

Appendix 9.2: Methodology

Construction Phase

The methodology for the construction phase dust assessment is set out in guidance from the Institute of Air Quality Management (IAQM)¹.

The IAQM guidance details criteria for assessing the sensitivity of an area to dust soiling and human health effects of PM₁₀, as summarised in Tables 9.11 to 9.15.

The guidance then goes on to provide significance criteria for the classification of dust soiling and human health effects from demolition, earthworks, construction activities and trackout, as summarised in Tables 9.16 to 9.18.

Step 1

Step 1 is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing sensitive human receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where any of these criteria are met, it is necessary to proceed to Step 2.

Step 2

Step 2 determines the potential risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

The risk of dust impacts is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon the following two factors.

Step 2A assesses the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large. Examples of how the magnitude may be defined are included in Table 9.11.

¹ Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, June 2016

Table 9.11 – Determining the Dust Emission Magnitude of Construction Phase Activities

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >50,000m ³ ; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; Demolition activities >20m above ground level	Total building volume 20,000-50,000m ³ ; Potentially dusty construction material; Demolition activities 10-20m above ground level	Total building volume <20,000m ³ ; Construction material with low potential for dust release (e.g. metal cladding or timber)
Earthworks	Total site area >10,000m 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 >8m in height; Total material moved >100,000 tonnes	Total site area 2,500-10,000m ² ; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 4-8m in height; Total material moved 20,000-100,000 tonnes	Total site area <2,500m ² ; Soil type with large grain size (e.g. sand); <5 heavy earth moving vehicles active at any one time; Formation of bunds <4m in height; Total material moved <20,000 tonnes; Earthworks during wetter months
Construction	Total building volume >100,000m ³ ; On-site concrete batching; Sandblasting	Total building volume 25,000-100,000m ³ ; Potentially dusty construction material (e.g. concrete); On-site batching	Total building volume <25,000m ³ ; Construction material with a low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements ^a in any one day ^b ; Potentially dusty surface material (e.g. high clay content); Unpaved road length >100m	10-50 HDV (>3,5t) outward movements ^a in any one day ^b ; Moderately dusty surface material (e.g. high clay content); Unpaved road length 50-100m	<10 HDV (>3.5t) outward movements ^a in any one day ^b ; Surface material with low potential for dust release; Unpaved road length <50m
<i>a. A vehicle movement is a one way journey i.e. from A to B, and excludes the return journey</i> <i>b. HDV movements during a construction project may vary over its lifetime, and the number of movements is the maximum not the average</i>			

Step 2B considers the sensitivity of the area to dust impacts which is defined as low, medium or high. The sensitivity categories for different types of receptors are described in Table 9.12. Based on the sensitivity of individual receptors, the overall sensitivity of the area to dust soiling, human health and ecological effects is then determined using the criteria detailed in Tables 9.13 to 9.15, respectively.

Table 9.12 – Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects

Sensitivity Category	Dust Soiling Effects	Health effects of PM ₁₀	Ecological Effects
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM₁₀; Examples include 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; Locations where there is a community of a particularly dust sensitive species; Examples include a Special Area of Conservation with dust sensitive features
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM₁₀; Examples include office and shop workers but will generally not include workers occupationally exposed to PM₁₀	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; Locations with a national designation where the features may be affected by dust deposition; Examples include a Site of Special Scientific Interest with dust sensitive features
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would be expected to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition; Examples include a Local Nature Reserve with dust sensitive features

Table 9.14 – Sensitivity of the Area to Human Health Impacts^{ab}

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^c	Number of Receptors ^d	Distance from Source (m) ^e				
			<20m	<50m	<100m	<200m	<350m
High	>32µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

a. The sensitivity to the area should be derived for each of the four activities

b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered

c. Most straightforwardly taken from the national background maps but should also take account of local sources. The values are based on 32µg/m³ being the annual mean concentration at which an exceedance of the 24-hour mean objective

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^c	Number of Receptors ^d	Distance from Source (m) ^e				
			<20m	<50m	<100m	<200m	<350m
<i>is likely in England, Wales and Northern Ireland. In Scotland, there is an annual mean objective of 18µg/m³</i> <i>d. 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, just include the number of properties</i> <i>e. For trackout, distances should be measured from the side of the roads used by construction traffic</i>							

Table 9.15 – Sensitivity of the Area to Ecological Impacts^{ab}

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
<i>a. The sensitivity to the area should be derived for each of the four activities outlined below.</i> <i>b. Only the highest level of sensitivity from the table needs to be considered</i> <i>c. For trackout, distances should be measured from the side of the roads used by construction traffic</i>		

These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

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

The risk of dust being generated by demolition activities at the site is determined using the criteria in Table 9.16.

