

Air Quality Assessment



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Executive Summary

Encon Associates were commissioned by Grays Architecture on behalf of Dappa Homes Ltd to carry out an air quality assessment in connection with the proposed redevelopment of the Whitehouse Club, Middleton Road, Crumpsall, Manchester, comprising the construction of a new club house and up to 74 residential properties on land to the rear of the club (the 'Site').

The Site falls within the Greater Manchester Combined Authority (GMCA). Due to exceedences of the national air quality annual mean objective for nitrogen dioxide (NO₂), the Council has declared a new single Air Quality Management Area (AQMA) for Greater Manchester which includes the 10 districts of Greater Manchester incorporating the whole of the City of Manchester, the main arterial routes, district centres and the airport. The Site is located off Middleton Road, in the region north of the city. Middleton Road falls within the AQMA.

An assessment of air quality impacts associated with the construction of the proposed development has been undertaken following the methodology set out within the Institute of Air Quality Management (IAQM)¹ guidance. This guidance provides a methodology to determine the risk of impacts occurring during the construction of the development and also identifies appropriate mitigation measures to be implemented on site to reduce dust emissions and associated impacts.

Due to the proximity of nearby residential receptors the Site is considered to have a medium risk of impacts with regards to dust soiling and PM₁₀ concentrations. However, following the implementation of appropriate mitigation measures, impacts associated with the construction of the development are likely to be insignificant.

The assessment has used detailed modelling to predict the impact of operational traffic on local air quality. The assessment has predicted a negligible impact on local air quality. No mitigation of operational impacts is therefore considered necessary. However, as recommended within the EPUK/IAQM air quality planning guidance the development incorporates good practice principles in

¹ IAQM (January 2014) Guidance on the Assessment of Dust from Demolition and Construction. Version 1.1

terms of design with all plots being constructed with a fabric first approach, ensuring high thermal performances and low energy consumption which will reduce potential on-site emissions. All properties will also be provided with secure cycle storage to encourage more sustainable travel

The assessment shows that air quality does not pose a constraint to development of the site for the proposed uses.

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1 Introduction

1.1 Introduction

Encon Associates were commissioned by to carry out an air quality assessment in connection with the proposed redevelopment of the Whitehouse Club, Middleton Road, Crumpsall, Manchester, comprising the construction of a new club house and up to 74 residential properties on land to the rear of the club (the 'Site').

The Site falls within the Greater Manchester Combined Authority (GMCA). Due to exceedences of the national air quality annual mean objective for nitrogen dioxide (NO₂), the Council has declared a new single Air Quality Management Area (AQMA) for Greater Manchester which includes the 10 districts of Greater Manchester incorporating the whole of the City of Manchester, the main arterial routes, district centres and the airport. The Site is located off Middleton Road, in the region north of the city. Middleton Road falls within the AQMA.

This report assesses air quality impacts associated with the proposed development. Potential sources of emissions are identified and assessed in the context of existing air quality and emission sources and the nature and location of receptors.

1.2 Scope of the Assessment

The hybrid application is for the demolition of the existing club house and the construction of a new club house and up to 74 residential properties. The operational development would result in additional vehicle movements on the adjacent road network. As Middleton Road falls within the Greater Manchester AQMA, there is a risk that pollution concentrations are exceeding the relevant air quality objectives at sensitive receptors in the vicinity of the Site and any change in concentrations as a result of additional vehicle movements could be deemed as significant. An assessment of the impact of traffic generated by the proposals on nearby receptors has therefore been carried out. The assessment has also considered air quality at the Site and its suitability for residential development.

Impacts associated with the construction phase of the development have also been considered.

The scope of the assessment has been discussed and agreed with the air quality officer (Graeme Souter) at GMCA.

2 Site Description

2.1 The Existing Site

The Site is located in the Crumpsall district of Manchester and is approximately 1.95 Ha in area.

The Site is bounded to the east by Middleton Road with residential areas along Counthill Drive to the south, Edenfield Road to the west and Windsor Crescent and White House Avenue to the north.

There are also residential properties located to the east on the opposite side of Middleton Road.

The existing Whitehouse Club building and associated car park currently occupies the eastern part of the Site. To the rear of the building is a disused bowling green and large area of open scrub land which make up the rest of the Site.

The location of the Site is presented in red in Figure 2.1.

Figure 2.1: Location of proposed development site



2.2 Proposed Development

The proposed application is for the demolition of the existing club building, the construction of a new club house within the eastern section of the Site and up to 74 residential houses across the rest of the Site consisting of a mix of erection of 32 x 3-bed houses, 18 x 4-bed houses and 24 x 2-bed apartments in purpose built apartment blocks.

The new club house would be located directly adjacent to Middleton Road with a bear garden and 60 parking spaces to the rear. The proposals also include for a new access road to the north of the new club house plus associated residential parking, infrastructure and landscaping.

The layout of the residential area is presented in Figure 2.2 while the new club house is shown in Figure 2.3.

Figure 2.2: Layout of Proposed Residential Development



Figure 2.2: Layout of Proposed Club House

3 Policy Context

3.1 International Legislation and Policy

The EU Directive 2008/50/EC² on ambient air quality and cleaner air for Europe (the CAFE directive) sets out the ambient air quality standards for NO₂ and PM₁₀, to be achieved by 1st January 2010 and 2005 respectively. The Air Quality Standards Regulations 2010³ implements the requirements of the Directive into UK legislation. The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation. These limit values are legally binding and the UK may incur infringement action if it does not meet the required objective limits within the agreed time limits. The UK is currently exceeding the objective limits for NO₂ and PM₁₀ within London and a number of other air quality zones within the UK, including across the majority of Westminster.

3.2 National Legislation and Policy

3.2.1 Local Air Quality Management

Part IV of the Environment Act 1995⁴, requires the UK Government to publish an Air Quality Strategy and local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM). The 2007 Air Quality Strategy⁵ establishes the policy for ambient air quality in the UK. It includes the National Air Quality Objectives (NAQOs) for the protection of human health and vegetation for 11 pollutants. Those NAQOs included as part of LAQM are prescribed in the Air Quality (England) Regulations 2000⁶ and the Air Quality (Amendment) (England) Regulations 2002⁷. Table 3.1 presents the NAQOs for NO₂ and PM₁₀, the two key pollutants emitted from traffic.

The recently published DEFRA Local Air Quality Management Policy Guidance (LAQM.PG(16))⁸ sets out new guidance on the role and responsibilities of local authorities and PM_{2.5}. There is no

² 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

³ Air Quality Regulations 2010 – Statutory Instrument 2010 No. 1001

⁴ Secretary of State The Environment Act 1995 part IV Air Quality HMSO

⁵ Department for Environment, Food and Rural Affairs, July 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland

⁶ The Air Quality (England) Regulations 2000 (SI 2000 No. 928)

⁷ The Air Quality (England) (Amendment) Regulations 2002 (SI 2002 No. 3043)

⁸ DEFRA (2016) Local Air Quality Management Policy Guidance (PG16) LAQM.PG(16)

regulatory standard applied to the PM_{2.5} role for local authorities in England, however, local authorities are expected to work towards reducing emissions and concentrations of PM_{2.5} in their area. The objective limit for PM_{2.5} is also provided in Table 3.1.

