

COVERDALE CRESCENT, MANCHESTER AIR QUALITY IMPACT ASSESSMENT

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Executive Summary

Temple Group Limited (Temple) has been commissioned to prepare an air quality assessment to support the planning application for the construction of residential units (the 'Proposed Development'), off Coverdale Crescent in the Ardwick area of Manchester (the 'Site').

The air quality assessment has determined the following:

- Baseline air quality conditions at the Proposed Development site are likely to meet prevailing air quality objectives once the site is operational. Therefore, future site users are unlikely to be exposed to poor ambient air quality.
- The type and volume of traffic expected to be generated by construction activities was screened out of further assessment and thus considered to have a 'not significant' effect on air quality. Mitigation measures to further reduce the effects of construction vehicles have been recommended. Residual effects would remain negligible and 'not significant'.
- The risk of health impacts arising from fugitive dust and particulate matter connected with construction related activities has been assessed as a maximum of medium. Mitigation measures to reduce the effects of fugitive dust and emissions have been recommended. Residual effects would be negligible and 'not significant'.
- The development is unlikely to have a significant effect on air quality once operational. Mitigation measures have been suggested to further reduce any residual impacts on air quality connected with vehicle movements attributable to the scheme.
- The Proposed Development is considered to comply with national and local air quality policy.

Glossary

AADT	Annual Average Daily Traffic (flow)
AMCT	Annual Mean Concentration Target
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Standard
ASR	Annual Status Report
CEMP	Construction Environmental Management Plan
DMP	Dust Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
EC	European Commission
EU	European Union
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
IT	Interim Target
LAQM	Local Air Quality Management
LBT	Legally Binding Target
LDV	Light duty vehicle
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
MCC	Manchester City Council
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
PERT	Population Exposure Reduction Target
PM ₁₀	Particulate matter of size fraction approximating to <10mm diameter
PM _{2.5}	Particulate matter of size fraction approximating to <2.5mm diameter
PPG	Planning Practice Guidance
PR	Proposed Receptor
RMSE	Root Mean Square Error
SSSI	Site of Special Scientific Interest
SAC	Special Area of Conservation
SPA	Special Protection Area
Temple	Temple Group Limited

TG	Technical Guidance
UK-AIR	UK Air Information Resource

1. Introduction

Temple Group Limited (Temple) has undertaken an air quality assessment for a proposed residential development (the 'Proposed Development') at Coverdale Crescent, in the Ardwick area of Manchester (the 'Site'), on behalf of Eden Planning ('the Client'). The Site location plan is shown in **Figure A.1** in **Appendix A**.

This report includes a baseline assessment of local air quality, a construction phase assessment and an operational phase assessment. Mitigation measures and/or further work have been recommended where appropriate.

2. Legislation and Policy

2.1. National Policy

The Air Quality Strategy for England¹ include ambient air quality objectives (AQOs) to be achieved and a strategy to achieve compliance with the AQOs. The ambient AQOs are established in the Air Quality (England) Regulations 2000², as amended³.

The Environment Act 1995⁴ requires all local authorities to carry out periodic reviews of air quality within their administrative areas. Where air quality is known or expected to exceed one or more of the AQOs, they must declare an air quality management area (AQMA) and implement an air quality action plan (AQAP) to work toward meeting the AQOs. Moreover, the European Union emissions limit values derived from the Ambient Air Quality Directive (2008/50/EC)⁵ were transposed into English and Welsh law as air quality standards (AQs) via the Air Quality Standards Regulations 2010⁶, as amended⁷.

The Environment Act 2021⁸ amends part of the Environment Act 1995 and sets legally binding targets in priority areas including air quality, which must be met in England over a 25-year period. The Act requires for Environmental Improvement Plans to be produced by the Department for Environment, Food and Rural Affairs (Defra) to monitor progress and commit the Government to greater compliance with those targets if insufficient progress is made.

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023⁹ set the following legally binding targets (LBTs) to be met by 2040:

- Annual mean concentration target (AMCT) of 10µg/m³; and,
- Population exposure reduction target (PERT) of 35% compared to 2018 exposure.

¹ Department for Environment, Food and Rural Affairs, 2023. Air quality strategy: framework for local authority delivery.

² The Air Quality (England) Regulations 2000.

³ The Air Quality (England) (Amendment) Regulations 2000.

⁴ The Environment Act 1995.

⁵ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. European Commission.

⁶ The Air Quality Standards Regulations 2010.

⁷ The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

⁸ The Environment Act 2021.

⁹ Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

The Environmental Improvement Plan 2023¹⁰ also set interim targets (ITs) to be met by end of January 2028:

- AMCT of 12µg/m³; and,
- PERT of 22% (compared to 2018 exposure).

Air quality assessments should consider whether the Proposed Development would hinder compliance with the AQOs or Limit Values (i.e. AQSs), according to the National Planning Policy Framework¹¹ (see **Section 2.2** below).

Planning applications are not yet required to meet the LBTs or ITs (although updates to national planning guidance are being considered); however, Local Authorities are expected to work towards these targets through the planning system¹². This is reiterated in the Air Quality and Planning Guidance¹³. Therefore, the extent to which the scheme affects broad compliance with the LBT has been considered.

This air quality assessment has focussed on achieving compliance with those established for those which are considered relevant based on the nature of the Proposed Development. The AQOs and AQSs shown in **Table 2.1** below.

Table 2.1 Ambient AQOs relevant to the assessment

Pollutant	Threshold	Applicable limit values	Measured as	Dates to be achieved and maintained thereafter
NO ₂	200 µg/m ³ , not to be exceeded more than 18 times per year	AQO and AQS	1-hour mean	31 December 2005
	40 µg/m ³	AQO and AQS	Annual mean	31 December 2005
PM ₁₀	50 µg/m ³ , not to be exceeded more than 35 times per year	AQO and AQS	24-hour mean	31 December 2004

¹⁰ Department for Environment, Food and Rural Affairs, 2023. Environmental Improvement Plan 2023: First revision of the 25 Year Environment Plan.

¹¹ Department for Levelling Up, Housing & Communities, 2023, *National Planning Policy Framework*, September 2023.

¹² Department for Environment, Food and Rural Affairs, 2023. Air quality strategy: framework for local authority delivery.

¹³ Manchester City Council (2022), Air Quality & Planning Technical Guidance, August 2022

Pollutant	Threshold	Applicable limit values	Measured as	Dates to be achieved and maintained thereafter
	40 µg/m ³	AQO and AQS	Annual mean	31 December 2004
PM _{2.5}	20 µg/m ³	AQS	Annual mean	01 January 2020

2.2. Planning Policy

The National Planning Policy Framework (NPPF) was published during September 2023¹¹. The NPPF establishes a framework under the Town and Country Planning Act which should be used by local authorities to make local plans and determine planning applications.

Paragraph 174 states:

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

“e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions....”

Paragraph 186 states:

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

Its focus is on achieving compliance with the AQOs (i.e. the AQSs), hence their adoption as the assessment criteria.

The 2019 Air Quality Planning Practice Guidance (PPG)¹⁴ supports the NPPF, by including recommendations on the scope of an air quality assessment.

¹⁴ Ministry of Housing, Communities & Local Government, 2019. *Planning Practice Guidance: Air Quality*.

2.3. Regional and Local Policy

Manchester Local Development Framework

The Core Strategy was adopted by Manchester City Council (MCC) on the 11th July 2012¹⁵. It is the key document in Manchester's Local Development Framework and covers a period of 15 years from 2012 to 2027. There are various policies for air pollution which are outlined below.

"Policy EN16

Air Quality

The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development land itself, including from Combined Heat and Power and biomass plant.

When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas."

Manchester Air Quality and Planning Guidance

MCC released Air Quality and Planning Guidance in August 2022 which this assessment adheres to for a detailed dispersion modelling assessment¹⁶. An outline of the methodology required is outlined below:

"Undertaking an Air Quality Assessment:

Stage 1 Criteria to Proceed to Stage 2:

A. If any of the following apply:

-10 or more residential units or a site area of more than 0.5ha

-more than 1,000m² of floor space for all other uses or a site area greater than 1ha

B. Couples with any of the following:

-the development has more than 10 parking spaces

-the development will have a centralised energy facility or other centralised combustion process.

¹⁵ Manchester City Council (2012), Manchester's Local Development Framework, Core Strategy Development Plan Document, Adopted 11th July 2012

¹⁶ Manchester City Council (2022), Air Quality & Planning Technical Guidance, August 2022

Assessment methodology should be agreed with the authority and include 3 basic steps:

- i. Assess the existing air quality in the study area (existing baseline);*
- ii. Predict the future air quality without the development in place (future baseline which may or may not include the contribution of committed development);*
- iii. Predict the future air quality with the development in place (with development).*

Assessment report should contain the following:

- a. Relevant details of the proposed development*
- b. The policy context for the assessment*
- c. Description of the relevant air quality standards and objectives*
- d. The basis for determining significance of effects arising from the impacts;*
- e. Details of assessment methods*
- f. Model verification*
- g. Identification of sensitive locations*
- h. Description of baseline conditions*
- i. Assessment of impacts*
- j. Description of construction phaser impacts*
- k. Cumulative impacts and effects*

Mitigation measures. Even where the effect is judged to be insignificant, consideration should be given to the application of good design and good practice measures.