Table 9.16 – Risk of Dust Impacts for Demolition

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

The risk of dust being generated by earthworks and construction at the site is determined using the criteria in Table 9.17.

Table 9.17 – Risk of Dust Impacts for Earthworks and Construction

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

The risk of dust being generated by trackout at the site is determined using the criteria in Table 9.18.

Table 9.18 – Risk of Dust Impacts for Trackout

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

Step 3

Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority², recommended for use outside the capital by LAQM guidance, and the IAQM guidance document itself. Professional judgement should be used to determine the type and scale of mitigation measures required.

If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

Professional Judgement

The IAQM guidance makes reference to the use of professional judgement when assessing the risks of dust and PM₁₀ from demolition and construction sites.

² Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2006

Operational Phase

Assessing the Impact of a Proposed Development on Human Health

Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM³ with relation to the assessment of the air quality impacts of proposed developments and their significance.

The impact of a development is usually assessed at specific receptors and takes into account both the long-term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

The impact descriptors for individual receptors are detailed in Table 9.19.

Table 9.19 – Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year*	Percentage 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
*Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5% or 0.2µg/m ³) should be described as Negligible				

Determining the Significance of Effects

Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

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

Air Dispersion Modelling Inputs

The air dispersion model ADMS-Roads (CERC, Version 5.0.1) has been used to assess the potential air quality impacts associated with development-generated road traffic emissions. This dispersion model is widely used and accepted for the purpose of undertaking assessments to support both Planning and Environmental Permit applications.

Traffic Flow Data

The ADMS-Roads model requires the input of detailed road traffic flow data for those routes which may be affected by the proposed development. Traffic flow data has been provided for this project by Vectos, the

³ Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality, January 2017

appointed transport consultants for the project. The study extent of the model is shown in Figure 9.1, below; modelled roads are shown in blue and existing/proposed sensitive receptors are shown in green.

