficient data available to determine any trend in measured concentrations.
- 5.8 The BURW roadside automatic monitoring station also measures PM₁₀ concentrations. Annual mean PM₁₀ results for the years 2017 to 2022 are summarised in Table 6, while results relating to the daily mean PM₁₀ objective are summarised in Table 7. There have been no exceedances of the respective

objectives. No monitoring of PM_{2.5} concentrations is undertaken close to the proposed development site.

Table 6: Summary of Annual Mean PM₁₀ Monitoring (2017-2022) (µg/m³)

Site No.	Site Type	Location	2017	2018	2019	2020	2021	2022
BURW	Roadside	Bury Whitefield	15	16	18	16	15	16
Objective			40					

Table 7: Number of Days With PM₁₀ Concentrations Above 50 µg/m³

Site No.	Site Type	Location	2017	2018	2019	2020	2021	2022
BURW	Roadside	Bury Whitefield	1	2	9	0	0	5
Objective			35					

Exceedances of Limit Value

- 5.9 The BURW AURN monitoring site shows no exceedance of the annual mean nitrogen dioxide limit value in any year (Table 4). In addition, Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2024b), which are used to identify and report exceedances of the limit value, do not identify any exceedances within the study area in 2019. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the proposed development by the time that it is operational.
- 5.10 As discussed in Paragraph 2.29, Defra has produced an Air Quality Plan (Defra, 2017) to tackle roadside nitrogen dioxide concentrations in the UK. Within this Plan, Rochdale Borough Council is identified as having limit value exceedances in or beyond 2017, but not beyond 2020, thus the Plan does not require the authority to undertake any further action. However, a High Court judgement (Royal Courts of Justice, 2018) declared the Plan unlawful with regard to its application to the 45 local authority areas in which exceedances were projected beyond 2017, but not beyond 2020. The judgement required the 33 local authorities where exceedances were projected beyond 2018 to *“develop and implement a plan designed to deliver compliance in the shortest time possible”*; Rochdale Borough Council is not one of these authorities, having no projected exceedances beyond 2018, thus it is not required to produce a plan.
- 5.11 However, several local authorities within GMCA are listed as authorities upon which the Government has placed legal duties to *“develop and implement a plan designed to deliver compliance in the shortest time possible”*. GMCA was, therefore, required to produce a local action plan by the end of 2018. The action plan that GMCA produced (Greater Manchester Combined Authority, 2016) included an action to undertake an appraisal of the effects of a CAZ. Initially, a Greater Manchester-wide charging CAZ, applicable to buses, coaches, taxis, private hire vehicles, heavy goods vehicles

and light goods vehicles, was proposed. However, it was subsequently agreed that the proposed charging CAZ need not be introduced.

5.12 GMCA is currently preparing an investment-led plan, which does not include road user charging and includes the following measures:

- investment in new zero-emission electric buses and upgrades to electric vehicle charging infrastructure at bus depots;
- a Clean Taxi Fund providing grants to help taxis meet a new emission standard;
- an Electric Hackney Upgrade Fund providing grants to help upgrade Hackney Carriages to zero-emission capable vehicles; and
- investment in measures to manage traffic flows.

5.13 GMCA has also been required by Defra to model the potential influence of a charging zone. The plan is to be submitted to Defra shortly, who will decide whether the investment-led plan or charging zone will be required⁶.

Background Concentrations

5.14 Estimated background concentrations in the study area are set out in Table 8 and are all well below the objectives. A range of values is presented as the study area covers multiple 1x1 km grid squares.

Table 8: Estimated Annual Mean Background Pollutant Concentrations in 2022 and 2027 ($\mu\text{g}/\text{m}^3$)

Year	NO ₂	PM ₁₀	PM _{2.5}
2022	13.6 - 18.4	11.2 - 14.0	7.5 - 8.7
2027	11.5 - 15.3	10.9 - 13.4	7.2 - 8.3
Objective	40	40	20 ^a

^a The 20 $\mu\text{g}/\text{m}^3$ PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Baseline Dispersion Model Results

5.15 Baseline concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} have been modelled at each of the existing receptor locations (see Figure 2 and Table 2 for receptor locations). The results, which cover both the existing (2022) and future year (2027) baseline (Without Scheme), are set out in Table 9 for nitrogen dioxide and Table 10 for PM₁₀ and PM_{2.5}. The modelled road components of nitrogen oxides, PM₁₀ and PM_{2.5} have been increased from those predicted by the model based on a comparison with local measurements (see Appendix A3 for the verification methodology).