- l. Summary of the assessment results.*

The assessment should also complete a construction dust assessment inline with the IAQM Construction Dust Guidance."

As the proposed development has more than 10 residential units and more than 10 car parks proposed a detailed dispersion assessment has been undertaken.

2.4. Technical Standards and Guidance

Land-Use Planning & Development Control: Planning for Air Quality ('the EPUK-IAQM guidance')

Published by Environmental Protection UK (EPUK) and the IAQM, this guidance¹⁷ includes a method for screening the requirement for an air quality assessment and

¹⁷ Environmental Protection UK & the Institute of Air Quality Management, 2017. Land-Use Planning & Development Control: Planning for Air Quality.

determining the significance of any air quality impacts associated with a development proposal. It also identifies mitigation measures which can be implemented to reduce air quality effects attributable to the scheme.

Guidance on the Assessment of Dust from Construction and Demolition

The IAQM has produced guidance on the assessment of air quality impacts from construction activities entitled the ‘Guidance on the Assessment of Dust from Construction and Demolition’ (‘the IAQM 2023 guidance’)¹⁸. This guidance provides a framework for assessing the risk of dust effects that may arise and suggests appropriate dust and air emissions mitigation measures for sites according to the level of risk.

Local Air Quality Management Technical Guidance (‘TG22’)

TG22¹⁹ includes guidance for local authorities to assess and, where required, deliver improvements in air quality within their jurisdiction. It describes a procedure which can be used to undertake model verification and adjustment and estimate hourly mean NO₂ or 24-hour mean PM₁₀ concentrations and undertake additional adjustment processes. TG22 also recommends where the AQOs should be applied, as outlined in **Table 2.2**.

Table 2.2 Examples of where the air quality objectives should apply, as per TG22

Averaging Period Objectives	Objectives should apply at	Objectives should generally not apply at
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.

¹⁸ Institute of Air Quality Management, 2023. Guidance on the assessment of dust from demolition and construction. Institute of Air Quality Management.

¹⁹ Department for Environment, Food and Rural Affairs, 2022. Part IV of the Environment Act 1995 as amended by the Environment Act 2021: Local Air Quality Management: Technical Guidance (TG22). London: Crown.

Averaging Period Objectives	Objectives should apply at	Objectives should generally not apply at
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties (not at peripheries or front gardens unless exposure is likely there).	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3. Air Quality Assessment Method

3.1 Overall Assessment Approach

The approach taken for assessing the potential air quality impacts of the Proposed Development is as follows:

- Baseline characterisation of local air quality;
- qualitative impact assessment of dust and emissions generated by construction related activities;
- advanced dispersion modelling assessment of air quality impacts attributable to increases in vehicle movements from the Proposed Development (once operational);
- recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised; and,
- identification of residual impacts resulting from the Proposed Development.

Temple discussed the method used within the air quality assessment with MCC on the 16th of August 2023. They stated that as long as the methodology complied with the MCC Air Quality and Planning Guidance¹⁶ the assessment would be suitable.

Pollutants

The main pollutants for consideration in this assessment are:

- Fugitive PM₁₀, PM_{2.5} and dust emissions from construction related activities; and,
- NO₂, PM₁₀ and PM_{2.5} emissions from existing baseline traffic and additional traffic attributable to the Proposed Development.

According to the Client, all proposed plant for space heating and hot water will be electrically powered and therefore on-site sources of combustion do not require assessment.

3.2 Baseline Assessment

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air, including road traffic and industrial sources.

A study has been undertaken using data obtained from continuous and diffusion tube monitoring stations maintained by MCC and estimated background from the United Kingdom Air Information Resource (UK-AIR) website maintained by the Department for Environment, Food and Rural Affairs (Defra).

3.3 Construction Phase Dust Assessment

Potential air emissions from demolition and construction activities, particularly in the form of dust, have the potential to cause a loss of amenity (due to dust soiling). The finer fraction of dust, in the form of PM₁₀ and particulates of finer fractions, have the

potential to affect human health. Given the variability of construction sites and the range of activities undertaken, making an accurate assessment of the dust and air pollutants generated is rarely feasible or practicable. Instead, a qualitative assessment has been undertaken to examine potential areas of concern and identify the best practicable means for eliminating, minimising and mitigating potential emissions.

The IAQM 2023 guidance has been used to undertake the risk assessment. The method recommended by this guidance is outlined in **Appendix B**.

3.4 Assessment of Vehicle Movements (Construction and Operational phases)

Road traffic is a primary source of emissions to air. The combustion of fuel in vehicles leads to several harmful by-products which can affect air quality in the vicinity of roads. Areas with high traffic volumes or near to major roads often experience elevated pollutant levels, particularly in the form of NO₂, PM₁₀ and PM_{2.5}. Fixed sources, such as boilers, can also be important emissions sources.

The EPUK-IAQM guidance outlines screening criteria which can be used to determine when an air quality assessment is required.

Due to the size of the Site, construction related activities are anticipated to be short-term and the number of attributable vehicle movements is expected to be limited. Therefore, the assessment of impacts from construction related activities has been screened out of further assessment.

Part of the Site is located within the Greater Manchester AQMA and as such, the development may introduce future site users into an area of poor ambient air quality once operational. Therefore, detailed dispersion modelling has been undertaken.

The Proposed Development is anticipated to introduce an additional 39 vehicle movements (expressed as an annual average daily traffic (AADT) flow). It will not introduce a new signalised junction or roundabout, underground car park and (considering its opening year) will not introduce any boilers or sources of combustion associated with space heating or hot water. Whilst this can normally be screened out of further assessment, the impacts of the proposed development on local air quality have been assessed as best practice.

The ADMS-Roads Extra v5 Gaussian dispersion model was used to assess emissions from road traffic attributable to the Proposed Development when it commences operation. The following scenarios were modelled:

- **Scenario 1 (S1):** Baseline 2022: base year;
- **Scenario 2 (S2):** Future baseline (2025), without the Proposed Development in place; and,
- **Scenario 3 (S3):** Future baseline (2025) with the Proposed Development in place.

Full details of the assessment methodology and model input data are provided in **Appendix C**. The method adopted for this assessment considers current best practice guidance for assessment of air quality, including the Manchester Air Quality & Planning Guidance¹⁶ and EPUK-IAQM guidance¹⁷.

3.5 Significance Criteria

Construction phase

The risk of dust impacts from construction activities were defined using the method outlined in **Appendix B**. The significance of the potential for dust to affect sensitive receptors has been assessed (in the absence of mitigation) using professional judgement but is generally considered proportionate to the risk impact categories.

The significance of effects connected with construction related vehicle movements is outlined below.

Operational Phase

The significance of effects attributable to impacts from vehicle movements (whether construction or operational) has been determined separately to account for impacts generated in connection with each of the following:

- The impacts of the Proposed Development on air quality at existing sensitive receptors using the assessment criteria in the EPUK-IAQM guidance;
- The number of future site users exposed to poor ambient air quality.

Impact magnitude – Existing Receptors

The potential impacts of the Proposed Development were assessed by comparing estimated pollutant concentrations with the AQOs (**Table 2.1**), with and without the Proposed Development in place. In addition to the AQOs, the EPUK-IAQM guidance descriptors for magnitude of impact were used to assess the annual mean changes in NO₂, PM₁₀ and PM_{2.5} concentrations, primarily because they consider effects in terms of the magnitude of change from predicted concentrations and also relative to the AQOs.

Table 3.1 shows the EPUK-IAQM guidance impact descriptors that take account of the percentage change in concentration relative to the air quality assessment level (AQAL), such as the annual mean objectives, and the annual mean concentration at the receptor during the assessment year.

Table 3.1 Air quality impact descriptors for changes to annual mean NO₂, PM₁₀ and PM_{2.5} concentrations

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

Note: The AQAL is relevant ambient AQO. For annual mean NO₂, for instance, the AQO 40 µg/m³. The AQAL is therefore 40 µg/m³ for annual mean NO₂.

Changes in the hourly mean NO₂ and daily mean PM₁₀ concentrations should not be assessed using the EPUK-IAQM guidance criteria specified above. Consequently, the following impacts would be considered to exert significant effects at a specific receptor location:

Where the Proposed Development causes a receptor to exceed an annual mean NO₂ concentration of 60µg/m³, where it did not without the Proposed Development in place; and/or,

Where the Proposed Development causes a receptor to exceed the daily mean PM₁₀ AQO more than the 35 times per year permissible.

The overall significance of effects on local air quality, including background pollutant concentrations, has been established through consideration of the following factors:

- the existing and future air quality in the absence of the Proposed Development;
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

4. Baseline Conditions

4.1 Proposed Development Site Description

The Proposed Development is located off Coverdale Crescent in the Ardwick area of Manchester. Some of the site is within Greater Manchester Combined Authority AQMA which was designated for exceedances of the annual mean nitrogen dioxide and 24-hour mean Particulate Matter PM₁₀ objectives.

4.2 Local Authority review and assessment information

MCC declared a city wide AQMA during 2001 due to known or anticipated exceedances of the annual mean NO₂ and 24-hour mean PM₁₀ AQOs. The Proposed Development site is therefore located within an AQMA.