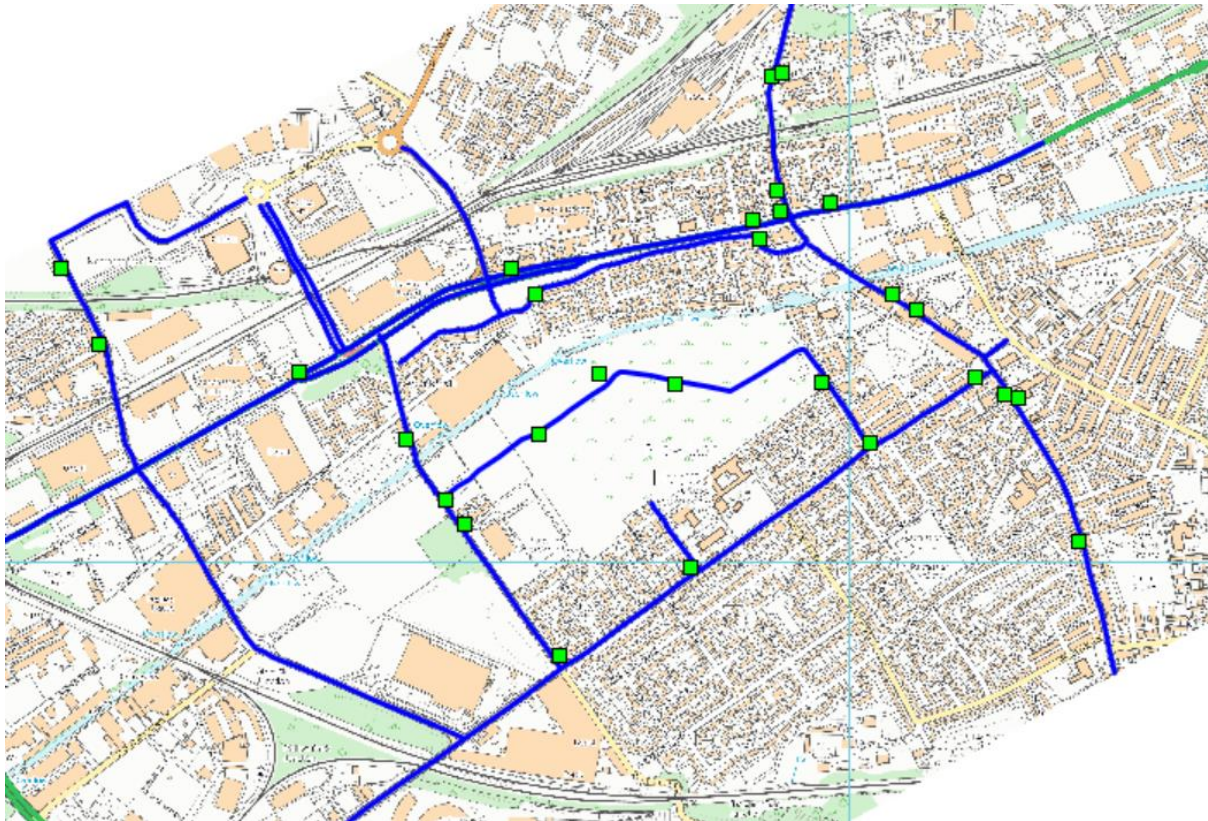


Figure 9.1: Study Extent of Air Dispersion Model ('Reproduced from Ordnance Survey Maps © Crown Copyright All Rights Reserved Licence No. 0100031673')

Data has been provided as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages. Average speed data was used where available; otherwise, speed limits were used, with a reduction to 15kph in locations where congestion or the slowing down of vehicles would be expected.

Committed developments were included in scenarios 1b, 2b and 3b; the committed developments that were included in these scenarios can be seen in Chapter 7 of the ES (Traffic and Transport).

Vectos provided the following statement, regarding the traffic data for the assessment:

We have not included any background traffic growth to arrive at a future year scenario, as an analysis of the traffic trends on the A62 demonstrated that overall traffic volume had either remained stable or reduced over recent years (prior to covid). Adding growth and committed development would lead to a vast over estimation of future traffic volumes in the area based on current and forecasted trends. This was agreed with TfGM prior to us starting the networking and modelling exercise.

The 2019 baseline data has therefore been used across all opening/future year scenarios, and includes additional flows (i.e. traffic generated by the Proposed Development/committed developments), dependent on the scenario. The opening/future year scenarios (both with and without Proposed Development) have been modelled in 2030 and include 2030 pollutant background concentrations and emission factors (which were obtained using the emission factor toolkit (EFT) v11.0).

As per the Greater Manchester Combined Authority (GMCA) 2020 ASR, no diffusion tubes were located along the

roads included in the study area provided by Vectos. DfT counts were therefore used to obtain traffic flows along the A662, which is in proximity to a nearby diffusion tube location, MAN71. This diffusion tube was used in the 2019 base year model verification, the results of which can be found later in the appendix. The model verification study area is shown in Figure 9.2, below; modelled roads are shown in blue and the MAN71 diffusion tube is shown in green.