⁶ <https://cleanairm.com/news/non-charging-plan-delivers-cleaner-air-faster-than-charging-zone-modelling/>

Table 9: Modelled Annual Mean Baseline Concentrations of Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$) at Existing Receptors ^a

Receptor	2022	2027 Without Scheme
R1	21.7	16.6
R2	20.2	16.5
R3	_ ^b	15.3
R4	_ ^b	14.7
R5	_ ^b	14.7
R6	_ ^b	14.6
R7	_ ^b	24.4
R8	_ ^b	28.6
R9	_ ^b	20.9
R10	_ ^b	14.3
R11	_ ^b	16.3
R12	29.9	20.9
R13	28.2	19.7
R14	22.8	17.8
R15	23.4	18.1
R16	35.9	24.6
R17	42.4	28.6
R18	24.7	18.0
R19	25.1	18.2
R20	28.4	20.1
R21	33.1	22.9
R22	27.5	19.6
R23	33.3	23.2
Objective	40	

^a Exceedances of the objective are shown in bold.

^b Representative traffic data were not available for the roads adjacent to these receptors in 2022, due to the ongoing construction of Queen Elizabeth II Way (which opened in November 2022), therefore results for these sites are not presented.

Table 10: Modelled Annual Mean Baseline Concentrations of PM₁₀ and PM_{2.5} at Existing Receptors (µg/m³)

Receptor	PM ₁₀		PM _{2.5}	
	2022	2027 Without Scheme	2022	2027 Without Scheme
R1	14.3	13.7	8.8	8.3
R2	14.1	13.6	8.8	8.3
R3	- ^a	12.6	- ^a	7.9
R4	- ^a	12.5	- ^a	7.9
R5	- ^a	12.5	- ^a	7.9
R6	- ^a	12.5	- ^a	7.9
R7	- ^a	13.6	- ^a	8.6
R8	- ^a	14.3	- ^a	8.9
R9	- ^a	13.1	- ^a	8.3
R10	- ^a	12.0	- ^a	8.0
R11	- ^a	12.3	- ^a	8.2
R12	13.0	12.5	8.4	8.1
R13	12.8	12.3	8.3	8.0
R14	13.7	13.4	8.8	8.6
R15	13.7	13.4	8.9	8.6
R16	14.9	14.5	9.5	9.2
R17	15.5	15.1	9.9	9.5
R18	12.9	12.6	8.7	8.4
R19	13.1	12.7	8.8	8.5
R20	13.6	13.2	9.1	8.8
R21	14.0	13.7	9.3	9.0
R22	13.4	13.0	8.9	8.6
R23	13.8	13.5	9.2	8.9
Assessment Criterion	32^b		20^c	

- ^a Representative traffic data were not available for the roads adjacent to these receptors in 2022, due to the ongoing construction of Queen Elizabeth II Way (which opened in November 2022), therefore results for these sites are not presented.
- ^b While the annual mean PM₁₀ objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM₁₀ objective is possible, as outlined in LAQM.TG (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM₁₀ objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).
- ^c The 20 µg/m³ PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

- 5.16 The predicted annual mean concentrations of nitrogen dioxide are below the objectives at all receptors in both 2022 and 2027 except at receptor R17 (which exceeds the objective in 2022; this receptor represents a property next to the junction of the A58 Bury New Road with the M66 motorway), but by 2027, the baseline concentrations at every receptor are predicted to be well below the objective. The annual mean nitrogen dioxide concentrations are below $60 \mu\text{g}/\text{m}^3$ at every receptor in both 2022 and 2027; it is, therefore, unlikely that the 1-hour mean nitrogen dioxide objective will be exceeded (see Paragraph 3.2).
- 5.17 The predicted annual mean concentrations of PM_{10} and $\text{PM}_{2.5}$ are well below the objectives in both 2022 and 2027 at all receptors. The annual mean PM_{10} concentrations are below $32 \mu\text{g}/\text{m}^3$ and it is, therefore, unlikely that the 24-hour mean PM_{10} objective will be exceeded.

6 Impact Assessment

Impacts at Existing Receptors

- 6.1 The proposed development will generate traffic volumes that exceed the EPUK/IAQM screening thresholds on a number of local roads, thus a detailed assessment is required.

Nitrogen Dioxide

- 6.2 Predicted annual mean concentrations of nitrogen dioxide in 2027 for existing receptors are set out in Table 11 for both the “Without Scheme” and “With Scheme” scenarios. The impact at each receptor is also described using the impact descriptors given in Table 3.