Table 3.1: Relevant Objectives set out in the Air Quality Strategy

Pollutant	Concentrations	Measured As	Date to be Achieved by
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times per year	1-hour mean	31 December 2005
	40 µg/m ³	Annual mean	31 December 2005
Particulate Matter (PM ₁₀)	50 µg/m ³ not to be exceeded more than 35 times per year	24-hour mean	31 December 2004
	40 µg/m ³	Annual mean	31 December 2004
Particulate Matter (PM _{2.5})	25 µg/m ³	Annual Mean	2020

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16))⁹ issued by the Defra for Local Authorities, on where the NAQOs apply as detailed in Table 3.2. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

It should be noted that the EU Limit Values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and legal responsibility. The compliance date for the NO₂ Limit Values is 1 January 2010, which is five years later than the date for the NAQO.

The Limit Values are mandatory, whereas the NAQOs are policy objectives. Local authorities are not required to achieve them, but have to work towards their achievement. In addition, the limit Values apply in all locations except where members of the public do not have access and there is no fixed habitation, on factory premises or at industrial installations, and on the carriageway/central reservation of roads except where there is normally pedestrian access.

⁹ Defra (2016) Local Air Quality Management. Technical Guidance LAQM.TG(16)

Table 3.2: Locations Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building Facades of residential properties, schools, hospitals, care home etc.	Building facades 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 facade), or any other location where public exposure is expected to be short term.
24-hour mean	All locations where the annual mean objective would apply together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building 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 hour mean objectives apply. Kerbside Sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations where the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3.2.2 National Planning Policy Framework

Published on 27th March 2012, the National Planning Policy Framework (NPPF)¹⁰ sets out the Government's planning policies for England and how these are expected to be applied. It replaces Planning Policy Statement 23: Planning and Pollution Control¹¹, which provided planning guidance for local authorities with regards to air quality.

At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the Framework with the objective of contributing to the achievement of sustainable development.

Current planning law requires that applications for planning permissions must be determined in accordance with the relevant development plan (i.e. Local Plan or Neighbourhood Plan). The NPPF should be taken into account in the preparation of development plans and therefore the policies set out within the Framework are a material consideration in planning decisions.

The NPPF identifies 12 core planning principles that should underpin both plan making and decision-taking, including a requirement for planning to '*contribute to conserving and enhancing the natural environment and reducing pollution*'.

Under Policy 11: Conserving and Enhancing the Natural Environment, the Framework requires the planning system to '*prevent both new and existing developments from contributing to or being put at unacceptable risk or being adversely affected by unacceptable levels of air pollution*'.

In dealing specifically with air quality the Framework states that '*planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in air Quality Management Areas is consistent with the local air quality action plan*'.

¹⁰ Communities and Local Government (2012) *National Planning Policy Framework*

¹¹ Office of the Deputy Prime Minister (2004) *Planning Policy Statement 23: Planning and Pollution Control*. HMSO

3.2.3 Manchester Core Strategy Development Plan Document

The Manchester City Council Core strategy¹² was adopted on 11th July 2012. It is the key document in Manchester's Local Development Framework and covers the period from 2012 to 2027. To protect air quality, policy EN 16 states that *'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 itself, including from Combined Heat and Power and biomass plant.'*

When considering 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.'

3.2.4 Local Air Quality Management

Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the NAQOs, it must designate these areas as Air Quality Management Areas (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out measures to reduce pollutant concentrations with the aim of meeting the NAQOs.

¹² Manchester City Council (July 2012) Manchester's Local Development Framework Core Strategy Development Plan Document, July 2012

The GMCA declared a new single AQMA on 1st May 2016 due to predicted exceedences of the annual mean NO₂ objective. The AQMA covers the 10 districts of Greater Manchester, including the city centre and main arterial routes, district centres and airport. As a consequence, the council have developed an Air Quality Action Plan(AQAP)¹³. The plan sets out the actions the council will take to improve air quality within the city. There are a number of successful projects which have been delivered through the previous action plan including bus priority packages, an increase in the number of hybrid taxis and electric charging sessions at charging points, completion of the Elizabethan Way Cycle/Pedestrian route and Burnside Road Toucan/Cycle Link, successful campaigns including the Dirty Diesel Campaign, introduction of an electric vehicle for MCC staff and a low emission taxi scheme. The new AQAP sets out new actions to reduce emissions across the city. In relation to new development the Plan sets out the following actions:

- *Action 1.1– Greater Manchester (GM) councils to adopt the most recent IAQM Guidance on the Assessment of Dust from Demolition and Construction as current best practice to assess and mitigate emissions from construction sites.*
- *Action 1.2 – GM councils will adopt the most recent IAQM/EPUK guidance for air quality assessment as current best practice guidance, to help ensure that planning applications consider potential local air quality impacts, and opportunities to improve air quality are realised.*
- *Action 1.3– A centralised database of planning applications and air quality assessments will be managed by Transport for Greater Manchester (TfGM) as a record of cumulative effects of multiple developments and thereby facilitate combined approaches to minimising emissions;*
- *Action 1.4- TfGM will undertake an appraisal of the effects of charging Clean Air Zones (CAZ);*

¹³Greater Manchester Air Quality Action Plan 2016-2021

- *Action 1.5– Review the effects of 20mph zones on air quality.*
- *Action 1.6– TfGM will work with the local authorities to encourage travel planning measures in businesses and individuals to effect a significant modal shift;*
- *Action 1.7– TfGM will work with licensing authorities and seek to standardise the minimum emission requirements (i.e. age) of the vehicles that are allowed to operate; and*
- *Action 1.8 – TfGM will promote the contribution of green infrastructure to improve air quality and will work with authorities to investigate the potential of green screens at significant locations, such as schools.*

4 Baseline Assessment

4.1 GMCA Air Quality Monitoring

NO₂ Concentrations

In 2016 the GMCA operated seventeen automatic monitoring stations within the city, recording concentrations of NO₂ and PM₁₀. The closest of these to the Site is the Bury Prestwich automatic monitoring site located approximately 2.2km west of the Site. Details of the automatic site and NO₂ concentrations recorded since 2012 are provided in Tables 4.1 and 4.2 below.

Table 4.1: NO₂ Concentrations Measured at Automatic Sites (µgm⁻³)

Site	Classification	Distance to kerb of nearest rd (m)	Year				
			2012	2013	2014	2015	2016
BUR2 Bury Prestwich	UT	2.5	48	45	49	42	42

UT = urban traffic

Exceedences of NO₂ annual mean AQO of 40µg/m³ are shown in **bold**

Data taken from GMCA Air Quality Annual Status Report 2016

The monitoring data shows annual mean NO₂ concentrations to be above the objective limit of 40µg/m³ at the Bury Prestwich location for the monitoring period 2012 to 2016. Data presented in Table 4.2 shows that the 1-hour objective for NO₂ has been met at this location since 2012.

Table 4.2: Number of Exceedences of the Hourly NO₂ Objective Measured at Automatic Sites

Site	Classification	Distance to kerb of nearest rd (m)	Year				
			2012	2013	2014	2015	2016
BUR2 Bury Prestwich	UT	2.5	0 (151)	0(126)	0	0	0

UT = urban traffic

Exceedences of NO₂ hourly mean AQO are shown in **bold**

If the period of valid capture is less than 90%, the 99.8th percentile of 1-hour mean is provided in brackets.

Data taken from GMCA Air Quality Annual Status Report 2016

GMCA also operate an extensive network of passive diffusion tubes which monitor NO₂ concentrations across the city. The closest sites to the Whitehouse Club Site are presented in Table 4.3, along with concentrations recorded over the last five years.