Each year, MCC produce an Air Quality Annual Status Report (ASR)²⁰ summarising the results of monitoring undertaken in the area, progress made on improving air quality within its jurisdiction, and consequently on whether the AQMA should be maintained. The most recent ASR available at the time of this assessment (the 2023 report, reviewing 2022 monitoring) did not suggest that the AQMA is expected to be revoked, suggesting that the AQMA is expected to remain in place when the Proposed Development site is anticipated to open in March 2025.

4.3 MCC air quality monitoring

MCC has undertaken monitoring at 12 locations within 1.5km of the Proposed Development site during 2022, the latest year for which monitoring data are available.

Table 4.1 below outlines the annual mean NO₂ monitoring locations monitored at these sites over the last five years. The monitors located within the vicinity of the Site are also displayed (along with roads and receptors included in the dispersion modelling assessment referred to in **Appendix C**) in **Figure A.1**.

The results indicate that the annual mean NO₂ AQO has typically been met at urban background locations and at some roadside locations but has exceeded at some roadside locations along the A57 Hyde Road.

²⁰ Greater Manchester Combined Authority (2022), 2022 Air Quality Annual Status Report (ASR), June 2023

Table 4.1 Annual mean NO₂ concentrations monitored by MCC at locations within 1.5km of the Proposed Development site

Site ID	Site Type	Distance from Proposed Devt. site (km)	Annual mean NO ₂ concentration (µg/m ³)				
			2018	2019	2020	2021	2022
CAP_MANC_169	Roadside	0.5	-	-	-	-	34.9
CAP_MANC_005	Roadside	0.6	-	-	-	-	54.9
CAP_MANC_168	Roadside	0.6	-	-	-	-	41.9
MA96BNO	Roadside	0.6	-	46.0	36.4	41.0	43.5
MA113BNO	Roadside	0.6	-	-	-	28.1	29.2
CAP_MANC_165	Roadside	0.8	-	-	-	-	33.7
CAP_MANC_166	Roadside	0.9	-	-	-	-	38.6
CAP_MANC_167	Roadside	0.9	-	-	-	-	48.1
MA72NO	Urban Background	1.1	33.4	32.8	24.5	27.5	26.3
MA82NO, MA83NO, MA84NO	Roadside	1.5	54.0	52.0	34.1	40.7	42.6
Manchester Oxford Road Continuous Monitor	Kerbside	1.5	62	59	36	44	43
Air Quality Objective			40				

MCC also undertake monitoring to determine compliance with the annual mean PM₁₀ and PM_{2.5} AQOs, hourly mean NO₂ AQO and 24-hour mean PM₁₀ AQO at three automatic monitors located within their jurisdiction.

For the years 2018 to 2022 there was no exceedance of the 1-hour mean NO₂ objective at any of the three monitoring locations. The annual mean AQO for PM₁₀ was not exceeded for the monitoring locations either. There were 8 exceedances of the 24-hour mean PM₁₀ objective greater than 50µg/m³ in 2022 at the Manchester Oxford Road Continuous Monitor, located approximately 1.5km to the north-west of the Site.

4.4 Pollutant Background Concentrations

Background annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} were obtained from maps downloaded from the UK-AIR website²¹ maintained by Defra. The maps present annual mean pollutant concentrations on a 1km² basis for the years 2018 to 2030. The concentrations for the 1km x 1km grid square centred on OS coordinates 385500, 396500, corresponding to the location of the Proposed Development, for 2022 (baseline year) and 2025 (year the development will open) are shown in **Table 4.2**. The data show that annual mean pollutant concentrations are not expected to exceed the annual mean NO₂, PM₁₀ or PM_{2.5} AQOs in any of the presented years.

Table 4.2 Background pollutant concentrations at the Proposed Development from the UK-AIR website

Pollutant	2022 (µg/m ³)	2025 (µg/m ³)	AQO / Limit Value
NO ₂	18.5	16.8	40
PM ₁₀	12.4	12.0	40
PM _{2.5}	8.2	8.0	20

4.5 Outline of Baseline Conditions at Site

Whilst exceedances of the 24-hour mean PM₁₀ objective greater than 50µg/m³ were experienced at the Manchester Oxford Road continuous monitor, this is located approximately 1.5km north-west of the Site, in the busy city centre, where air quality is expected to be considerably worse than conditions experienced at the Site. This, in addition to the background pollution concentrations being significantly below the AQO / limit values, suggests that based on the monitored and estimated background data presented above, it is considered that the Proposed Development site is located in an area where the PM₁₀ and PM_{2.5} AQOs are unlikely to be exceeded.

Data collected by MCC indicate that annual mean NO₂ concentrations may exceed in the vicinity of A roads local to the Proposed Development site, including the A6 Ardwick Green South. Diffusion tubes MA96BNO, CAP_MANC_005, CAP_MANC_168, located along the A6 Ardwick Green South, experienced annual mean NO₂ concentrations in excess of the AQO (43.5µg/m³, 54.9µg/m³ and 41.9µg/m³ respectively) during 2022, the latest year for which representative monitoring data are available. Whilst these monitors are located approximately 600m to the north-west of the Site, they are located along a busy A road, providing access to Manchester City Centre. As pollutant concentrations tend to disperse and dilute with distance from the road, it is considered

²¹ Department for Environment, Food and Rural Affairs, 2020. UK Air Information Resource. [online] Available at: <http://uk-air.defra.gov.uk>. Accessed on 17th August 2023

likely that annual mean NO₂ concentrations at the Proposed Development site will be lower than those recorded at these monitoring locations.

Emissions of NO_x, PM₁₀ and PM_{2.5} from vehicles are expected to decrease with time, as newer, less polluting vehicles replace older ones using local roads (although PM₁₀ and PM_{2.5} concentrations will eventually level off). As such, air quality by the Proposed Development's opening year (for the year of first occupation) is generally expected to comply with all five AQOs at and around the Site.

5. Construction Phase Assessment

5.1 Construction Dust

The dust emission magnitudes for each of the four construction related activities (demolition, earthworks, construction and trackout) are informed by the types of construction related activities expected to take place at the Proposed Development site. These comprise:

- Demolition: the current site that has Coverdale Crescent to the north and Devonshire Street to the west is unused land with vegetation and trees located on the west site. Therefore, there would be no demolition expected as part of the construction work;
- Earthworks: this stage would include the soil-stripping from the open land, ground levelling, defining the site access locations, excavation and landscaping ready for the next stage of construction;
- Construction: the residential units being constructed, the services being integrated, the buildings being constructed, insulated, tiled, windows and doors inserted and internal fit out. The later stages include the final layer of the access road, car parking spaces and landscaping.
- Trackout: According to the IAQM 2023 guidance, trackout is defined as *'The transport of dust and dirt from the construction/ demolition site when HDVs leave the site (having travelled over muddy ground) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.'*

Potential dust emission magnitudes from each of the construction related activities has been assessed using the IAQM 2023 guidance criteria (described in **Appendix B**) and are detailed in **Table 5.1**.

Table 5.1 Dust Emission Magnitudes

Type of work	Description of site characteristics with reference to IAQM 2023 guidance	Dust emissions magnitude
Demolition	The site is currently open undeveloped land. Therefore, demolition will not be undertaken.	N/A
Earthworks	The total site is 5.05 acres which is greater than 18,000m ² Anticipated <5 heavy earth moving vehicles will be active at any one time Stockpiles anticipated to be <3m in height Earthworks may be expected at all times of the year	Medium

Type of work	Description of site characteristics with reference to IAQM 2023 guidance	Dust emissions magnitude
Construction	An average terraced house is 688 square foot ²² is 64m ² . Multiplied by the anticipated 24 number of residential units gives a total area of 1,536m ² and if each house is approximately 8m tall then the total construction volume would be 12,888m ³ . This is in the medium dust emission category as the total volume is >12,000m ³ . Concrete may be used and on-site concrete batching may take place.	Medium
Trackout	Heavy Good Vehicles (HGVs) will travel over <50m of unpaved ground on site. <20 HDV outward movements from site expected on any one day	Small

Step 2B: Define sensitivity of the area

Using the IAQM 2023 guidance process outlined in **Appendix B**, the sensitivity of the surrounding area was determined. This is shown in **Table 5.2**.

Table 5.2 Sensitivity of the surrounding area

Type of work	Demolition	Earthworks	Construction	Trackout
Dust soiling	N/A	High: 10-100 high sensitivity receptors located at Tesito House and on Polebrook Avenue within 20m of site boundary	High: 10-100 high sensitivity receptors located at Tesito House and on Polebrook Avenue within 20m of site boundary	High: 10-100 high sensitivity receptors located at Tesito House and on Polebrook Avenue within 20m of site boundary
Human health impacts	N/A	Low: 10-100 high sensitivity receptors within 20m of the site boundary located at Tesito House and on Polebrook Avenue and annual mean PM ₁₀ concentrations are likely to be below 24µg/m ³ the vicinity of the Application Site.	Low: 10-100 high sensitivity receptors within 20m of the site boundary located at Tesito House and on Polebrook Avenue and annual mean PM ₁₀ concentrations are likely to be below 24µg/m ³ the vicinity of the Application Site.	Low: 10 - 100 high sensitivity receptors within 50m of the roads used by construction traffic PM ₁₀ concentrations are likely to be below 24µg/m ³ the vicinity of the Application Site.