Table 11: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2027 ($\mu\text{g}/\text{m}^3$)

Receptor	Without Scheme	With Scheme	% Change ^a	Impact Descriptor
R1	16.6	16.8	0	Negligible
R2	16.5	16.6	0	Negligible
R3	15.3	15.5	0	Negligible
R4	14.7	14.8	0	Negligible
R5	14.7	14.8	0	Negligible
R6	14.6	14.7	0	Negligible
R7	24.4	24.8	1	Negligible
R8	28.6	28.9	1	Negligible
R9	20.9	21.0	0	Negligible
R10	14.3	14.5	0	Negligible
R11	16.3	16.5	1	Negligible
R12	20.9	21.1	1	Negligible
R13	19.7	19.9	0	Negligible
R14	17.8	18.1	1	Negligible
R15	18.1	18.4	1	Negligible
R16	24.6	24.8	1	Negligible
R17	28.6	28.8	1	Negligible
R18	18.0	18.1	0	Negligible
R19	18.2	18.3	0	Negligible
R20	20.1	20.3	0	Negligible
R21	22.9	23.1	1	Negligible
R22	19.6	19.7	0	Negligible
R23	23.2	23.3	0	Negligible
Objective	40		-	-

^a % changes are relative to the objective and have been rounded to the nearest whole number.

- 6.3 The annual mean nitrogen dioxide concentrations are well below the objective at all receptors, with or without the proposed development. The changes in concentrations are small (1% or less), resulting in *negligible* impacts.
- 6.4 Furthermore, as the annual mean NO_2 concentrations are below $60 \mu\text{g}/\text{m}^3$, it is unlikely that the 1-hour mean NO_2 objective will be exceeded at any of the receptors.

PM₁₀ and PM_{2.5}

- 6.5 Predicted annual mean concentrations of PM₁₀ and PM_{2.5} in 2027 for existing receptors are set out in Table 12 for both the “Without Scheme” and “With Scheme” scenarios. The impacts at each receptor are also described using the impact descriptors given in Table 3.

Table 12: Predicted Impacts on Annual Mean PM₁₀ and PM_{2.5} Concentrations in 2027

Receptor	Annual Mean PM ₁₀ (µg/m ³)				Annual Mean PM _{2.5} (µg/m ³)			
	Without Scheme	With Scheme	% Change ^a	Impact Descriptor	Without Scheme	With Scheme	% Change ^a	Impact Descriptor
R1	13.7	13.7	0	Negligible	8.3	8.3	0	Negligible
R2	13.6	13.6	0	Negligible	8.3	8.3	0	Negligible
R3	12.6	12.6	0	Negligible	7.9	8.0	0	Negligible
R4	12.5	12.5	0	Negligible	7.9	7.9	0	Negligible
R5	12.5	12.5	0	Negligible	7.9	7.9	0	Negligible
R6	12.5	12.5	0	Negligible	7.9	7.9	0	Negligible
R7	13.6	13.7	0	Negligible	8.6	8.6	0	Negligible
R8	14.3	14.4	0	Negligible	8.9	9.0	0	Negligible
R9	13.1	13.1	0	Negligible	8.3	8.3	0	Negligible
R10	12.0	12.0	0	Negligible	8.0	8.1	0	Negligible
R11	12.3	12.3	0	Negligible	8.2	8.2	0	Negligible
R12	12.5	12.6	0	Negligible	8.1	8.1	0	Negligible
R13	12.3	12.3	0	Negligible	8.0	8.0	0	Negligible
R14	13.4	13.5	0	Negligible	8.6	8.6	0	Negligible
R15	13.4	13.5	0	Negligible	8.6	8.7	0	Negligible
R16	14.5	14.5	0	Negligible	9.2	9.2	0	Negligible
R17	15.1	15.1	0	Negligible	9.5	9.5	0	Negligible
R18	12.6	12.6	0	Negligible	8.4	8.4	0	Negligible
R19	12.7	12.7	0	Negligible	8.5	8.5	0	Negligible
R20	13.2	13.3	0	Negligible	8.8	8.8	0	Negligible
R21	13.7	13.7	0	Negligible	9.0	9.0	0	Negligible
R22	13.0	13.0	0	Negligible	8.6	8.7	0	Negligible
R23	13.5	13.5	0	Negligible	8.9	8.9	0	Negligible
Criterion	32 ^b		-	-	20 ^c		-	-

^a % changes are relative to the criterion and have been rounded to the nearest whole number.