Diffusion tubes are a passive form of monitoring, which, due to their relative in-expense, allow for a much greater spatial coverage than with automatic monitoring sites. Diffusion tubes are acknowledged as a less accurate method of monitoring ambient air pollutants than automatic monitors, with diffusion tubes over or under estimating concentrations by as much as 30 %. To allow the results to be reliably compared with the AQ Objectives, the data should be bias corrected using factors calculated from a co-location site where both diffusion tubes and an automatic monitor are located in the same location. The data provided in Table 4.3 has been adjusted by GMCA using appropriately derived adjustment factors.

Table 4.3: NO₂ Diffusion Tube Monitoring Results 2012-2016 (µg/m³)

Site	Classification	Year				
		2012	2013	2014	2015	2016
22 - Cheetham Hill Road	K	44.5	40.2	40.7	38.8	-
BU1 – Baguley Crescent, Midleton	R	36.6	30.3	34.9	40.1	35.2
BU4 – Hardmans Road, Whitefield	R	39.5	39.7	39.1	44.1	38.1
23 – Oldham Road	K	41.2	36.9	40.0	36.3	-

UT = urban traffic UB=urban background

The monitoring data presented in Table 4.3, shows annual mean NO₂ concentrations above the objective limit of 40µg/m³ at the Cheetham Hill site between 2012 and 2014, however concentrations declined to below the objective in 2015. No data is available for this site for 2016.

Concentrations have met the objective during all five years at the two Bury monitoring sites with the exception of 2015. During this year both sites recorded an increase in concentrations to above the objective although concentrations subsequently declined to below the objective again in 2016.

Diffusion tubes cannot monitor short-term NO₂ concentrations, however, research¹⁴ has concluded that exceedences of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. Based on the monitoring data presented in Table 4.3, it is unlikely that the short-term objective is being exceeded.

PM₁₀ Concentrations

GMCA monitor PM₁₀ concentrations at fifteen locations in the city. The closest of these to the Site is the BUR2 automatic monitoring site. The data set out in Table 4.4 shows annual mean PM₁₀ concentrations have been consistently below the annual mean objective of 40 µg/m³ during 2012. The data shows an overall decline in annual mean concentrations over the five-year monitoring period presented.

Exceedences of the 24-hour objective have been recorded at this site since 2012, (Table 4.5) however, the objective allows for up to 35 exceedences of the limit in any given year, therefore the objective has been met at this location during the five-year period.

Table 4.4: Annual Average PM₁₀ Concentrations Measured within Manchester (µg/m³)

Site	Classification	Distance to kerb of nearest rd (m)	Year				
			2012	2013	2014	2015	2016
BUR2 Bury Prestwich	UT	2.5	23	23	23	20	19

UT = urban traffic

¹⁴ D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites (July 2003).

Table 4.5: Number of Exceedences of the 24-hour PM₁₀ Objective Measured within Manchester (µgm⁻³)

Site	Classification	Distance to kerb of nearest rd (m)	Year				
			2012	2013	2014	2015	2016
BUR2 Bury Prestwich	UT	2.5	14	8	4	6	1

UT = urban traffic

PM_{2.5} Concentrations

GMCA monitor PM_{2.5} concentrations at 5 locations across the area. These are mainly within the centre of Manchester, with one located in Salford and the other in Wigan. Data from these sites are provided in Table 4.6 below.

Annual mean PM_{2.5} concentrations have been consistently below the objective limit of 25 µg/m³ at all five monitoring locations since 2012. The data shows little change in concentrations over the five-year period although there is an overall downward trend in concentrations.

Table 4.6: Annual Average PM_{2.5} Concentrations Measured within Manchester (µgm⁻³)

Site	Classification	Distance to kerb of nearest rd (m)	Year				
			2012	2013	2014	2015	2016
Manchester Piccadilly	UB	30	14	13	12	10	10
Manchester South	SB	15	9	10	10	8	-
Manchester Sharston	SB	6	-	-	-	-	8.2
Salford Eccles	UI	5	13	15	15	11	10
Wigan Centre	UB	175	19	13	14	11	11

UT = urban traffic UB = Urban Background SB = Suburban Background UI = Urban Industrial

4.2 Defra Background Maps

Additional information on estimated background pollutant concentrations has been obtained from the Defra background maps provided on the UK-AIR, the Air Quality Information Resource (<http://uk-air.defra.gov.uk/>). Estimated air pollution concentrations for oxides of nitrogen (NO_x), NO₂, and PM₁₀ have been extracted from the 2015 background pollution maps for the UK, which were published in 2017. These maps are available in 1 km x 1 km grid squares and provide an estimate of concentrations between 2015 and 2030. The average concentrations for the grid square representing the Site have been extracted for the 2015 base year. The data is provided in Table 4.6. The NO_x and PM₁₀ background maps are provided not only as total concentrations but are also broken down into sector contributions (i.e. motorways and rail). However, as this assessment is considering the impact of the proposed development on existing air quality, background concentrations from all sources should be considered. The data presented in Table 4.6 provides total background concentrations of both pollutants.

Table 4.6: Annual Mean Background Air Pollution Concentrations in 2015

Year	Annual mean concentrations (µgm ⁻³)			
	Oxides of Nitrogen	Nitrogen dioxide	PM ₁₀	PM _{2.5}
2015	23.9	19.6	12.6	8.2

The data indicates that existing background concentrations are currently meeting the NO₂ and PM₁₀ objectives at the Site.

4.3 Air Quality at the Development Site

The closest and most representative monitoring site to the Whitehouse Club is the Cheetham Hill diffusion tube site. Based on the data recorded at this location NO₂ concentrations are expected to be meeting the annual mean objective in the vicinity of the Site.

Monitoring of both PM₁₀ and PM_{2.5} show concentrations to be considerably below the relevant air quality objectives in the Greater Manchester Area. Concentrations of both particulates are therefore expected to be meeting the relevant objective limits in the vicinity of the Site.

5 Methodology

5.1 Construction Phase

5.1.1 Construction Traffic

During construction of the proposed development, lorries will require access to the Site to deliver and remove materials; earthmoving plant and other mobile machinery will work on site and generators and cranes will also be in operation. These machines produce exhaust emissions; of particular concern are emissions of NO₂ and PM₁₀.

It is anticipated that during the construction phase there would be no more than 15-20 heavy duty vehicles (HDV) accessing the Site in any given day. Air quality planning guidance published by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)¹⁵ sets out criteria to assist in establishing when an air quality assessment will be required. These criteria indicate that significant impacts on air quality are unlikely to occur where a development results in less than 25 HGV movements per day within an AQMA and less than 100 per day elsewhere. It is therefore anticipated that construction traffic generated by the proposed development would result in a negligible impact on local NO₂ and PM₁₀ concentrations and has not been considered any further in this assessment.

5.1.2 Construction Dust

The main air quality impacts that may arise during construction activities are dust deposition resulting in the soiling of surfaces e.g. cars, window sills; visible dust plumes and elevated PM₁₀ concentrations as a result of dust generating activities on the site. These dust emissions can give rise to annoyance at nearby receptors due to the soiling of surfaces by the dust.

Separation distance is also an important factor. Research indicates that particles greater than 30µm, will largely deposit within 100 metres of sources, while intermediate particles (10-30µm) can travel

¹⁵ EPUK & IAQM, Land-Use Planning & Development Control: Planning for Air Quality, January 2017

up to 200 – 300m¹⁶. Particles of greater than 30µm are responsible for the majority of dust annoyance. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (<10µm) are deposited slowly and can travel up to 1 km; however, the most significant impacts on short term concentrations of PM₁₀ occur within a shorter distance from source. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

The assessment of construction impacts has followed the methodology set out within guidance produced by the IAQM on assessing impacts from construction activities¹⁷. In order to assess the potential impacts, the activities on construction sites are divided into four categories. These are.