²² From website [The average house sizes & square footage in the UK | DWH](#) accessed on 17th August 2023

Ecological	Negligible: According to the MAGIC Maps website, there are no SACs, SPAs, Ramsar sites, SSSIs, National Nature Reserves or Ancient Woodlands within 50m of the Proposed Development site or routes along which trackout could arise. It is therefore assumed that there are no species sensitive to the impacts of dust deposition within the vicinity of the Proposed Development site.
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Step 2C: Define the risk of dust impacts

Using the IAQM 2023 guidance process outlined in **Appendix B**, the risk of dust impacts derived from the different on-site activities is shown in **Table 5.3**.

Table 5.3 Summary of the dust risk from site activities

Potential Impact	Dust Risk Summary			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium risk	Medium risk	Low risk
Health Effects	N/A	Low risk	Low risk	Negligible risk
Ecological	Negligible Risk – none expected			

The overall dust risk from the Proposed Development site is predicted to be a maximum of medium, in connection with dust soiling risks attributable to earthworks. Therefore, in the absence of mitigation, effects on air quality are assessed as significant. Mitigation measures will help to negate some of the potential negative air quality impacts resulting from fugitive dust attributable to construction related activities and will avoid significant dust effects. This is further discussed in the mitigation section.

6. Operational Phase Assessment

6.1 Cumulative Schemes

Following a review of the significant planning applications on the MCC planning portal, Temple found that the only site which would potentially have an impact on the Proposed Development would be the Brunswick Road Masterplan (Planning Reference 101664/FO/2013/N2). This consists of selective demolition and clearance to allow for a phased redevelopment and refurbishment of the Brunswick Neighbourhood, including the erection of 444 new residential dwellings (C3), the refurbishment of 839 existing homes, mixed use residential extra care home with 60 residential units, and a day care centre on part of the ground floor, upgrading of Gartside Gardens, a new orchard, 25 new allotments with associated infrastructure landscaping and tree planting. However, the traffic data used in the Environmental Statement air quality chapter did not correlate with any of the road links used in S2 and S3 and subsequently was not included in the modelling assessment.

6.2 Impacts of the Development

Air quality effects attributable to emissions from road traffic associated with the Proposed Development during operational phase was assessed.

Table 6.1 presents the predicted annual mean NO₂ concentrations at each of the existing receptors for S2 and S3. It also shows the percentage change in pollutant concentrations (with the Proposed Development in place) relative to the AQAL (i.e. the annual mean AQO) in S2 and S3, the S3 pollutant concentration as a percentage of the AQAL, and the assigned EPUK-IAQM guidance descriptor.

The Proposed Development would not expose any of the modelled existing receptors to NO₂ in concentrations breaching the annual mean AQO.

The largest change in annual mean NO₂ concentrations was <0.1 µg/m³ (<0.5% increase relative to the AQO). As per the EPUK-IAQM guidance assessment method, the impact of the Proposed Development on air quality was assessed as negligible at the modelled receptors.

None of the existing receptors modelled are exposed to annual mean NO₂ concentrations exceeding 60 µg/m³ with the Proposed Development in place, either without or with the Proposed Development. Therefore, in accordance with TG22, the potential for the Proposed Development to lead to hourly mean NO₂ AQOs being breached has been screened out.

Table 6.1: Estimated 2025 annual mean NO₂ (µg/m³) at modelled existing receptors (Operational phase) in S2 and S3 and assessment of impact magnitude in accordance with the EPUK-IAQM guidance method

Receptor ID	Predicted annual mean concentration (µg/m ³)		Percentage change in concentration relative to AQUAL	% of AQUAL	EPUK-IAQM Impact descriptor
	S2 Without Development	S3 With Development			
R1	23.9	23.9	<0.5	59.7	Negligible
R2	23.1	23.1	<0.5	57.7	Negligible
R3	21.6	21.6	<0.5	54.0	Negligible
R4	24.1	24.1	<0.5	60.2	Negligible
R5	27.9	27.9	<0.5	69.8	Negligible

Table 6.2 presents the predicted annual mean PM₁₀ concentrations at each of the existing receptor locations to which the annual mean AQOs should be applied in S2 and S3. It also shows the percentage change in pollutant concentrations (with the Proposed Development in place) relative to the AQUAL (i.e. the annual mean PM₁₀ AQO) in S2 and S3, the S3 pollutant concentration as a percentage of the AQUAL, and the assigned EPUK-IAQM guidance descriptor.

The predicted pollutant concentrations suggest that the Proposed Development would not expose any of the modelled existing annual mean sensitive receptors to concentrations in excess of the annual mean AQO.

The largest change in annual mean concentrations was <0.1µg/m³ (<0.5% increase relative to the AQO). As per the EPUK-IAQM guidance assessment method, the impact of the Proposed Development on air quality was assessed as negligible at the modelled receptors sensitive to changes in annual mean PM₁₀ concentrations.

The largest concentration was below the ~31µg/m³ annual mean PM₁₀ concentration, meaning that the 50µg/m³ 24-hour mean AQO threshold is unlikely to be exceeded on more than the 35 occasions permissible per annum.

Table 6.2 Estimated annual mean PM₁₀ (µg/m³) at modelled existing receptors (Operational phase) in S2 and S3 and assessment of impact magnitude in accordance with the EPUK-IAQM guidance method

Receptor ID	Predicted annual mean concentration (µg/m ³)		Percentage change in concentration relative to AQUAL	% of AQUAL	EPUK-IAQM Impact descriptor
	S2 Without Development	S3 With Development			
R1	14.0	14.0	<0.5	35.0	Negligible
R2	13.7	13.7	<0.5	34.2	Negligible

R3	13.5	13.5	<0.5	33.9	Negligible
R4	13.9	13.9	<0.5	34.9	Negligible
R5	15.3	15.3	<0.5	38.2	Negligible

Emissions of PM₁₀ from vehicles are expected to decrease with time, as newer, less polluting vehicles replace older ones using local roads (although concentrations will eventually level off). As such, air quality by the Proposed Development's opening year (for the year of first occupation) is generally expected to comply with the PM₁₀ AQOs at and around the Site.

Table 6.3 presents the predicted annual mean PM_{2.5} concentrations at each of the existing receptor locations to which the annual mean AQOs should be applied in S2 and S3. It also shows the percentage change in pollutant concentrations (with the Proposed Development in place) relative to the AQAL (i.e. the annual mean PM_{2.5} AQO), the S3 pollutant concentration as a percentage of the AQAL, and the assigned EPUK-IAQM guidance descriptor.

The predicted pollutant concentrations suggest that the Proposed Development would not expose any of the modelled existing annual mean sensitive receptors to concentrations in excess of the annual mean AQO.

The largest change in annual mean concentrations was <0.1 µg/m³ (<0.5% increase relative to the AQO). As per the EPUK-IAQM guidance assessment method, the impact of the Proposed Development on air quality was assessed as negligible at the relevant modelled receptors.

Table 6.3 Estimated annual mean PM_{2.5} (µg/m³) at modelled existing receptors (Operational phase) in S2 and S3 and assessment of impact magnitude in accordance with the EPUK-IAQM guidance method

Receptor ID	Predicted annual mean concentration (µg/m ³)		Percentage change in concentration relative to AQAL	% of AQAL	EPUK-IAQM Impact descriptor
	S2 Without Development	S3 With Development			
R1	9.0	9.0	<0.5	45.1	Negligible
R2	8.8	8.8	<0.5	44.2	Negligible
R3	8.8	8.8	<0.5	43.8	Negligible
R4	9.0	9.0	<0.5	44.9	Negligible
R5	9.7	9.7	<0.5	48.3	Negligible

Significance assessment

Based on the EPUK-IAQM guidance, the change in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations associated with operation of the Proposed Development results in the air quality impact being classified as negligible for all modelled receptors. Moreover, the Proposed Development does not expose any additional existing receptors to concentrations of the hourly mean NO₂ or 24-hour mean AQOs exceeding the AQO where they were not predicted to without the Proposed Development in place.

For these reasons, the effect of road traffic associated with operation of the Proposed Development on local air quality is therefore considered to be not significant.

6.3 Impacts on future receptors introduced by the Proposed Development

The results of the modelling and the impact of the completed and operational Proposed Development on NO₂, PM₁₀ and PM_{2.5} concentrations at each modelled Proposed Receptor (PR) are presented in **Table 6.4**

Table 6.4 shows that the annual mean NO₂ AQO was also below 60µg/m³ at all of the modelled receptor locations, indicating that the hourly mean NO₂ AQO is unlikely to be exceeded at the Proposed Development site.

It also shows that the on-site modelled pollution concentrations are all well below the annual mean NO₂, PM₁₀ and PM_{2.5} AQOs. The largest concentration was below the ~31µg/m³ annual mean PM₁₀ concentration which can be expected prior to the 50µg/m³ 24-hour mean AQO threshold being exceeded on more than the 35 occasions permissible per annum.

For these reasons, air quality at the Site is expected to be acceptable.