- ^b While the annual mean PM₁₀ objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM₁₀ objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM₁₀ objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).
- ^c The PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

6.6 The annual mean PM₁₀ and PM_{2.5} concentrations are well below the relevant criteria at all receptors, with or without the proposed development, and all impacts are *negligible*. Furthermore, as the annual mean PM₁₀ concentrations are below 32 µg/m³, it is unlikely that the 24-hour mean PM₁₀ objective will be exceeded at any of the receptors.

Significance of Operational Air Quality Effects

6.7 The operational air quality effects without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in Appendix 11 and takes account of the assessment that pollutant concentrations at all of the selected worst-case existing receptors along the local road network will be well below the air quality objectives, and all of the impacts are predicted to be *negligible*.

7 Mitigation

Good Design and Best Practice

- 7.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required.
- 7.2 The proposed development incorporates the following good design and best practice measures, which have been accounted for in the assessment as far as is possible:
- provision of active electric vehicle charging facilities for 10% of car parking spaces, with passive provision for a further 10%;
 - provision of a framework travel plan setting out measures to encourage sustainable means of transport (public, cycling and walking) and to reduce the impact of operational trips;
 - provision of pedestrian and cycle access to the new development, including secure, covered cycle parking; and
 - no inclusion of gas combustion plant for heating or hot water, to minimise on-site point source emissions.

Recommended Mitigation

- 7.3 The assessment has demonstrated that the overall air quality effect of the proposed development will be 'not significant' and the development-generated traffic emissions will not have a significant impact on local air quality. It is, therefore, not considered appropriate to propose further mitigation measures for this development.
- 7.4 Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law).

8 Conclusions

- 8.1 The assessment has considered the impacts of the proposed development on local air quality in terms of emissions from road traffic generated by the completed and occupied development.
- 8.2 The assessment has demonstrated that pollutant concentrations will be well below the objectives at all existing receptors in 2027, with or without the proposed development, and that the emissions from the additional traffic generated by the proposed development will have a *negligible* impact on air quality conditions at all existing receptors along the local road network.
- 8.3 The overall operational air quality effects of the proposed development are therefore judged to 'not significant'.
- 8.4 Taking into account these conclusions, it is judged that the proposed development is consistent with Paragraph 191 of the NPPF, being appropriate for its location in terms of its effects on the local air quality environment. It is also consistent with Paragraph 192, as it will not affect compliance with relevant limit values or national objectives.
- 8.5 The proposed development is also consistent with Policy G9 and DM1 of Rochdale Borough Council's Core Strategy, as it will not have an adverse or unacceptable impact on health or air quality.

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10 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AQAL	Air Quality Assessment Level
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
LGV	Light Goods Vehicle
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO₂	Nitrogen dioxide

NOx	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
OEP	Office for Environmental Protection
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OLEV	Office for Low Emission Vehicles
PM₁₀	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM_{2.5}	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Practice Guidance
RDE	Real Driving Emissions
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide
TEMPro	Trip End Model Presentation Program

11 Appendices

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A1 EPUK & IAQM Planning for Air Quality Guidance

- A1.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

“Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations”.*

Recommended Best Practice

- A1.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

“The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions”.

- A1.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m² of commercial floorspace;
- are carried out on land of 1 ha or more.

- A1.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new “street canyon”, as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNO_x/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
 - Spark ignition engine: 250 mgNO_x/Nm³;
 - Compression ignition engine: 400 mgNO_x/Nm³;
 - Gas turbine: 50 mgNO_x/Nm³.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNO_x/Nm³ and 25 mgPM/Nm³.

A1.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

“It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the “damage cost approach” used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential”.

A1.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

“There may be a requirement to carry out an air quality assessment for the impacts of the local area’s emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- the presence of a source of odour and/or dust that may affect amenity for future occupants of the development”.*

Impacts of the Development on the Local Area

A1.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m² of floor space for all other uses or a site area greater than 1 ha.

A1.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A1.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A1.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A1.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

“Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NO_x gas boiler or a 30kW CHP unit operating at <95mg/Nm³.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable”.

- A1.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

“The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive ‘trigger’ for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality”.

- A1.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

“The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer”.

- A1.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

Assessment of Significance

- A1.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

- A1.16 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either ‘significant’ or ‘not significant’. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A1.17 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A1.18 A 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 Appendix A2.