- demolition (removal of existing structures);
- earthworks (soil-stripping, ground-levelling, excavation and landscaping);
- construction (activities involved in the provision of a new structure); and
- trackout (the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the network).

For each activity, the risk of dust annoyance, health and ecological impact is determined using three risk categories: low, medium and high risk. The risk category may be different for each of the four activities. The risk magnitude identified for each of the construction activities is then compared to the number of sensitive receptors in the near vicinity of the site in order to determine the risks posed by the construction activities to these receptors.

Step 1: Screen the Need for an Assessment

The first step is to screen the requirement for a more detailed assessment. An assessment is required where there is

¹⁶ Arup, The Environmental Effects of Dust at Surface Mineral Workings. (Report to the DETR)

¹⁷ IAQM (January 2014) Guidance on the Assessment of Dust from Demolition and Construction. Version 1.1

- a 'human receptor' within 350m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- an 'ecological receptor' within 50m of the boundary of the site; or 50m of the route(s) used by the construction vehicles on the public highway, up to 500m from the site entrance(s).

Step 2A: Define the Potential Dust Emission Magnitude

This is based on the scale of the anticipated works and the proximity of nearby receptors. The risk is classified as small, medium or large for each of the four categories.

Demolition: The potential dust emission classes for demolition are:

- Large: Total building volume $>50,000\text{m}^3$, potentially dusty construction material (e.g. Concrete), on site crushing and screening, demolition activities $>20\text{m}$ above ground level;
- Medium: total building volume $20,000\text{m}^3 - 50,000\text{m}^3$, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- Small: total building volume $<20,000\text{m}^3$, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities $<10\text{m}$ above ground, demolition during wetter months.

Earthworks: This involves excavating material, haulage, tipping and stockpiling. The potential dust emission classes for earthworks are:

- Large: Total site area $>10,000\text{m}^2$, 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 $>8\text{ m}$ in height, total material moved $>100,000$ tonnes;
- Medium: Total site area $2,500\text{ m}^2 - 10,000\text{m}^2$, moderately dusty soil (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4m – 8m in height, total material moved 20,000 tonnes- 100,000 tonnes; and

- Small: Total site area $<2,500\text{m}^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved $<20,000$ tonnes, earthworks during wetter months.

Construction: The important issues here when determining the potential dust emission magnitude include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. The categories are:

- Large: Total building volume $>100,000\text{m}^3$, on site concrete batching, sandblasting;
- Medium: Total building volume $25,000\text{m}^3 - 100,000\text{m}^3$, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- Small: Total building volume $<25,000\text{m}^3$, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout: The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the Site as a result of trackout. The categories are:

- Large: >50 HDV ($>3.5\text{t}$) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length $> 100\text{m}$;
- Medium: $10-50$ HDV ($>3.5\text{t}$) outward movements in any one day, moderately dusty surface material (e.g. high clay content, unpaved road length $50-100\text{m}$; and
- Small: <10 HDV ($>3.5\text{t}$) outward movements in any one day, surface material with low potential for dust release, unpaved road length $>50\text{m}$.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health (PM_{10}) and ecological receptors.

The sensitivity of the area takes into account the following factors:

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

Table 5.1 is used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table 5.1: Examples of Factors Defining Sensitivity of an Area

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect enjoyment of a high level of amenity • The appearance, aesthetics or value of their property would be diminished by soiling' • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • E.g. dwellings, museums and other important collections, medium and long term car parks and car showrooms.	• 10 – 100 dwellings within 20 m of site. • Local PM₁₀ concentrations close to the objective (e.g. annual mean 36 -40 µg/m³). • E.g. 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 such as vascular species included in the Red List for Great Britain. • E.g. A Special Area of Conservation (SAC).
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as	• Less than 10 receptors within 20 m. • Local PM₁₀ concentrations below the objective (e.g. annual mean 30-36 µg/m³).	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown.

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
	in their home. - The appearance, aesthetics or value of their property could be diminished by soiling - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. - E.g. parks and places of work.	E.g. office and shop workers but will generally not include workers occupationally exposed to PM₁₀ as protection is covered by the Health and Safety at Work legislation.	- Locations with a national designation where the features may be affected by dust deposition - E.g. A Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	- The enjoyment of amenity would not reasonably be expected. - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. - E.g. playing fields, farmland unless commercially sensitive horticultural, footpaths, short lived car [parks and roads.	- Locations where human exposure is transient. - No receptors within 20 m. - Local PM₁₀ concentrations well below the objectives (less than 75%). - E.g. 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 Reserve with dust sensitive features.

Based on the sensitivities assigned to the different receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification can be defined for each.

Tables 5.2 to 5.4 indicate the criteria used to determine the sensitivity of the area to dust soiling, human health and ecological impacts.

Table 5.2: Sensitivity of the Area to Dust Soiling on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	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

Table 5.3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from 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

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
		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

Table 5.4: Sensitivity of the Area to Ecological Impacts

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

Defining the Risk of Impacts

The final step is to combine the dust emission magnitude determined in step 2A with the sensitivity of the area determined in step 2B to determine the risk of impacts with no mitigation applied. Tables 5.5 to 5.7 indicate the method used to assign the level of risk for each construction activity.

Table 5.5: Risk of Dust Impacts from Demolition

Sensitivity of Area	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 5.6: Risk of Dust Impacts from Earthworks/construction

Sensitivity of Area	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 5.7: Risk of Dust Impacts from Trackout

Sensitivity of Area	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

5.2 Operational Phase

5.2.1 Introduction

The prediction of local air quality has been undertaken using the ADMS Roads dispersion model (Version 4.0.1.1, released in February 2017). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from Manchester Meteorological Station for 2015 has been used for the assessment.

The model has been used to predict road specific concentrations of oxides of nitrogen (NO_x) and PM₁₀. The predicted concentrations of NO_x have been converted to NO₂ using the LAQM calculator available on the DEFRA air quality website (<http://uk-air.defra.gov.uk>).

5.2.2 Emissions Data

The emission factors released by DEFRA in October 2017, provided in the emissions factor toolkit EFT2017_8.0.1, have been used within the ADMS model to predict traffic related emissions of NO₂ and PM₁₀.

The assessment has predicted air quality during 2015 for verification and has assumed no change in emissions data for the future assessment year, with 2015 emissions data used to predict concentrations in 2019, the anticipated completion year of the development. This represents a worst-case prediction of potential impacts and future concentrations at the Site.

The ADMS model cannot predict short-term pollutant concentrations with any degree of accuracy. The LAQM.TG(16) guidance recommends calculating the number of exceedences of 50 µg/m³ from the predicted annual mean using the following formula:

$$A = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

where A is the number of exceedences of 50 µg/m³ as a 24-hour mean PM₁₀ concentration.

LAQM.TG(16) does not provide a method for the conversion of annual mean NO₂ concentrations to 1-hour mean NO₂ concentrations. However, research¹⁸ has concluded that exceedences of the 1-hour mean objective are generally unlikely to occur where annual mean concentrations do not exceed 60 µg/m³. Care has been taken to ensure that locations where the 1-hour mean objective is relevant are included in the assessment.

5.2.3 Traffic Data

Base traffic data for use in the assessment has been obtained from the Department of Transport (DfT) traffic count data set available on the DfT website (<http://www.dft.gov.uk/traffic-counts/>). The

¹⁸ D Laxen and B Marner: Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites (July 2003).

2016 base flows have been factored forward to 2019 using the adjustment factor 1.0734, provided by the transport consultants SCP. Additional trips generated by the operational development have been provided by SCP and added to the 2019 base flows to provide the 'with development' scenario.