Table 6.4 Concentrations of NO₂, PM₁₀ and PM_{2.5} at New Receptors for S3

Receptor ID	Height (m)	S3 With Proposed Development 2025			
		Annual mean NO ₂	Annual mean PM ₁₀	Annual mean PM _{2.5}	No. days per annum where daily mean PM ₁₀ AQO exceeded
PR1	1.5	23.2	14.0	9.0	0
PR2	1.5	19.8	12.9	8.4	0
PR3	1.5	19.1	12.7	8.3	0
PR4	1.5	19.0	12.7	8.3	0
PR5	1.5	18.9	12.7	8.3	0
PR6	1.5	19.9	12.9	8.4	0
PR7	1.5	24.6	14.4	9.2	0
PR8	1.5	24.4	14.4	9.2	0

7. Mitigation

7.1 Construction Dust

Under best practice guidance, the Proposed Development will constitute a maximum of medium risk for construction dust. The use of appropriate mitigation measures throughout the construction period will ensure that impacts to sensitive receptors are minimised.

The following is a set of best-practice measures from the IAQM 2023 guidance that should be incorporated into the specification for the works. These measures should ideally be written into a Dust Management Plan (DMP), Construction Environmental Management Plan (CEMP) or similar, which can be done at the post-consent stage. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the DMP. Provided these measures (or suitable alternatives agreed via the DMP or with the local authority) are put in place, emissions from the site during construction are not expected to have a significant effect on receptors. The measures in italics are classified as desirable in the IAQM 2023 guidance, the others being highly recommended.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.*
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Proposed Development Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicles/machinery and sustainable travel

- Maintain non-road mobile machinery (NRMM) to relevant standards.
- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel- or petrol- powered generators and use mains electricity or battery powered equipment where practicable.
- *Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas.*
- *Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).*

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.

- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- *Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. Measure should be sufficient to prevent dust generation.*
- *Use Hessian, mulches or trackifiers where it is not possible to cover, seed and/or fence stockpiles sufficiently, as soon as practicable.*
- *Only remove the cover in small areas during work and not all at once.*

Measures Specific to Construction

- *Avoid scabbling (roughening of concrete surfaces) if possible.*
- Ensure sand and other aggregate are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- *Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.*
- *For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.*

Measures Specific to Trackout

- *Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.*
- *Avoid dry sweeping of large areas.*
- *Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.*
- *Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).*

With the proposed construction activities mitigation measures as described in place, the likely residual impact of dust connected to works undertaken during the construction phase on local air quality can be considered as 'not significant'.

The Client could consider implementing a Construction Logistics Plan to manage the sustainable delivery of goods and materials (including measures to reduce the number of HGVs required during the construction programme, implementing a Travel Plan which supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)) and/or providing or signposting nearby electric vehicle charge points for construction workers. Information on nearby car clubs, public transport routes and electric vehicle charge points could be signposted using a billboard at Site and measures implemented during site inductions.

7.2 Operational Phase

The Proposed Development is not expected to have significant adverse effects on air quality. As such, no mitigation is considered to be required for the operational phase of the Proposed Development.

The Manchester Air Quality and Planning Guidance also includes examples of approaches that can be undertaken to reduce operational phase emissions and impacts, including:

- Electric Vehicle (EV) charge points, either 1 EV charge point (minimum 7kW²³) for each dwelling or a minimum of 20% EV (minimum 7kW) charge points for unallocated parking, and cable routes for all other spaces; and
- Implementation of a Travel Plan.

Whilst final details of the Proposed Development are not yet available, based on discussions with the Client and the scale and nature of the Proposed Development, these additional measures are expected to be considered.

Mitigating effects of air quality on future site users

The Proposed Development is not expected to introduce receptors into an area of poor ambient air quality and as such no mitigation has been recommended, beyond those outlined above.

²³ Mode 3, 7kW (32A) single phase, or 22kW (32A) three phase, and for 50kW Mode 4 rapid charging may be required. See British Standard BS EN 61851-1:2019

8. Conclusions

The air quality assessment has determined the following:

- The dust risk assessment has identified that construction activities pose up to a medium risk of causing loss of amenity, a low risk of impacting upon human health, and a negligible risk at ecological receptors. However, with the implementation of the mitigation measures detailed in the relevant section of this report, the activities are not anticipated to result in significant effects on local receptors.
- The assessment of air quality in relation to roads during the operational stage has determined that there will be a negligible impact on air quality at nearby existing sensitive receptors and therefore its effect will not be significant. Mitigation measures have been recommended to ensure the air quality effects remain negligible.
- The assessment in relation to the road traffic has determined that future receptors within the Proposed Development will not expose future Site users to poor ambient air quality.

Appendix A Figures

Job Title **Coverdale Crescent, Manchester**

Temple Job No. T10050

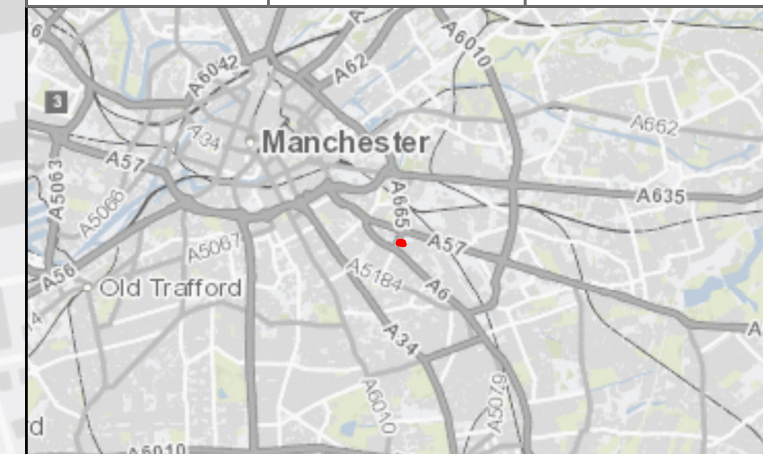
Client **Eden Planning**

Map Title **Air Quality Study Area**

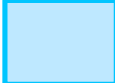
Figure Title **Figure A.1**

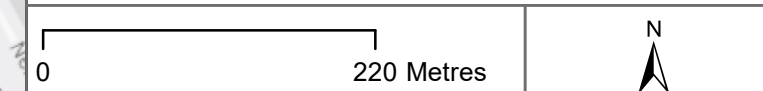
Section **N/A** Scale **1:5,000**

Drawn **HP** Approved **DM** Date **07/12/2023**



Legend

-  Site Boundary
-  Modelled Road Network
-  Manchester AQMA Boundary
-  Manchester City Council Diffusion Tube Locations
-  Existing Receptor Locations
-  Propsed Receptor Locations
-  Model Verification Diffusion Tubes



Appendix B Construction Phase Assessment

Construction Phase Dust Assessment Methodology

The qualitative construction dust and PM₁₀ risk assessment method outlined in the IAQM 2023 guidance is summarised below.

Step 1: Identify the need for a detailed assessment

An assessment would normally be required where there is:

- A human receptor within 250 metres of the boundary of the proposed scheme; and/or within 50 metres of the access route(s) used by the construction vehicles on the public highway up to 250 metres from the study area site entrance(s); and/or
- An ecological receptor within 50 metres of the proposed scheme and/or within 50 metres of the access route(s) used by construction vehicles on the public highway up to 250 metres from the entrance(s).

A human receptor refers to any location where a person or property may experience the adverse effects of airborne dust or dust-soiling, or exposure to PM₁₀ over a period relevant to the ambient AQOs.

An ecological receptor refers to any sensitive habitat affected by dust soiling. For locations with a statutory designation, such as a National Nature Reserve, Ramsar site, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) or Special Protection Areas (SPA), consideration should be given as to whether the particular site is sensitive to dust. Some non-statutory sites may also be considered if appropriate, such as a Site of Importance for Nature Conservation.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is 'negligible' and any effects would be 'not significant'.

Step 2: Assess the risk of dust impacts

A site is allocated a risk category on the basis of the scale and nature of the works (Step 2A) and the sensitivity of the area to dust impacts (Step 2B). These two factors are combined in Step 2C to determine the risk of dust impacts before the allocation of mitigation measures. Risks are described as low, medium or high for each of the four separate activities (demolition, construction, earthworks and trackout). Site-specific mitigation is required, proportionate to the level of risk.

Step 2A: Define the potential dust emission magnitude

The potential dust emission magnitude is based on the scale of the anticipated works and should be classified as small, medium or large. **Table B.1** presents the dust emission criteria outlined for each construction activity.

Table B.1: Potential dust emission magnitude criteria

Construction activity	Large	Medium	Small
Demolition	Total building volume >75,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level.	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material, demolition activities 6-12 m above ground level.	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months.
Earthworks	Total site area >110,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.	Total site area 18,000 m ² – 110,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3 m – 6 m in height.	Total site area <18,000 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height.
Construction	Total building volume >75,000 m ³ , on site concrete batching, sandblasting.	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	>50 HDV (>3.5 t) outward movements ^a in any one day ^b , potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	20-50 HDV (>3.5 t) outward movements ^a in any one day ^b , moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.	<20 HDV (>3.5 t) outward movements ^a in any one day ^b , surface material with low potential for dust release, unpaved road length <50 m.

a. A vehicle movement is a one way journey. i.e. from A to B and excludes the return journey.

b. HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.