A2 Professional Experience

Martin Peirce, BSc (Hons), MSc, MIEncSci, MIAQM

Mr Peirce is an Associate Director with AQC and has some thirty years' experience in environmental modelling and assessment, most relating to air quality and carbon and greenhouse gases (GHGs). He has extensive experience in the calculation of emissions to air and compiling emission inventories, for both local air quality assessments and carbon footprinting. For air quality, he also has extensive expertise in modelling the atmospheric dispersion of pollutants for comparison against regulatory limits and for assessment of health and environmental impacts. He has prepared assessments in support of Environmental Impact Assessments (EIA), permit applications and planning applications (under both Town and Country Planning Act (TCPA) and Development Consent Order (DCO) regimes), and has acted as expert witness. He has particular experience in modelling aviation and transport sources, non-road mobile machinery, construction and industrial sources.

Julia Burnell, MEnvSci (Hons) MIEncSci MIAQM

Miss Burnell is a Principal Consultant with AQC with over eight years' experience in the field of air quality. She has experience of undertaking a range of air quality assessments for power, transportation, and mixed-use development projects both in the UK and internationally. She is also experienced at preparing environmental permit applications for medium combustion plant/specified generator sites and has commissioned and maintained numerous ambient air quality monitoring surveys. Prior to her work with AQC, Julia completed an MEnvSci (Hons) in Environmental Science (four-year integrated master's). She is a Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

Dr Imogen Heard, BSc (Hons) MSc PhD

Dr Heard is an Associate of AQC with over 12 years' experience in the field of air quality. She has been involved in numerous development projects including road schemes, energy from waste facilities, urban extensions and energy centres. These have included the use of ADMS-5 and ADMS-Roads dispersion models to study the impacts of a variety of pollutants, including nitrogen dioxide, PM₁₀ and PM_{2.5}, and the preparation of air quality assessment reports and air quality chapters for Environmental Statements. She also has experience in undertaking construction dust risk assessments, Air Quality Neutral assessments and human health risk assessments, as well as in preparing local authority reports. Prior to joining AQC she worked as a scientist in the Atmospheric Dispersion and Air Quality area at the UK Met Office for four years, modelling the dispersion of a range of pollutants over varying spatial and temporal scales.

A3 Modelling Methodology

Model Inputs

A3.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 12.0) published by Defra (2024a). Model input parameters are summarised in Table A3.1 and, where considered necessary, discussed further below.

Table A3.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	Yes – 12km x 12km Cartesian grid at 50m resolution
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Rochdale
Meteorological Data Year	2022
Dispersion Site Surface Roughness Length (m)	N/A (variable surface roughness file used)
Dispersion Site Minimum MO Length (m)	30
Met Site Surface Roughness Length (m)	0.3
Met Site Minimum MO Length (m)	30
Gradients?	No

A3.2 AADT flows, and the proportions of HDVs, for roads close to the scheme have been provided by PJA, who have undertaken the transport assessment work for the proposed development. AADT flows, and the proportions of HDVs, for roads within the AQMA have been determined from the interactive web-based map provided by DfT (DfT, 2024). The 2022 AADT flows have been factored forwards to the assessment year of 2027 using growth factors derived using the TEMPro System v8.1 (DfT, 2023a). Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic data used in this assessment are summarised in Table A3.2. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2023b).

Table A3.2: Summary of Traffic Data used in the Assessment

Road Link		2022		2027 (Without Scheme)		2027 (With Scheme)	
ID	Name	AADT	%HDV	AADT	%HDV	AADT	%HDV
1	Croft Lane	21,444	3.7	21,316	2.7	21,859	2.7
2	Pilsworth Road east of M66	12,040	19.6	10,818	9.1	12,106	10.7
3	Pilsworth Road north of Hareshill Road	- ^a	- ^a	9,276	3.3	9,847	3.1
4	QEII Way west of Manchester Road	- ^a	- ^a	11,936	11.1	13,310	14.9
5	QEII Way east of Manchester Road	- ^a	- ^a	11,468	12.8	12,594	16.9
6	Manchester Road north of QEII Way	- ^a	- ^a	10,788	2.8	10,925	2.8
7	Manchester Road south of QEII Way	- ^a	- ^a	11,031	2.7	11,143	2.7
8	Middleton Road north of M62	- ^a	- ^a	16,509	2.8	16,526	2.8
9	Middleton Road south of M62	- ^a	- ^a	15,236	3.1	15,334	3.1
10	Moss Hall Road	5,183	3.0	6,465	2.4	7,023	2.2
11	Bury New Road	20,337	6.0	21,104	6.0	21,661	5.8
12	Rochdale Road	18,206	6.1	18,892	6.1	19,450	6.0
13	Bond Street	8,285	2.8	8,597	2.8	8,597	2.8
14	Heywood Street	13,807	2.3	14,327	2.3	14,327	2.3
15	M66 northbound	48,634	6.6	50,468	6.6	51,025	6.5
16	M66 southbound	49,678	8.9	51,551	8.9	52,108	8.8
17	M62 eastbound east of Middleton Road	72,425	16.6	75,872	16.6	76,435	16.5
18	M62 westbound east of Middleton Road	65,244	16.2	68,350	16.2	68,913	16.1
19	M62 eastbound west of Middleton Road	62,724	15.4	65,710	15.4	66,273	15.2
20	M62 westbound west of Middleton Road	63,507	14.6	66,530	14.6	67,093	14.5