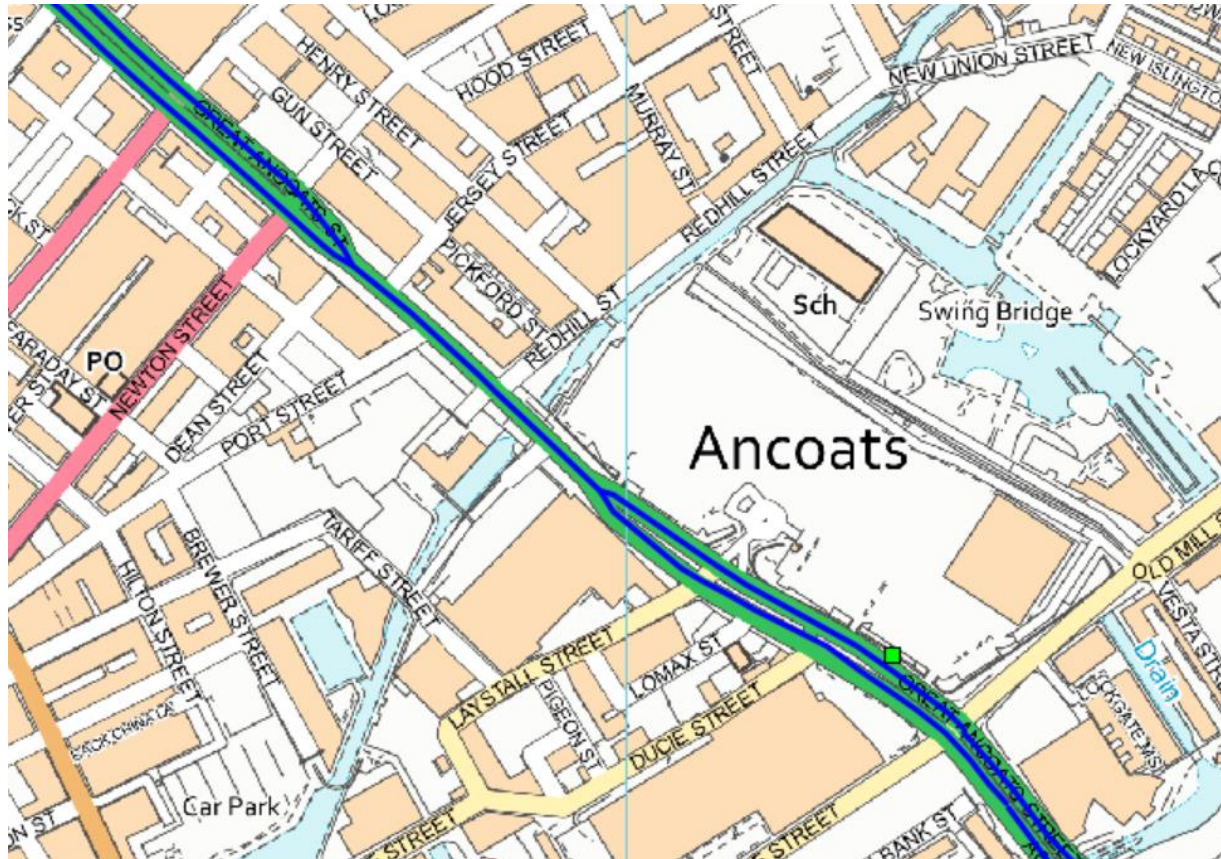


Figure 9.2: Study Extent of Air Dispersion Model used for Verification ('Reproduced from Ordnance Survey Maps © Crown Copyright All Rights Reserved Licence No. 0100031673')

The traffic flow data used in the assessment is included in Table 9.20, overleaf.

Table 9.20 – Traffic Data Used in Air Quality Assessment

Link	Road	Speed (km/hr)	Scenario 1 and 1i: 2019 and 2030 Base Year		Scenario 1a: Base + P1		Scenario 1b: Base + P1 + Comm Dev		Scenario 2a: Base + P1 + School		Scenario 2b: Base + P1 + School + Comm Dev		Scenario 3a: Base + P1 + School + P2		Scenario 3b: Base + P1 + School + Comm Dev + P2	
			AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV	AADT	%HGV
1	Monsall Road	48	7447	1.3	7543	1.3	7883	1.3	7543	1.3	7883	1.3	7543	1.3	7883	1.3
2	Grimshaw Lane	32	9957	2.5	10211	2.5	12310	2.5	10211	2.5	12310	2.5	10211	2.5	12310	2.5
3	A62 Oldham Road	48	25044	1.2	26244	1.2	29009	1.2	26507	1.2	29272	1.2	27096	1.2	29861	1.2
4	The Gateway	48	5252	1.6	5429	1.6	5987	1.6	5457	1.6	6015	1.6	5542	1.6	6104	1.6
5	Ten Acres Lane	48	3603	2.3	4548	2.3	4645	2.3	4811	2.3	4908	2.3	5400	2.3	5497	2.3
6	Thorp Road	48	7556	1.9	7810	1.9	7846	1.9	7858	1.9	7895	1.9	8054	1.9	8090	1.9
7	Lowcross Road	32	3420	1.4	3468	1.4	3468	1.4	3468	1.4	3468	1.4	3468	1.4	3468	1.4
8	Dean Lane	48	16554	0.9	16712	0.9	17039	0.9	16712	0.9	17039	0.9	16712	0.9	17039	0.9
9	Old Church Street	32	9556	2	9751	2	9969	2	9751	2	9969	2	9751	2	9969	2
10	All Saints Street	32	7325	0.8	7473	0.8	7473	0.8	7473	0.8	7473	0.8	7616	0.8	7616	0.8
11	Culcheth Lane	32	6937	1.4	7052	1.4	7064	1.4	7059	1.4	7071	1.4	7089	1.4	7101	1.4
12	Mitchell Street	32	874	0	873	0	873	0	873	0.0	873	0.0	1589	0	1589	0
13	Hallam Road	32	643	0	643	0	643	0	643	0.0	643	0.0	643	0	643	0
14	Briscoe Lane	32	15923	1.8	16233	1.8	16317	1.8	16238	1.8	16323	1.8	16689	1.8	16774	1.8
15	Site Access Road Ten Acres Lanes	48	0	0	1802	0	1802	0	2338	0	2338	0	3265	0	3265	0
16*	A662 (E)	48	13281	2.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17*	A662 (W)	48	17983	2.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
*Data obtained using DfT counts																