The traffic data used within this assessment are provided in Table 5.8 below.

Table 5.8: Traffic Data

Road	Speed (kph)	% HDV	2015 Base	2019 Base	2019 With Development
Cheetham Hill	48 (25 at junction)	6.5	17759	19063	19113
Bury Old Road	48 (25 at junction)	6.5	17759	19063	19067
Middleton Road (south of Site)	48 (25 at junction)	3.3	23082	24776	24828
Middleton Road (north of Site)	48	3.3	23082	24776	24871

5.2.4 Background Concentrations

The ADMS model predicts concentrations arising as a result of vehicle emissions. It is necessary to add an estimate of local background concentrations to obtain the total concentration for comparison against the air quality objectives.

Background concentrations of NO₂, PM₁₀ and PM_{2.5} have been taken from the DEFRA 2015 background maps. The 2015 data has been used for the 2019 assessment year, which represents a worst-case prediction of future concentrations.

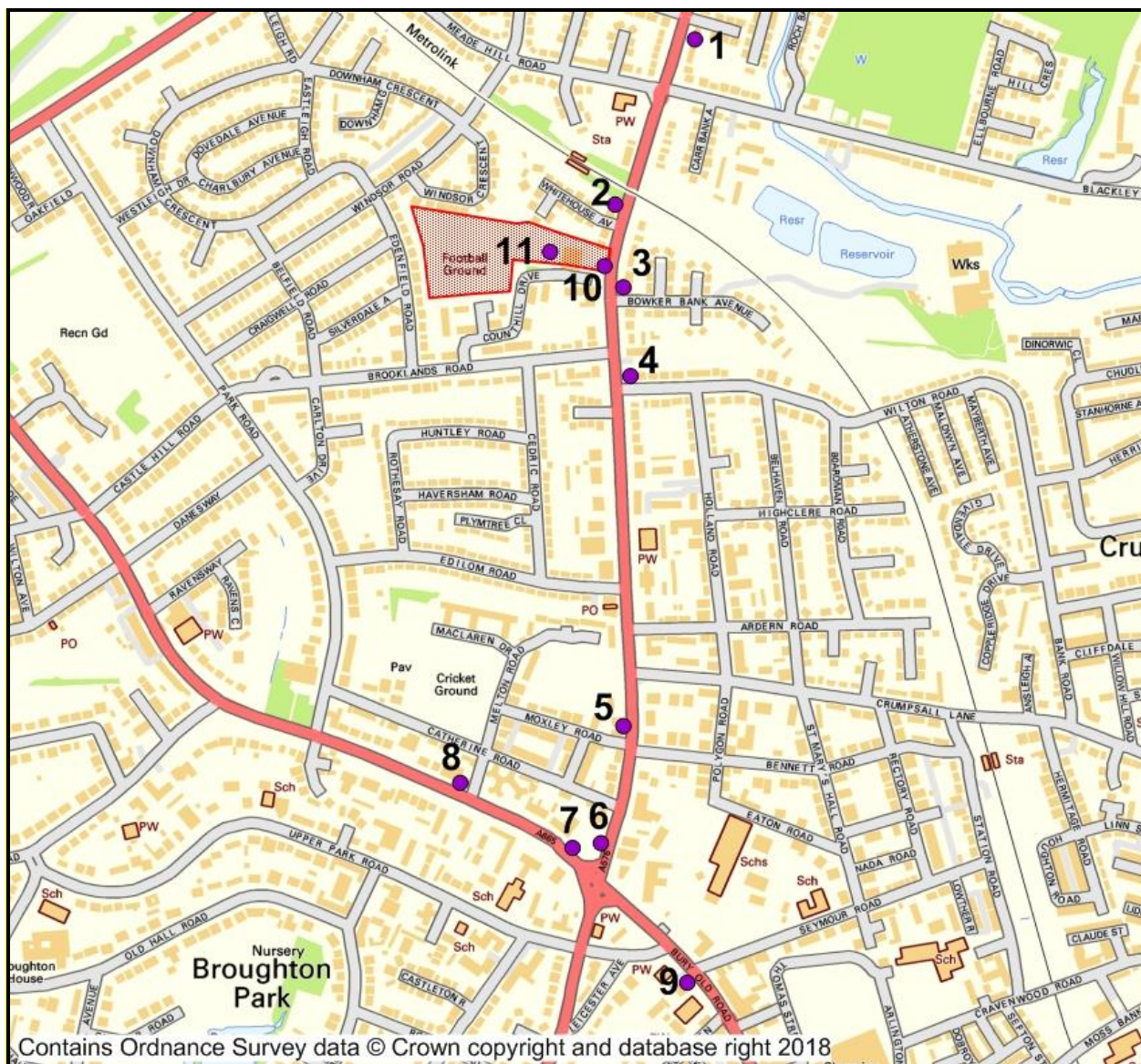
5.2.5 Receptors

Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted at a number of locations represented existing sensitive receptors (residential facades) along the adjacent road network. The receptors have been selected to represent worst-case exposure to local traffic emissions.

The location of the selected receptors is shown in Figure 5.1. Details of the receptors are provided in Table 5.9.

Table 5.9: Receptors used in Modelling Assessment

Receptor Number	Location	OS Grid Reference
1	218 Middleton Road	383694, 403341
2	203 Middleton Road	383583, 403090
3	150 Middleton Road	383597, 402985
4	130 Middleton Road	383603, 402860
5	21 Middleton Road	383594, 402328
6	Hamlock House	383557, 402193
7	Hamlock House	383532, 402189
8	154 Bury Old Road	383371, 402284
9	Seymour Apartments	383683, 402006
10	Eastern site boundary (adjacent to Middleton Road)	383573, 403016
11	Proposed Residential façade nearest Middleton Road	383508, 403032

Figure 5.1: Location of Existing Receptors Used in Modelling

5.2.6 Verification of Model results

It is recommended that the model results are compared with measured data to determine whether the model results need adjusting to more accurately reflect local air quality. This process is known as verification.

LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. Also, the guidance recommends that any adjustment factors applied to model results should be calculated based on verification using monitoring sites in a similar location i.e. roadside, intermediate or background sites.

The model has been used to predict NO₂ concentrations at the Cheetham Hill monitoring site.

The results of the comparison are presented below in Table 5.10.

Table 5.10: Comparison of Modelled and Monitored Concentrations (µgm⁻³)

Monitoring Location	Measured Concentrations	Modelled Concentrations	% Difference
Cheetham Hill	38.8	24.4	-37.2

The comparison of monitored and modelled concentrations indicates that the model is under-predicting local concentrations by 73%. It is therefore considered appropriate to adjust the model results to better represent local concentrations. The results of the modelling assessment have been adjusted using the methodology given in LAQM.TG(16). Full details of the verification and calculation of adjustment factors are provided in Appendix B.

5.2.7 Significance of Impacts

The guidance issued by EPUK & IAQM relates to Air Quality considerations within the planning process and sets criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Table 3.1. The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Table 5.11 below.

Table 5.11: Impact Descriptors for Individual Receptors

Long-term average concentration at receptor in assessment year	% Change in concentrations relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% of AQAL	Moderate	Major	Major	Major
AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Table 3.1 The percentage change in concentration should be rounded to a whole number The table should only be used with annual mean concentrations The descriptors are for individual receptors only: overall significance should be based on professional judgment When defining the concentrations as a percentage of the AQAL use the 'without scheme' concentration where there is a decrease in pollutant concentrations and the 'with scheme' concentrations for an increase The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value i.e. well below, the degree of harm is likely to be small. As exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year, it is impossible to define the new total concentrations without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.				

