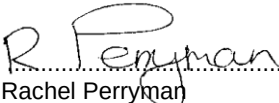
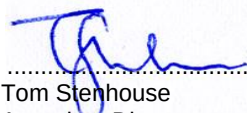


Capitol Park, Barnsley: Air Quality Assessment

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Prepared by: 
Rachel Perryman
Senior Environmental Scientist

Checked by: 
Duncan Urquhart
Principal Environmental Scientist

Approved by: 
Tom Stenhouse
Associate Director

Capitol Park, Barnsley: Air Quality Assessment

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5th Floor, 2 City Walk, Leeds, LS11 9AR
Telephone: 0113 391 6800 Website: <http://www.aecom.com>

Job No 60501921

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1.1 Introduction

AECOM was commissioned to undertake a local air quality assessment for a proposed development in Dodworth, Barnsley, in support of an Outline planning application. The proposed site is located on undeveloped land on Capitol Close and will consist of four units for industrial and office use and car parking for approximately 300 vehicles.

A qualitative construction phase assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM, 2014) 'Guidance on the assessment of dust from demolition and construction' to determine the potential dust and vehicle emission impacts. Taking into consideration the risk of potential impacts, appropriate mitigation measures were recommended.

A quantitative operational phase assessment has been undertaken in accordance with the Environmental Protection UK (EPUK)/IAQM 'Land Use Planning & Development Control: Planning for Air Quality' (EPUK/IAQM, 2015) and the Barnsley Metropolitan Borough Council 'Air Quality and Emissions Good Practice Planning Guidance' (BMBC, 2014). Detailed dispersion modelling, using the ADMS Roads software, was undertaken to determine the impact of traffic derived pollutant concentrations at nearby sensitive receptors. The assessment was conducted for the following scenarios:

1. 2015 Base;
2. 2021 Base;
3. 2021 Base + Committed Developments; and
4. 2021 Base + Committed Developments + Development

1.2 Site

The proposed development site is located to the north of Dodworth and west of the M1. The site is bounded by Whinby Road, Capitol Close and Higham Lane. Access to the site will be from Capitol Close. The nearest receptors to the proposed site are

the residential properties to the south on Thornely Avenue and Highams Lane as well as Lane Head Farm adjacent to the northern boundary of the site.

The proposed development will comprise of four units for industrial and office use, covering a total area of approximately 16,500m². Currently the site is undeveloped so no demolition works will be undertaken.

The proposed Masterplan is illustrated in Appendix A, Figure 1. However it should be noted that the Masterplan is indicative only, and that the planning application is for Outline permission with all matters reserved.

2 Legislation and Policy

2.1 European Air Quality Directives

The Air Quality Framework Directive (96/62/EC) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. Ambient concentration limit values for the specific pollutants are set through a series of Daughter Directives.

Following the Daughter Directives, Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force in 2008, and was transposed into national legislation in 2010 (The Air Quality Standards Regulations 2010 (Defra, 2010)). It consolidated existing air quality legislation and made provisions for Member States to postpone limit value attainment deadlines and allow an exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission (EC).

2.2 National Air Quality Legislation

The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all Local Authorities to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the UK Air Quality Strategy (AQS) (Defra, 2007) and the Air Quality Standards Regulations 2010 (Defra, 2010) (henceforth referred to as the "Air Quality Regulations") will not be met, the Local Authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves.

The UK AQS (AQS) (Defra, 2007) identifies nine ambient air pollutants that have the potential to cause harm to human health. These pollutants are associated with local air quality problems, with the exception of ozone, which is instead considered to be a regional problem. Similarly, the Air Quality Regulations set objectives, but for just seven of the pollutants that are associated with local air quality. These objectives aim to reduce the health effects of the pollutants to negligible levels.

The air quality objectives and limit values currently applicable to the UK can be split into two groups. Each has a different legal status and is therefore handled differently within the framework of UK air quality policy. These are:

- UK air quality objectives set down in regulations for the purposes of local air quality management; and
- European Union (EU) limit values transcribed into UK legislation for which compliance is mandatory.

2.3 Pollutants of Concern

2.3.1 Nitrogen Dioxide

The Government and the Devolved Administrations adopted two Air Quality Objectives for nitrogen dioxide (NO₂) which were to be achieved by the end of 2005. In 2010, mandatory EU air quality limit values on pollutant concentrations were to apply, although it continues to be breached in locations throughout the UK. The EU limit values for NO₂ in relation to human health are the same as the national objectives (Defra, 2007):

- An annual mean concentration of 40 µg/m³ (micrograms per meter cubed); and
- An hourly mean concentration of 200 µg/m³, to be exceeded no more than 18 times per year (99.79th percentile).

In practice, meeting the annual mean objective has been and is expected to be considerably more demanding than achieving the 1-hour objective. The annual mean objective of 40 µg/m³ is currently widely exceeded at roadside sites throughout the UK, with exceedances also reported at urban background locations in major conurbations. Exceedances are associated almost exclusively with road emissions.