^a Representative traffic data unavailable due to the ongoing construction of Queen Elizabeth II Way (which opened in November 2022).

A3.3 Figure A3.1 shows the road network included within the model, along with the speed at which each link was modelled.

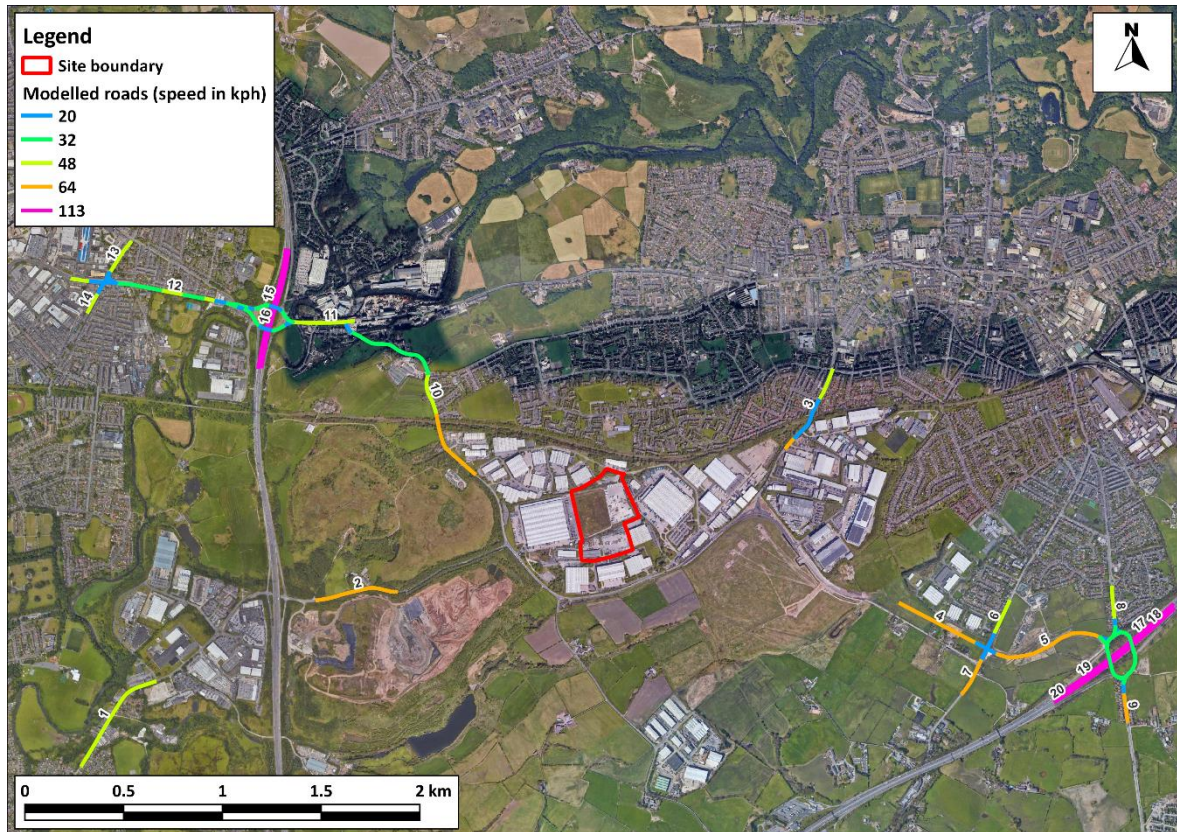


Figure A3.1: Modelled Road Network & Speed

Imagery ©2024 Airbus, Maxar Technologies.