6 Construction Assessment

6.1 Assessing the Risk of Dust Effects

6.1.1 Site and Surroundings

A summary of the proposed development is provided in Section 2 of this report.

There are residential properties located to the north, west and south of the Site within 20 m of the Site boundary and to the east within 30 m. An assessment of construction related impacts in relation to human receptors is therefore considered necessary.

Significant impacts on ecologically sensitive receptors are unlikely to occur beyond 50 m from any construction activities. A review of data held on the DEFRA MAGIC website¹⁹ shows no sites designated as important for wildlife within 50 m of the Site therefore impacts on ecological receptors has not been considered any further within this assessment.

As discussed in Section 4, the PM₁₀ concentrations, taken from the DEFRA background maps, in the vicinity of the Site are expected to be below the relevant objective limits (Table 4.4). The data indicates background concentrations at the Site to be less than 35% of the objective. It is therefore expected, based on professional judgement, that concentrations at roadside locations are unlikely to be higher than 24 µg/m³, making the surrounding area low in sensitivity to human health impacts.

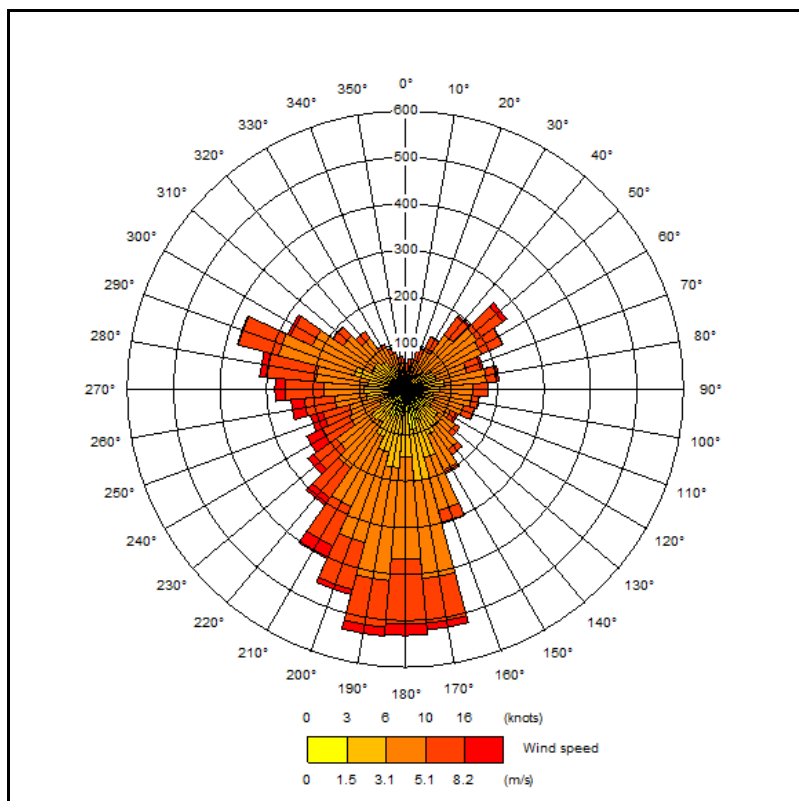
The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

A windrose from the Manchester Meteorological Station for 2016 is provided below in Figure 6.1, which shows that the prevailing wind is from the south. Receptors located to the north are therefore

¹⁹ <http://magic.defra.gov.uk/>

most at risk of experiencing impacts. Land-uses and properties to the north of the Site are predominantly residential which are highly sensitive to dust impacts.

Figure 6.1: Windrose from Manchester Meteorological Site (2016)



6.1.2 Risk Assessment of Dust Impacts

Defining the Dust Emission Magnitude

With reference to the criteria detailed in section 5.1, the dust emission magnitude for each of the categories demolition, earthworks, construction and trackout have been determined. These have been summarised in Table 6.1.

Table 6.1: Dust Emission Magnitude for each Activity

Activity	Criteria	Magnitude
Demolition	Volume of building to be demolished <4000 m ³ , and less than 10 m in height.	Small
Earthworks	Site area > 10,000 m ³ , >10 HDV on site,	Large
Construction	Total build volume 25,000 to 50,000m ³ , concrete and brick construction materials	Medium
Trackout	<25 HDV per day	Medium

Sensitivity of Surrounding Area

Using the criteria set out in Tables 5.2 and 5.3, the sensitivity of the surrounding area to impacts from dust emissions has been determined and are set out in Table 6.2.

Dust Soiling

There are more than 10 residential properties within 20 m of the Site, the sensitivity of the surrounding area in relation to dust soiling effects is therefore considered to be high.

It is expected that there will be less than 25 (>3.5t) movements per day during the construction phase which are expected to travel to and from the Site along Middleton Road. There are residential properties along all this route within 20 m of the road side within 250 m of the site access road. The sensitivity of the area to dust soiling effects from trackout is therefore considered to be high.

PM₁₀ Effects

As previously discussed, annual mean PM₁₀ concentrations in the vicinity of the Site are expected to be below 24 µg/m³. Based on the proximity of sensitive receptors to the site boundary and the local concentrations of PM₁₀ the sensitivity of the surrounding area is considered to be low with regards human health impacts.

Table 6.2: Sensitivity of Surrounding Area

Source	Dust Soiling	Human health
Demolition	High	Low
Earthworks	High	Low
Construction	High	Low
Trackout	High	Low

Defining the Risk of Impacts

The dust emission magnitude as set out in Table 6.1 is combined with the sensitivity of the area (Table 6.2) to determine the risk of both dust soiling and human health impacts, assuming no mitigation measures applied at site (Tables 5.5 to 5.7). The risk of impacts associated with each activity is provided in Table 6.3 below and has been used to identify site-specific mitigation measures, which are discussed in Section 6.2 and set out in Appendix A.

Table 6.3: Summary of Risk Effects to Define Site Specific Mitigation

Source	Dust Soiling	Human health
Demolition	Medium Risk	
Earthworks	Medium Risk	Low Risk
Construction	Medium Risk	Low Risk
Trackout	Medium Risk	Low Risk

6.2 Determining Appropriate Mitigation

The control of dust emissions from construction site activities relies upon management provisions and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without impacts to nearby properties.

An overall medium risk of impacts is predicted at adjacent receptors during construction of the proposed development. Appropriate mitigation measures for the Site have been identified following the IAQM guidance and based on the risk effects presented in Table 6.3. It is recommended that the measures set out in Appendix A are incorporated into a DMP and approved by GMCA prior to commencement of any work on site.

Based on the risk effects identified during each of the four types of activities and following implementation of the recommended mitigation measures, the significance of residual impacts during construction of the proposed development will be **negligible**.

7 Operational Impact Assessment

7.1 Model Results

NO₂ concentrations predicted at the selected existing receptor locations are provided in Table 7.1.

Predicted PM₁₀ concentrations are set out in Tables 7.2.