Step 2B Define the sensitivity of the area

The sensitivity of the area is described as low, medium or high. It takes into account a number of factors:

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

Table B.2 presents indicative examples of classification groups for the varying sensitivities of people to dust soiling effects and to the health effects of PM₁₀; and the sensitivities of receptors to ecological effects. A judgement is made at the site-specific level where sensitivities may be higher or lower, for example a soft fruit business may be more sensitive to soiling than an alternative industry in the same location. Box 6, Box 7 and Box 8 within the IAQM 2023 guidance outlines more detailed information on defining sensitivity.

Table B.2: Indicative examples of the sensitivity of different types of receptors

Sensitivity of receptor	Sensitivities of people and ecological receptors		
	Dust soiling effects ^a	Health effects of PM ₁₀ ^b	Ecological effects ^c
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.	Residential properties, hospitals, schools and residential care homes.	Locations with an international or national designation and the designated features may be affected by dust soiling (e.g. SAC/SPA/Ramsar). Locations where there is a community of a species particularly sensitive to dust such as vascular species included in the Red Data list for Great Britain.
Medium	Parks, places of work.	Office and shop workers not occupationally exposed to PM ₁₀ .	Locations where there is a particularly important plant species, where dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition (e.g. SSSIs).
Low	Playing fields, farmland (unless commercially-sensitive horticultural),	Public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition (e.g. Local Nature Reserves).

	footpaths, short-term car parks and roads.		
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- People's expectations would vary depending on the existing dust deposition in the area.
- This follows the Department for Environment, Food and Rural Affairs (Defra, 2016) guidance as set out in Local Air Quality Management Technical Guidance (LAQM.TG (16)). Notwithstanding the fact that the ambient AQOs and limit values do not apply to people in the workplace, such people can be affected to exposure of PM₁₀. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.
- Only if there are habitats that might be sensitive to dust. A Habitat Regulation Assessment of the site may be required as part of the planning process if the site lies close to an internationally designated site i.e. SACs, SPAs and Ramsar sites.

The IAQM 2023 guidance advises consideration of the risk associated with the nearest receptors to construction activities.

The sensitivity and distance of receptors from the source of dust (i.e. demolition activities, earthworks, etc.) are then used to determine the potential dust risk for each dust effect for each construction activity as shown in **Table B.3**, **Table B.4** and **Table B.5**. It is noted that distances are to the dust source and so a different area may be affected by trackout than by on-site works.

For trackout, the distances should be measured from the side of the roads used by construction HDVs. Without site specific mitigation, trackout may occur from roads up to 500 metres from large sites, 200 metres from medium sites and 50 metres from small sites, as measured from the site exit. The impact declines with distance from the site. It is only necessary to consider trackout impacts up to 50 metres from the edge of the road.

Table B.3: Sensitivity of the area to dust soiling effects on people and property ^a

Receptor area sensitivity	Number of Receptors ^b	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Low	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

- Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 metres of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 metres is 102. The sensitivity of the area in this case would be high.
- Exact counting of number of human receptors not required. It is instead recommended that judgement is used to determine the approximate number of receptors within each distance band. For example, a residential unit is one receptor. For receptors which are not dwellings, professional judgement should be used to determine the number of human receptors. For example a school or hospital is likely to be within the >100 receptor category.

Table B.4: Sensitivity of the area to human health impacts^{a b c}

Receptor sensitivity	Annual Mean PM ₁₀ Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

- Estimate the total within the stated distance (e.g. the total within 350 metres and not the number between 200 and 350 m), noting that only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 metres of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 metres is 102. If the annual mean PM₁₀ concentration is 29 µg/m³, the sensitivity of the area would be high.
- Annual mean PM₁₀ concentrations are most straightforwardly taken from the national background maps but should also take account of local sources. The values are based on 32 µg/m³ being the annual mean concentration at which an exceedance of the 24-hour objective is likely in England, Wales and Northern Ireland.
- In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, simply include the number of properties.

Table B.5: Sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from the Source (m) ^a	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

a. Only the highest level of area sensitivity from the table needs to be considered.

Step 2C Define the risk of impacts

The dust emission magnitude is then combined with the sensitivity of the area to determine the overall risk of impacts with no mitigation measures applied. The matrices in **Table B-6** provide a method of assigning the level of risk for each activity. These can then be used to determine the level of mitigation that is required.

Table B.6: Risks of dust impacts

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

Step 3 Site-specific mitigation

Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low-, medium- or high-risk site. The highest risk category of a site (of all activities being undertaken) is recommended when considering appropriate mitigation measures for the site. Where risk is assigned as 'negligible', no mitigation measures beyond those required by legislation are required. However, additional mitigation measures may be applied as good practice.

A selection of these measures is specified as suitable to mitigate dust emissions from activities, based on professional judgement.

Step 4 Determine significant effects

Following Step 2 (definition of the proposed scheme and the surroundings and identification of the risk of dust effects occurring for each activity), and Step 3 (identification of appropriate site-specific mitigation), the significance of the potential dust effects can be determined. The recommended mitigation measures should normally be sufficient to reduce construction dust impacts to a not significant effect.

The approach in Step 4 of the IAQM dust assessment guidance has been adopted to determine the significance of effects with regard to dust emissions. The guidance states the following:

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

IAQM guidance also states that:

'Even with a rigorous DMP [Dust Management Plan] in place, it is not possible to guarantee that the dust mitigation measures will be effective all the time, and if, for example, dust emissions occur under adverse weather conditions, or there is an interruption to the water supply used for dust suppression, the local community may experience occasional, short-term dust annoyance. The likely scale of this would not normally be considered sufficient to change the conclusion that with mitigation the effects will be 'not significant'.'

Step 4 of IAQM guidance recognises that the key to the above approach is that it assumes that the regulators ensure that the proposed mitigation measures are implemented. The management plan would include the necessary systems and procedures to facilitate on-going checking by the regulators to ensure that mitigation is being delivered, and that it is effective in reducing any residual effect to 'not significant' in line with the guidance.

Appendix C Detailed Dispersion Modelling Assessment Method

Modelling software

The ADMS-Roads Extra detailed dispersion model (version 5) was used to assess direct effects from the additional traffic on local air quality during 2025, the year the Proposed Development will open. The site will be fully electric so there has been no assessment of combustion plant.

The ADMS-Roads model considers the key variables that influence pollutant emission and dispersion (meteorology, surface roughness, diurnal traffic flows, predicted future traffic mixes and predicted future engine emission standard mixes). Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted at a number of locations in the vicinity of the Proposed Development and at the Site itself. The receptors chosen include those that are representative of worst-case exposure locations within the modelled study area.

Assessment scenarios

Predictions of NO₂, PM₁₀ and PM_{2.5} were made for the following scenarios:

- S1: Baseline 2022: base year;
- S2: Future baseline (2025), without the Proposed Development in place; and
- S3: Future baseline (2025) with the Proposed Development in place;

Traffic Data

The AADT and percentage of heavy-duty vehicles (%HDVs) for the local roads of interest were obtained from the Department for Transport traffic counts (year 2022), considered suitable by the transport consultants for the scheme, SK Transport Planning. Vehicle speeds were from Google Streetview and professional judgement.

For S2 and S3, the S1 traffic flows were multiplied by the Temprow growth factor (1.0327, sourced from SK Transport Planning Limited). For a conservative assessment, it was assumed that the additional 39 vehicles generated by the Site have been added onto every modelled road.

Table C.1 summarises the information used within the assessment (AADT, %HDVs and speed). The roads included in the dispersion modelling assessment are also presented in **Figure A.1** in **Appendix A**.

Table C.1: Traffic Data for S1, S2 and S3

Link ID	Road name	S1 2022 base year		S2 (Without Development) 2025		S3 (With Development) 2025		Speed (km/h)
		AADT	%HDV	AADT	%HDV	AADT	%HDV	
1	Coverdale Crescent Junction	0	0.00	0	0.00	39	5.13	10
2	Coverdale Crescent	0	0.00	0	0.00	39	5.13	25
3	Devonshire Street Junction (South)	11,777	1.87	12,162	1.87	12,201	1.88	10
4	Devonshire Street	11,777	1.87	12,162	1.87	12,201	1.88	25
5	Devonshire Street Junction (North)	11,777	1.87	12,162	1.87	12,201	1.88	10
6	A57 Slip onto Devonshire Street	6,825	6.01	7,048	6.01	7,087	6.01	10
7	Hyde Road near Devonshire Street (EB)	6,825	6.01	7,048	6.01	7,068	6.01	25
8	Hyde Road near Devonshire Street (WB)	6,825	6.01	7,048	6.01	7,068	6.01	25
9	Hyde Road (East) near Devonshire Street Junction	13,650	12.01	14,096	12.01	14,135	11.99	15
10	Hyde Road (East)	13,650	12.01	14,096	12.01	14,135	11.99	30
12	Hyde Road (West) near Devonshire Street junction	13,650	12.01	14,096	12.01	14,135	11.99	15
13	Hyde Road (West)	13,650	12.01	14,096	12.01	14,135	11.99	30
14	Hyde Road (West) near roundabout junction	13,650	12.01	14,096	12.01	14,135	11.99	10
15	Hyde Road / Ardwick Green South Roundabout	12,705	9.30	13,120	9.30	13,159	9.29	10
16	Ardwick Green South (WB) Junction	10,877	4.13	11,232	4.13	11,252	4.12	10
17	Ardwick Green South (WB)	10,877	4.13	11,232	4.13	11,252	4.12	25
18	Ardwick Green South (EB)	10,877	4.13	11,232	4.13	11,252	4.12	10
19	Ardwick Green South (EB) Junction	10,877	4.13	11,232	4.13	11,252	4.12	25
20	Site Access	0	0.00	0	0.00	39	5.13	15
21	Devonshire Street North Junction	12,956	2.06	13,380	2.06	13,419	2.07	15
22	Devonshire Street North	12,956	2.06	13,380	2.06	13,419	2.07	30
23	Stockport Road Junction	14,281	3.54	14,748	3.54	14,787	3.54	15
24	Stockport Road	14,281	3.54	14,748	3.54	14,787	3.54	30
25	A6 Stockport Road Junction	9,486	5.05	9,796	5.05	9,835	5.05	15

Link ID	Road name	S1 2022 base year		S2 (Without Development) 2025		S3 (With Development) 2025		Speed (km/h)
		AADT	%HDV	AADT	%HDV	AADT	%HDV	
26	A6 Stockport Road	9,486	5.05	9,796	5.05	9,835	5.05	30

Vehicle Emissions Factors

The ADMS-Roads model assesses the volume of pollutants generated along each stretch of modelled road based on inputted 'emissions factors' (g/km/s).