- A3.4 Hourly sequential meteorological data in sectors of 10 degrees from Rochdale for 2022 have been used in the model. The Rochdale meteorological monitoring station is located at Rochdale Wastewater Treatment Works, approximately 5.2 km to the north east of the proposed development. Both the application site and the Rochdale meteorological monitoring station are located in Rochdale where they will be influenced by the effects of inland meteorology over urban topography. The topography of the model domain is similar to that around the meteorological monitoring station and measurements from this site are considered to provide the most robust basis to predict meteorology within the model domain. A wind rose for the site for 2022 is provided in Figure A3.2. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

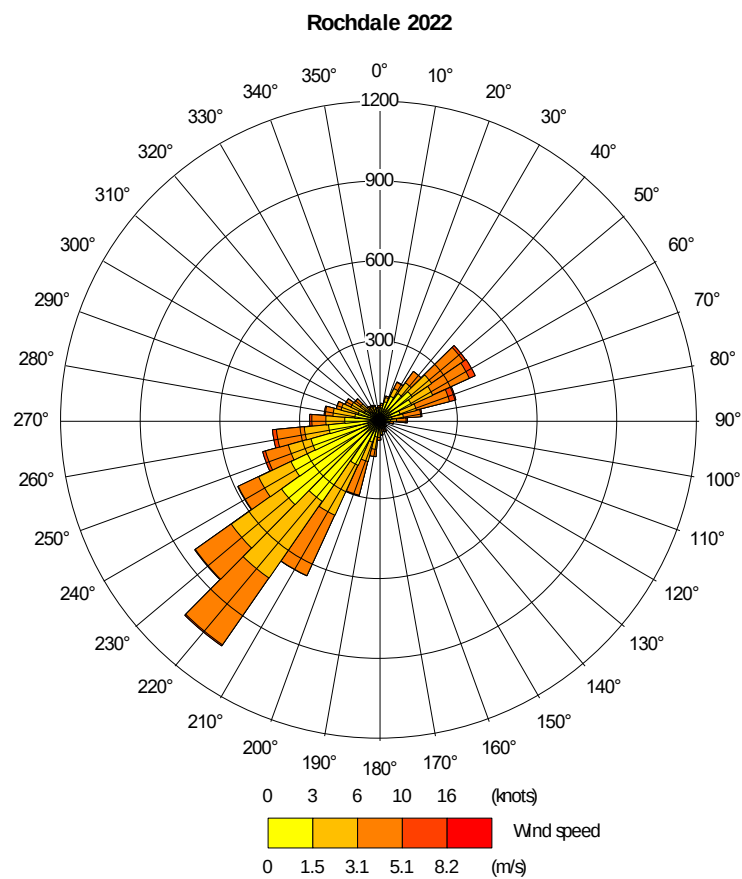


Figure A3.2: Wind Rose

Model Verification

- A3.5 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside nitrogen dioxide concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean nitrogen dioxide concentrations during 2022 at the BUR-D1, BUR-D2, BU12NO and BU13NO diffusion tube monitoring sites, located on Rochdale Road. These sites have been selected because both monitoring data and traffic data are available for 2022 at this location. Site RO20ANO has been excluded from the model verification because, due to the construction of the nearby Queen Elizabeth II Way, representative traffic data are not available for the surrounding roads in 2022.

Nitrogen Dioxide

- A3.6 Most nitrogen dioxide (NO₂) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂).

- A3.7 The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x. Measured road-NO_x has been calculated from the measured NO₂ concentrations and the predicted background NO₂ concentration using the NO_x from NO₂ calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2024a).
- A3.8 The unadjusted model has under predicted the road-NO_x contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A3.3). The calculated adjustment factor of 2.497 has been applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations.
- A3.9 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO₂ concentration within the NO_x to NO₂ calculator. Figure A3.4 compares final adjusted modelled total NO₂ at each of the monitoring sites to measured total NO₂, and shows a close agreement.