Table 7.1: Predicted Annual Mean NO₂ Concentrations (µg/m³)

Receptor	2015 Base	2019 Base	2019 With Development	Change in PM ₁₀ due to Development (as % of the AQAL)	Significance of Impact
1	32.0	33.0	33.1	0	Negligible
2	34.5	35.7	35.8	0	Negligible
3	31.9	32.9	33.0	0	Negligible
4	32.8	33.9	33.9	0	Negligible
5	36.3	37.8	37.8	0	Negligible
6	42.7	44.9	45.0	0	Negligible
7	44.9	47.8	47.8	0	Negligible
8	33.5	35.2	35.2	0	Negligible
9	28.7	29.8	29.9	0	Negligible
10	47.2	49.5	49.6	0	Negligible
11	23.1	23.4	23.5	0	Negligible

Table 7.2: Predicted Annual Mean PM₁₀ Concentrations (µg/m³)

Receptor	2015 Base	2019 Base	2019 With Development	Change in NO ₂ due to Development (as % of the AQAL)	Significance of Impact
1	14.8	14.9	14.9	0	Negligible
2	15.3	15.4	15.4	0	Negligible
3	14.8	14.9	14.9	0	Negligible
4	14.9	15.1	15.1	0	Negligible

Receptor	2015 Base	2019 Base	2019 With Development	Change in NO ₂ due to Development (as % of the AQAL)	Significance of Impact
5	15.6	15.7	15.8	0	Negligible
6	16.0	16.2	16.2	0	Negligible
7	16.2	16.5	16.5	0	Negligible
8	14.9	15.1	15.1	0	Negligible
9	14.1	14.2	14.2	0	Negligible
10	17.9	18.3	18.3	0	Negligible
11	13.2	13.2	13.2	0	Negligible

Table 7.3: Predicted Annual Mean PM₁₀ Concentrations (µg/m³)

Receptor	2015 Base	2019 Base	2019 With Development	Change in NO ₂ due to Development (as % of the AQAL)	Significance of Impact
1	9.5	9.6	9.6	0	Negligible
2	9.8	9.9	9.9	0	Negligible
3	9.5	9.6	9.6	0	Negligible
4	9.6	9.7	9.7	0	Negligible
5	10.0	10.1	10.1	0	Negligible
6	10.3	10.5	10.5	0	Negligible
7	10.4	10.6	10.6	0	Negligible
8	9.6	9.7	9.7	0	Negligible
9	9.1	9.2	9.2	0	Negligible
10	11.4	11.6	11.6	0	Negligible
11	8.6	8.6	8.6	0	Negligible

7.2 Assessment of Results

NO₂ Concentrations

The ADMS model is predicting annual mean NO₂ concentrations above the annual mean objective of 40 µg/m³ at receptors 6, 7 and 10 under all three assessment scenarios, but below the objective at all other receptor locations.

Receptors 6 and 7 represent existing residential facades while receptor 10 represents the eastern boundary of the development site.. The proposed new club house would be located at the eastern side of the Site. As detailed in Table 3.2, the annual mean objective only applies where members of the public would be exposed for extended periods of time i.e. residential properties, care homes, hospitals. The club house is not therefore considered representative of long-term exposure given the nature of its use. Nevertheless, due to the transient nature of people using the Site the 1-hour objective is considered relevant. However, as annual mean NO₂ concentrations at receptor 10 are predicted to be less than 60 µg/m³, it is considered unlikely that the 1-hour objective will be exceeded at this location.

The proposed development would locate the new residential properties within the western region of the Site. Receptor 11 represents the nearest residential façade to Middleton Road (i.e. worst-case exposure to local traffic emissions). The modelling assessment is predicting annual mean concentrations in the region of 23 µg/m³ at this receptor, less than 75% (well below) the objective limit. Based on the concentrations predicted at both receptors 10 and 11 the impact of the development in terms of new exposure is considered to be **negligible**.

Traffic generated by the operational development is predicted to increase annual mean NO₂ concentrations by no more than 0.1 µg/m³ at all the existing receptors (receptors 1 to 9). This equates to less than 1% of the AQAL and is classed as a **negligible** impact based on the criteria set out within Table 5.11.

Annual mean concentrations are predicted to be less than $60 \mu\text{g}/\text{m}^3$ at all 9 receptors therefore impacts on short-term NO_2 are also expected to be **negligible**.

PM₁₀ Concentrations

The ADMS model is predicting annual mean PM_{10} concentrations at less than 75% of the AQAL at all the selected receptor locations.

Using the methodology set out in section 5.2.1, the maximum number of days $>50 \mu\text{g}/\text{m}^3$ is predicted to range between 0 and 2 at all receptors.

The impact of the development in terms of new exposure to PM_{10} would be **negligible** given that concentrations at receptors 10 and 11 are predicted to be well below the objective limits.

Traffic generated by the proposed development is predicted to increase PM_{10} concentrations by a maximum of $0.1 \mu\text{g}/\text{m}^3$ which equates to less than 1% of the AQAL and is therefore considered to be of **negligible** significance.

Based on the predicted annual mean concentrations the number of exceedences of the 24-hour objective would not change as a result of the operational development. The impact of the development would therefore be **negligible** in terms of short-term PM_{10} concentrations.

PM_{2.5} Concentrations

The ADMS model is predicting annual mean $\text{PM}_{2.5}$ concentrations at less than 75% of the AQAL at all the selected receptor locations.

The impact of the development in terms of new exposure to $\text{PM}_{2.5}$ would be **negligible** given that concentrations at receptors 10 and 11 are predicted to be well below the annual mean objective limit.

Traffic generated by the proposed development is predicted to increase $\text{PM}_{2.5}$ concentrations by a maximum of $0.1 \mu\text{g}/\text{m}^3$ which equates to less than 1% of the AQAL and is therefore considered to be of **negligible** significance.

7.3 Mitigation

The operational development is predicted to have a negligible impact on NO₂ and PM₁₀ concentrations at existing sensitive receptors. No mitigation of operational impacts is therefore considered necessary.

However, as recommended within the EPUK/IAQM air quality planning guidance the development incorporates good practice principles in terms of design with all plots being constructed with a fabric first approach, ensuring high thermal performances and low energy consumption which will reduce potential on-site emissions. All properties will also be provided with secure cycle storage to encourage more sustainable travel.

Conclusion

Encon Associates were commissioned by Grays Architecture on behalf of Dappa Homes Ltd to carry out an air quality assessment in connection with the proposed redevelopment of the Whitehouse Club, Middleton Road, Crumpsall, Manchester, comprising the construction of a new club house and up to 74 residential properties on land to the rear of the club (the 'Site').

It is inevitable that with any development, demolition and construction activities will cause some disturbance to those nearby. Dust arising from most construction activities tends to be of a coarse nature, which through dispersion by the wind can lead to soiling of property including windows, cars, external paintwork and laundry. However, as well as giving rise to annoyance due to soiling of surfaces from dust emissions, there is evidence of major construction activities causing increases in long term PM₁₀ concentrations and in the number of days exceeding the short term PM₁₀ objective of 50 µgm⁻³.

The IAQM guidance on assessing impacts on air quality from construction activities and determining the likely significance has been used to determine the risk of impacts occurring during the construction of the development and to identify appropriate mitigation measures to be implemented on site to reduce dust emissions and associated impacts.

Due to the proximity of nearby residential receptors the Site is considered to have a medium risk of impacts with regards to dust soiling and PM₁₀ concentrations. However, following the implementation of appropriate mitigation measures impacts associated with the construction of the development are likely to be insignificant.

The assessment has used detailed modelling to predict the impact of operational traffic on local air quality. The assessment has predicted a negligible impact on local air quality. No mitigation of operational impacts is therefore considered necessary. However, as recommended within the EPUK/IAQM air quality planning guidance the development incorporates good practice principles in terms of design with all plots being constructed with a fabric first approach, ensuring high thermal

performances and low energy consumption which will reduce potential on-site emissions. All properties will also be provided with secure cycle storage to encourage more sustainable travel

The assessment shows that air quality does not pose a constraint to development of the site for the proposed uses.