Vehicle Emission Factors

The air quality assessment has used vehicle emission factors calculated using the Emissions Factor Toolkit (EFT) version 11.0, released in November 2021. This is the most up-to-date version of the EFT currently available.

Meteorological Data

The meteorological data used in the air quality modelling has been obtained from ADM Limited and is from the recording station, covering the period between 1st January and 31st December 2019. This has complete data capture for wind and temperature.

The Manchester Airport recording station is located approximately 17km south west from the proposed development and is considered to be the most representative of the conditions at the proposed development, due to its relative location and similar altitude.

The 2019 wind rose for the Manchester Airport meteorological recording station is shown below in Figure 9.3.

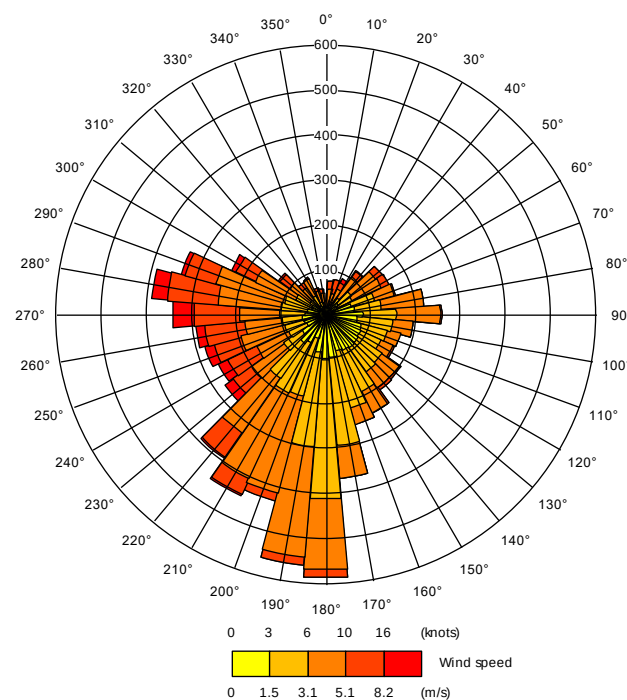


Figure 9.3: 2019 Wind Rose for the Manchester Airport Meteorological Station

Dispersion and Meteorological Site Characteristics

The characteristics for the dispersion site and meteorological sites, included in the ADMS-Roads model, are detailed in Table 9.21, below.

Table 9.21 –Dispersion and Meteorological Site Characteristics

Setting	Dispersion Site	Meteorological Site
Surface Roughness	1.5m	0.02m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30m	30m
Priestley-Taylor Parameter	1	1

NO_x to NO₂ Conversion

In accordance with the guidance within LAQM.TG(16), the ADMS-Roads model has been run to predict the road-contribution NO_x concentrations for each receptor location. These have then been converted to NO₂ concentrations using the Defra NO_x to NO₂ calculator⁴.

Model Validation and Verification

LAQM.TG(16) refers to model validation as “the general comparison of modelled results against monitoring data carried out by model developers”. ADMS-Roads is widely accepted by regulatory authorities for use in this type of assessment.

Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads air dispersion model is achieved by modelling concentrations at existing monitoring locations in the vicinity of the proposed development, and comparing the modelled concentrations with the measured concentrations.

Manchester City Council currently operate one roadside automatic monitoring location in the vicinity of the Proposed Development Site, which was used for model verification.

The monitoring data which has been used in the model verification procedures for NO₂ is detailed in Table 9.22, below.

Table 9.22 – NO₂ Diffusion Tube Located in Study Area

Monitoring Location Reference	Grid Reference		2019 Bias Adjusted NO ₂ Annual Average Concentration (µg/m ³)*
	Easting	Northing	
MAN71	385161	398290	45.30
<i>*NO₂ monitoring data for 2019 obtained from Greater Manchester's Combined Authority 2020 Annual Progress Report.</i>			

The comparison is shown on Figure 9.4, overleaf. The equation of the trend line is based on linear regression through zero, which provides an overall adjustment factor of 1.9389.