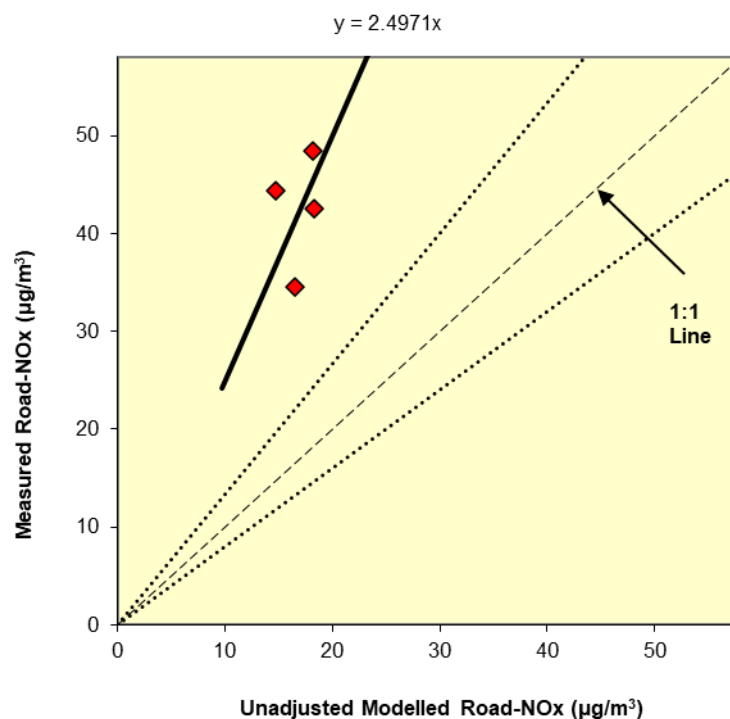


Figure A3.3: Comparison of Measured Road NO_x to Unadjusted Modelled Road NO_x Concentrations. The dashed lines show $\pm 25\%$.

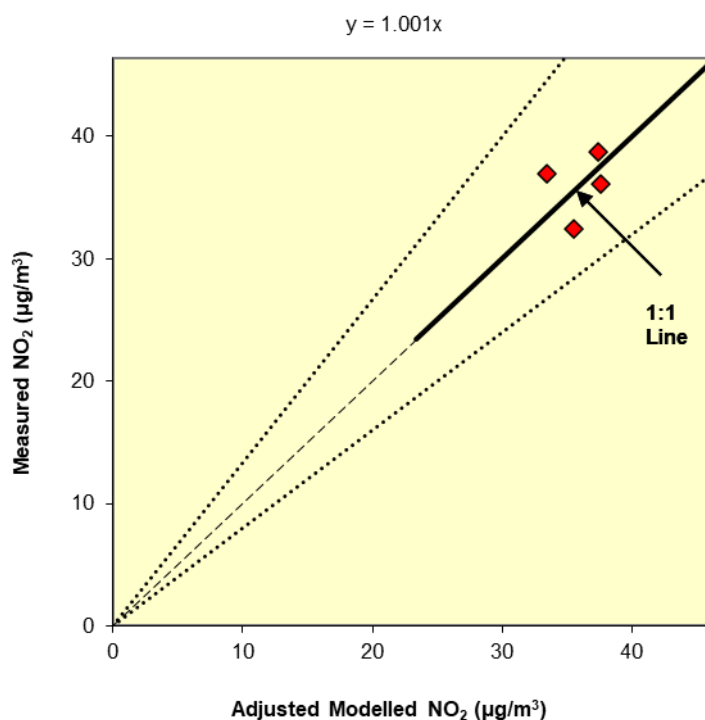


Figure A3.4: Comparison of Measured Total NO₂ to Final Adjusted Modelled Total NO₂ Concentrations. The dashed lines show $\pm 25\%$.

PM₁₀ and PM_{2.5}

- A3.10 The approach described above for NO_x and nitrogen dioxide determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NO_x because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM₁₀ and PM_{2.5} concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured PM_{2.5} in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean PM_{2.5} concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.
- A3.11 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM₁₀ and PM_{2.5} concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for

NO_x and NO₂ is not appropriate for PM₁₀ and PM_{2.5}. Historically, many studies have derived a model adjustment factor for NO_x and applied this to PM₁₀ and PM_{2.5}. This is also not appropriate, since there is no reason to expect the same bias in emissions of NO_x, PM₁₀ and PM_{2.5}.

- A3.12 While there is very strong evidence that EFT-based models have consistently under-predicted road-NO_x concentrations in urban areas, there is no equivalent evidence for PM₁₀ and PM_{2.5}. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM₁₀ and PM_{2.5} have thus not been adjusted.

Post-processing

- A3.13 The model predicts road-NO_x concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO₂, has been processed through the NO_x to NO₂ calculator available on the Defra LAQM Support website (Defra, 2024a). The traffic mix within the calculator has been set to “All other urban UK traffic”, which is considered suitable for the study area. The calculator predicts the component of NO₂ based on the adjusted road-NO_x and the background NO₂.