Appendix A

Construction Mitigation Measures

It is recommended that the following measures are incorporated into a DMP and approved by GMCA prior to commencement of any work on site. The measures set out below summaries the measures set out within the IAQM guidance

This guidance should be read in conjunction with this report to obtain full details of all the measures that should be applied on site.

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, 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;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to GMCA when asked;
- increase frequency of site inspection 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 periods of dry or windy conditions;
- 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;

- 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 being re-used on site, cover as detailed below;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- produce a construction logistics plan to manage the sustainable delivery of goods and materials;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- 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 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;
- ensure effective water suppression is used during demolition operations;
- avoid explosive blasting, using appropriate manual or mechanical alternatives;
- bag and remove any biological debris or damp down such material before demolition;
- avoid bonfires and burning of waste materials;

- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- cover, seed or fence stockpiles to prevent wind whipping;
- avoid scabbling (roughening of concrete surfaces) if possible;
- avoid scabbling where possible;
- 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 or overfilling during delivery;
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust;
- use water-assisted dust sweepers on the access and local roads, to remove, as necessary, any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving the site are covered to prevent the escape of materials during transport;
- record all inspections of haul routes and any subsequent action in a site log book;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud).

Appendix B

Roads Modelling Verification

Most nitrogen dioxide (NO₂) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. The model has been run to predict annual mean road-NO_x concentrations at the Cheetham Hill diffusion tube site. The model is under-predicting concentrations at this monitoring locations. An adjustment factor has therefore been calculated following the methodology given below to apply to concentrations predicted by the ADMS model.

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x (Figure B1). The 'measured' road NO_x has been calculated from the measured NO₂ concentrations, by first converting the measured NO₂ into an equivalent measured NO_x using the NO_x from NO₂ DEFRA calculator, then subtracting the background value.

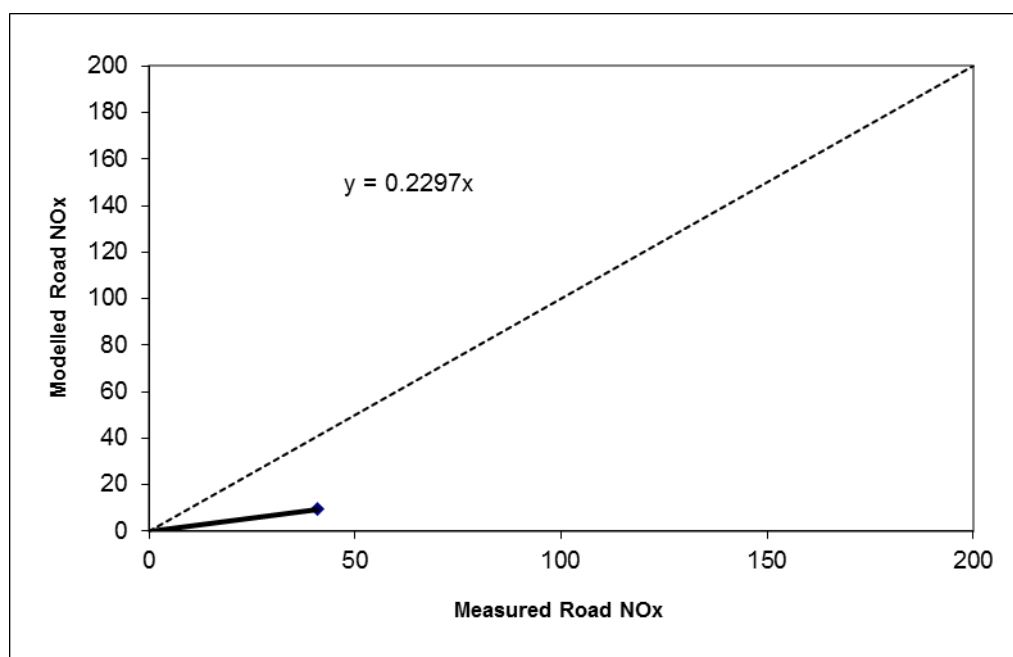


Figure B1: Comparison of Modelled Road NO_x to 'Measured' Road NO_x

A primary adjustment factor was then determined as the ratio between the measured road-NO_x contribution and the model derived road-NO_x contribution, forced through zero ($1/0.2297 = 4.35$).

This factor was then applied to the modelled road-NO_x concentration for each monitoring location to provide an adjusted modelled road-NO_x concentration. The background concentration was then added to these concentrations to determine the adjusted total modelled NO_x concentration.

The NO₂-road contribution to the total annual mean NO₂ concentration was then determined using the DEFRA NO_x:NO₂ calculator tool.

The total NO₂ concentration was then determined by adding the background NO₂ concentration to this calculated road contribution. Figure B2 shows the adjusted modelled total NO₂ vs monitored NO₂. The graph shows that $y = x$ therefore a secondary adjustment factor is not required.

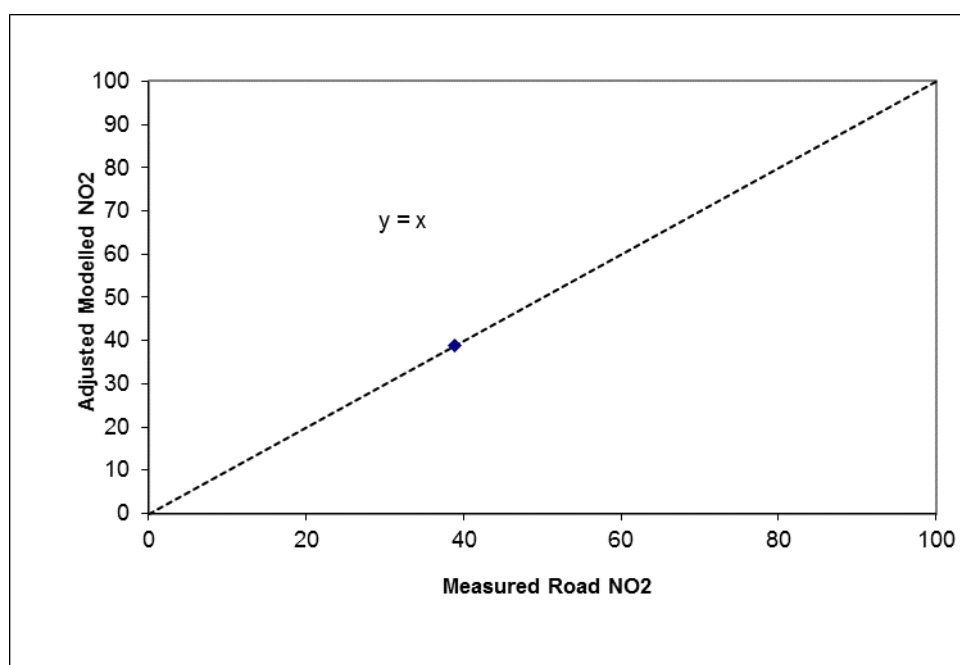


Figure B2: Comparison of Modelled NO₂ with Measured NO₂ before Secondary Adjustment.

The adjustment factor of 4.35 has been applied to the modelled NO_x-road concentrations predicted at all receptor locations. The predicted NO₂-road concentrations, calculated using the NO_x-NO₂ converter tool, have subsequently been added to background NO₂ concentrations to provide the final predicted annual mean NO₂ concentrations at each receptor.

There is no monitoring available to undertake verification of the PM₁₀ and PM_{2.5} concentrations.

Following guidance set out within LAQM.TG(16) the predicted PM results have been adjusted using the adjustment factor calculated for NO₂.