⁴ Defra Local Air Quality Management web pages (<http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html>)

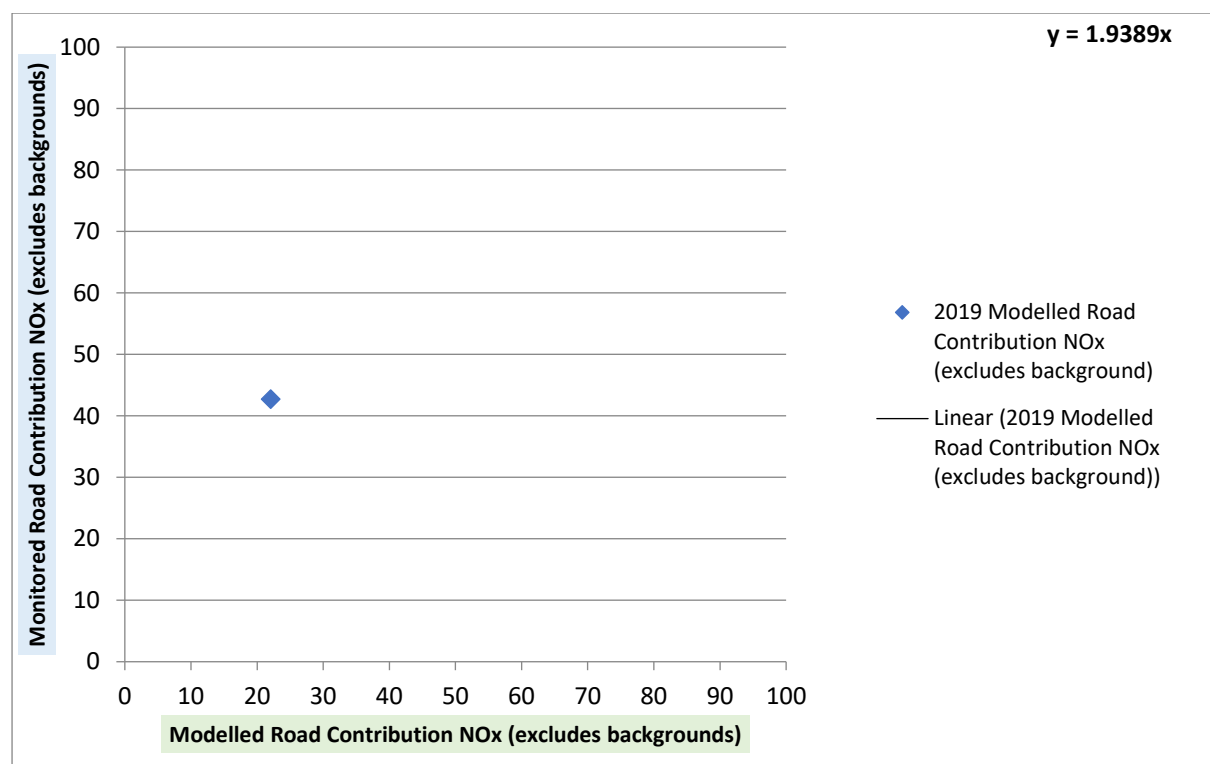


Figure 9.4: Graph Comparing Monitored Road Contribution NO_x against Modelled Road Contribution NO_x

This adjustment factor has been applied to the modelled road-contribution NO_x concentrations. The total NO₂ concentrations have been derived by combining the adjusted road-contribution NO_x concentration and background NO₂ concentration, using the Defra NO_x to NO₂ calculator.

A final comparison has been made between the total measured NO₂ concentrations and total modelled NO₂ concentrations, as shown in Table 9.23, below. Following adjustment, modelled concentrations are within 25% of measured concentrations.

Table 9.23 – Comparison Between Measured and Monitored NO₂ Concentrations After Adjustment

Monitoring Location Reference	Measured Total NO ₂ Concentration (µg/m ³)	Modelled Total NO ₂ Concentration (µg/m ³)	Difference (%)
MAN71	45.30	45.30	0.00

There are no representative roadside PM₁₀ or PM_{2.5} monitoring locations along the road network for which traffic flow information is available. It has not therefore been possible to undertake verification of PM₁₀ or PM_{2.5} concentrations.