Defra's emissions factors toolkit²⁴ was used to determine the emissions of NO_x, PM₁₀ and PM_{2.5} from operational traffic along the affected links. The Urban (Not London) setting was selected for each road link modelled and with reference to the 'Emissions Factors Toolkit v12.0 User Guide'.²⁵

The 2022 emission year was used for S1 baseline, and 2025 emission year was used for the future scenarios (scenarios 2 and 3).

Modelled Receptors

Sensitive existing receptors were selected at a range of locations (including worst-case ones) where members of the public are expected to be present and potentially regularly exposed to air pollutants. In addition, receptors were selected at the Proposed Development site boundary to assess whether future users may be exposed to poor ambient air quality when the Proposed Development is operational. It is anticipated that the facades of the dwellings within the Proposed Development will be further set back from the road than the site boundary (although a layout plan was not available at the time of writing), and as such this method is considered to be conservative.

The assessment has assumed that all receptors at ground floor level are elevated to 1.5m above ground level, to represent the average breathing height for a human.

Existing and future (new) sensitive receptors modelled are shown in **Figure A.1** in **Appendix A** and detailed in **Table C.2**.

²⁴ Defra. 2023a. Emissions Factors Toolkit version 12.0. Date accessed: 6th December 2023

²⁵ Defra, 2023b. Emissions Factors Toolkit v12.0 User Guide.

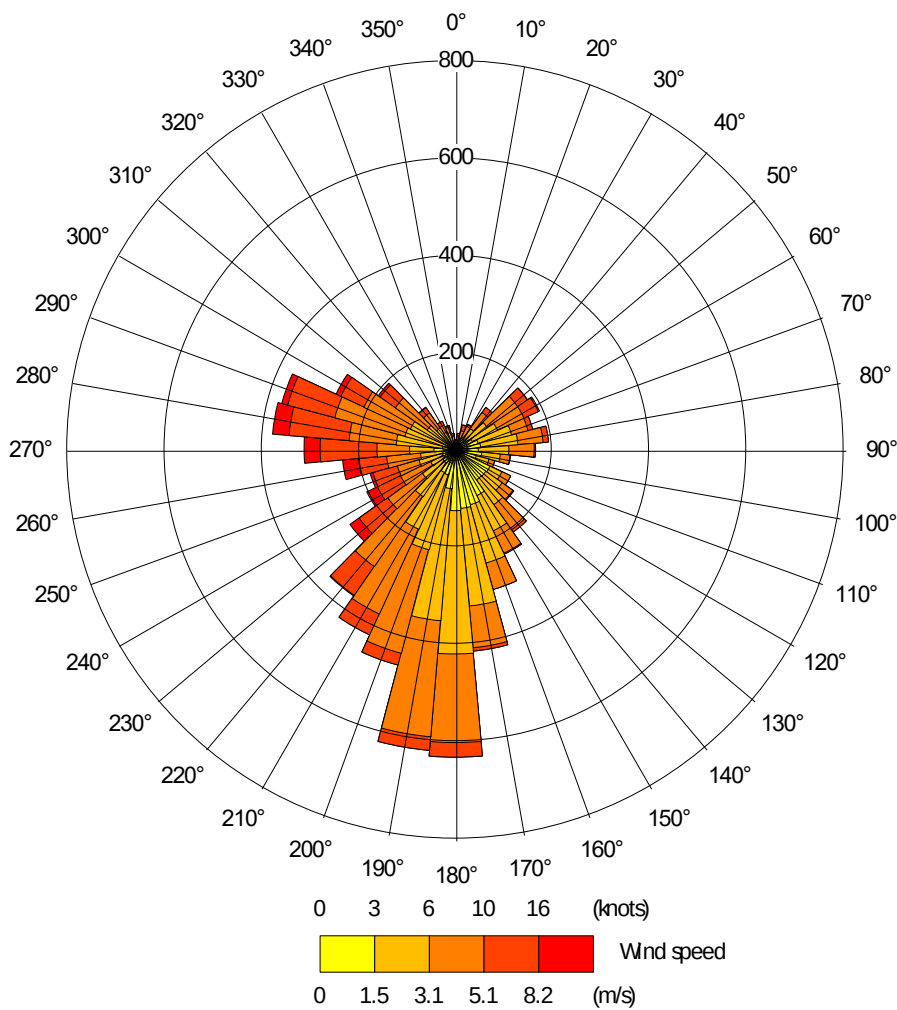
Table C.2: Receptors included in construction traffic air pollutant dispersion modelling

Receptor number	Receptor description	Coordinates		Height (m)
		x (m)	y (m)	
R1	Devonshire House Care Home	385711.0	396692.0	1.5
R2	119 Devonshire Street South	385659.0	396680.0	1.5
R3	Winifred Massey Court	385751.0	396668.0	1.5
R4	Early Explorers Day Nursery	385838.0	396887.0	1.5
R5	Manchester Nicholls College	385755.0	396957.0	1.5
PR1	Proposed Receptor (Site Boundary)	385728.0	396779.0	1.5
PR2		385757.0	396771.0	1.5
PR3		385779.0	396768.0	1.5
PR4		385782.0	396753.0	1.5
PR5		385786.0	396735.0	1.5
PR6		385748.0	396741.0	1.5
PR7		385713.0	396751.0	1.5

Meteorological data

This study used 2022 meteorological data from Manchester Airport, which is considered a suitable, representative site. The wind rose (showing the wind direction and speed) for each year of meteorological data used are set out in **Figure C.1**.

Figure C.1: Wind rose from the Manchester Airport meteorological station during 2022



Background Concentrations

The total concentration of a pollutant comprises those from the modelled local emission sources and background pollutant concentrations, which are transported into an area by the wind from further away.

The concentration applicable to the assessed year and 1km² grid within which each receptor is located has been applied.

The annual mean NO₂, PM₁₀ and PM_{2.5} concentrations applied at each of the receptor locations is shown in **Table C.3**.

Table C.3: Background annual mean NO₂, PM₁₀ and PM_{2.5} concentrations applied at each of the modelled receptor locations

Scenario	1km ² grid square	NO ₂ (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
S1 (2022)	385500, 396500	18.5	12.4	8.2
S2 + S3 (2025)	385500, 396500	16.8	12.0	8.0

Summary of Additional Model Inputs

A summary of the additional parameters considered in the dispersion modelling study are outlined in **Table C.4** below.

Table C.4: Summary of additional model input parameters

Parameter	Input into model
Road elevation	No terrain file used.
Road width	Road widths determined based on approximate measurement of roads using online measurement tools.
Canyon heights	No street canyons modelled.
Surface roughness	A value of 1.5 at the dispersion site and 0.5 at the meteorological site.
Monin-Obukhov length	Assumed to be 100m at the site (representative of large conurbations). Was set to 30m at meteorological data site.

Post-processing of results

At each receptor, the following method was used to estimate total annual mean pollutant concentrations:

- Modelled road NO_x, PM₁₀ and PM_{2.5} concentrations were adjusted (as part of model verification, described below);
- The road source NO₂ at each receptor was estimated from the modelled NO_x concentration using version 8.1 of the NO_x to NO₂ calculator; and,
- Adjusted annual mean road NO₂, PM₁₀ and PM_{2.5} concentrations were added to the applicable background, shown in **Table C.3**.

According to the EPUK-IAQM guidance, the 24-hour mean PM₁₀ AQO will not be exceeded unless the annual mean PM₁₀ AQO exceeds ~31µg/m³. TG22 indicates that exceedances of the hourly mean NO₂ AQO should not be excepted if annual mean NO₂ concentrations are below 60µg/m³. These criteria have been used to determine whether the Proposed Development is likely to expose receptors into an area where the relevant short-term AQOs may be exceeded.

Model verification

Model verification refers to checks that are carried out on model performance in relation to roads modelling at a local level. Modelled concentrations are compared with the results of local monitoring and, where there is a disparity between modelled and monitored concentrations, an adjustment may be applied to the final model output.

Model verification for NO₂ was undertaken for this assessment using 2022 data monitored at diffusion tubes MA96BNO, CAPMANC168, CAPMANC005 and CAPMANC169. These monitoring locations were selected as they are the nearest 'roadside' monitoring sites to the Proposed Development site.

Model verification for PM₁₀ and PM_{2.5} was undertaken using the NO_x verification factor. This approach is recommended in TG22 where there are no suitable 'roadside' verification sites within the vicinity of the Proposed Development site.

Table C.5 below summarises the comparison of monitored versus modelled NO_x concentrations at the diffusion tube used for model verification and assessment purposes. The monitored road NO_x was calculated by converting roadside NO₂ (i.e. monitored NO₂ – background NO₂) to NO_x using the latest version of the NO_x to NO₂ calculator. The model was identified as underpredicting modelled pollutant concentrations by a factor of **3.3098**. This adjustment factor was applied to all modelled road concentrations before being combined with background concentrations.

Table C.5: Verification table for NO_x

Characteristic of verification	Verification Location			
	MA96BNO	CAP_MANC_168	CAP_MANC_005	CAP_MANC_169
Monitored total NO ₂ (µg/m ³)	43.5	41.9	54.9	34.9
Background NO ₂ (µg/m ³)	21.7	21.7	21.7	21.7
Modelled road contribution NO _x (µg/m ³)	9.41	9.22	10.60	18.54
Monitored road contribution NO _x (µg/m ³)	45.6	41.9	73.5	26.5
Monitored NO _x / Modelled NO _x (Correction Factor)	4.84	4.54	6.93	1.43

To determine whether the unadjusted modelled NO_x concentrations are suitable post-adjustment, the percentage difference between the total modelled NO₂ and total monitored NO₂ at each monitoring site is required to be within 25% or ideally within 10%.

Chart 1 below displays the modelled verses the monitored NO₂ concentrations before and after adjustment.

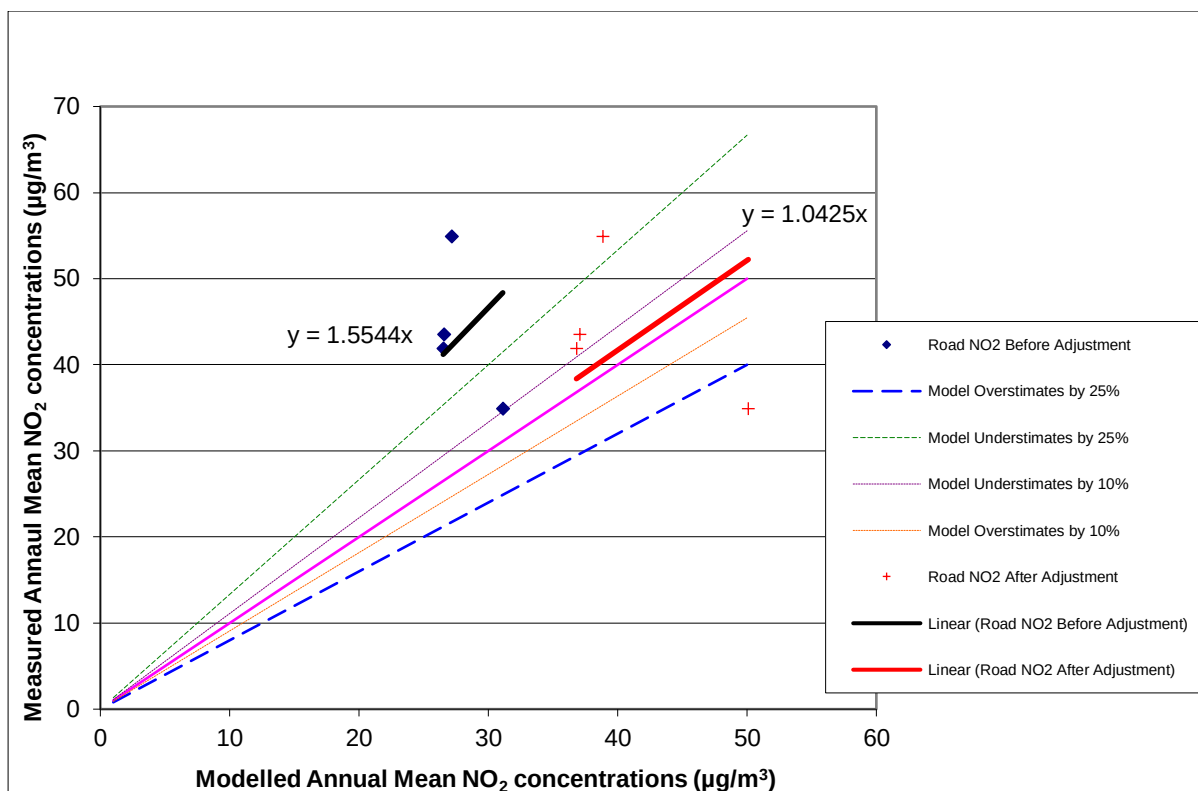


Chart 1: Performance of Unadjusted and Adjusted Model for the verification factor of 3.31

Table C.6 below compares the percentage difference between the total monitored and modelled NO₂ concentrations, the latter calculated by inputting the modelled road NO_x and background NO₂ into the NO_x to NO₂ calculator²⁶. The average percentage difference and root mean square error (RMSE, which measures the average error or uncertainty in a model, with an ideal value of 0 µg/m³) was -34.2% and 11.8 µg/m³ respectively. The fractional bias (the systematic tendency for models to over- or underpredict) and the correlation coefficient (which measures the linear relationship between predicted and observed data) were 0.1 and 0.6 respectively, compared to ideal values of 0 and 1. The model is therefore performing better than before, but is still potentially underperforming when compared to other locations.

Table C.6: Comparison of the modelled and monitored annual mean NO₂ concentrations at the verification locations post-adjustment

Monitoring Location	Monitoring Result NO ₂	Background NO _x	Background NO ₂	Post-adjustment modelled road NO _x	Total modelled NO ₂	% difference in monitored vs modelled NO ₂
MA96BNO	43.5	32.1	21.7	31.15	37.08	-14.8
CAP_MANC_168	41.9	32.1	21.7	30.57	36.81	-12.2

²⁶ Defra NO_x to NO₂ Calculator (v8.1) <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

Monitoring Location	Monitoring Result NO ₂	Background NO _x	Background NO ₂	Post-adjustment modelled road NO _x	Total modelled NO ₂	% difference in monitored vs modelled NO ₂
CAP_MANC_005	54.9	32.1	21.7	35.09	38.87	-29.2
CAP_MANC_169	34.9	32.1	21.7	61.37	50.10	43.5

Temple have undertaken checks of the model setup to account for the residual substantial differences between the modelled and monitored total NO₂ concentrations. Vehicle speeds were initially reduced, which led to a reduced verification factor.

TG22 indicates that the following factors may affect dispersion model setup:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source activity data such as traffic flows, stack emissions and emissions factors;
- Model input parameters such as roughness length, minimum Monin Obukhov; and overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

Considering each of the diffusion tubes are located in the vicinity of the same road and each other, there were no differences in the background NO₂ concentrations, meteorological data, AADT or %HDVs between each monitoring location. The distance each tube is located from the kerb and vehicle speeds using the section of road near the tubes (with reference to professional judgement based on the location of junctions) have been accounted for in the model. **Table C.7** shows that the distance each tube is located from the road, and the environs in which the tube is located, are relatively similar to each other, despite there being a substantial difference in the annual mean NO₂ concentrations monitored.

Based on the information available to compile the assessment, it is considered unlikely that model setup can be amended further to accommodate the substantial differences in modelled concentrations.

Table C.7: Comparison of the modelled and monitored annual mean NO₂ concentrations at the verification locations post-adjustment

Monitoring Location	Monitored annual mean NO ₂	Distance of tube from kerb (m)	Height above ground level (m)	Proximity to 'main' junction (m)	Environs in which tube is located
MA96BNO	43.5	3	2	132	Open. Same lamppost as CAP_MANC_168
CAP_MANC_168	41.9	3	4	132	Open. Same lamppost as MA96BNO
CAP_MANC_005	54.9	2.4	2	88	Near pub; generally open
CAP_MANC_169	34.9	3	3	45	Open

The RMSE is expected to represent the maximum potential difference between monitored and modelled pollutant concentrations based on the differences identified at each verification site. If it were assumed that this concentration should be added onto the modelled annual mean NO₂ concentrations, the impact magnitudes at each modelled existing receptor would remain negligible; and there would be no breaches of the annual mean NO₂ AQO.

As the contribution of the modelled concentrations of PM₁₀ and PM_{2.5} are substantially smaller than for NO₂, and model verification was only undertaken for NO₂, this type of comparison is not considered reliable. However, owing to the headspace between the PM₁₀ and PM_{2.5} concentrations and the annual mean AQOs shown in Section 6, exceedances of the AQOs at Site or existing receptor locations are not expected. Breaches of the 24-hour mean AQO remain unlikely, as PM₁₀ concentrations are considerably less than the 31µg/m³ threshold used to determine whether the 24-hour mean PM₁₀ AQO may be exceeded more than the permissible 35 times per annum. Moreover, the increase in PM₁₀ and PM_{2.5} concentrations would likely remain less than 0.5%, so regardless of pollutant concentrations at existing receptors, the impacts would remain negligible. Therefore, the conclusions of this report are considered reliable.

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