There is considerable year-to-year variation in the number of exceedances of the hourly objective, driven by meteorological conditions which give rise to winter episodes of poor dispersion and summer oxidant episodes. Analysis of the relationship between 1-hour and annual mean NO₂ concentrations at roadside and kerbside monitoring sites indicate that exceedances of the 1-hour objective are unlikely where the annual mean is below 60 µg/m³ (Defra, 2016).

NO₂ and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as NO_x. All combustion processes produce NO_x emissions, largely in the form of NO, which is then converted to NO₂, mainly as a result of its reaction with ozone in the

atmosphere. Therefore the ratio of NO₂ to NO is primarily dependent on the concentration of ozone and the distance from the emission source.

2.3.2 Particulate Matter

Particulate matter is composed of a wide range of materials arising from a variety of sources. Particulate matter is typically assessed as total suspended particulates or as a mass size fraction.

This assessment considers the annual mean and daily mean air quality objectives, as specified in the AQS for England, Scotland, Wales and Northern Ireland (Defra, 2007). Two objectives have been adopted in England and Wales for PM₁₀ (fine particulate matter), which were to be achieved by the end of 2004:

- An annual mean concentration of 40 µg/m³ (gravimetric); and
- A 24-hour mean concentration of 50 µg/m³ (gravimetric) to be exceeded no more than 35 times per year (90.4th percentile).

One objective has been adopted for PM_{2.5} in England and Wales which is an annual mean concentration of 25 µg/m³ (gravimetric).

Both short-term and long-term exposure to ambient levels of particulate matter are consistently associated with respiratory and cardiovascular illness and mortality as well as other ill-health effects. Particles of less than 10 micrograms (µm) in diameter have the greatest likelihood of reaching the thoracic region of the respiratory tract.

It is not currently possible to discern a threshold concentration below which there are no effects on the whole population's health. Reviews by World Health Organisation and the Committee on the Medical Effects of Air Pollutants (COMEAP, 1998) have suggested exposure to a finer fraction of particles (PM_{2.5}, which typically make up around two thirds of PM₁₀ emissions and concentrations) give a stronger association with the observed ill health effects, but also warn that there is evidence that the coarse fraction (between PM₁₀ – PM_{2.5}) also has some effects on health.

2.3.3 Construction Dust

Dust is defined as all particulate matter up to 75 µm in diameter and comprising both suspended and deposited dust, whereas PM₁₀ is a mass fraction of airborne particles of diameter of 10 µm or less. The health effects associated with dust include eye, nose and throat irritation in addition to the nuisance caused by deposition on cars, windows and property. Dust and PM₁₀ emissions arise from a number of sources, so construction activities and emissions from vehicles associated with the development should be considered.

2.4 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and concisely sets out national policies and principles on land use planning. Paragraph 109 of the NPPF states that:

"The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability..."

Annex 2 of the NPPF defines 'Pollution' as

"Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light".

There are both national and local policies for the control of air pollution and local action plans for the management of local air quality within the Barnsley Metropolitan Borough Council area. The effect of the proposed development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 124 of the NPPF 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.”

The Planning Practice Guidance (PPG) was updated in March 2014 (CLG, 2014), with specific reference to air quality. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely effect upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition dust can also be a planning concern, for example, because of the effect on local amenity.

When deciding whether air quality is relevant to a planning application the PPG states that a number of factors should be taken into consideration including if the development will:

- Significantly affect traffic in the immediate vicinity of the site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal results in construction sites that would generate large Heavy Goods Vehicle (HGV) flows over a period of a year or more;
- Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality; and
- Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations.

The PPG states:

‘The air quality assessment undertaken should be proportionate to the nature and scale of the development proposed and the level of concern about air quality. Mitigation options, where necessary, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented.’

2.5 Barnsley Metropolitan Borough Council Core Strategy

Barnsley Core Strategy was adopted in September 2011. The following policies relate to air quality:

CSP 28 Reducing the Impact of Road Travel:

We will reduce the impact of road travel by:

- *Developing and implementing robust, evidence based air quality action plans to improve air quality;*
- *Working with our sub regional partners, fleet and freight operators to improve the efficiency of vehicles and goods delivery, and reduce exhaust emissions; and*
- *Implementing measures to ensure the current road system is used efficiently.*

CSP 40 Pollution Control and Protection:

Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.

Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate.

CSP 41 Development in Air Quality Management Areas:

Development in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), or that any such harmful effects can be mitigated against.

We will only allow residential development in air quality management areas, where the developer provides an assessment that shows living conditions will be acceptable for future residents.

We will only allow development in air quality management areas which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality.

2.6 Barnsley Metropolitan Borough Council Air Quality Action Plan

In accordance with the LAQM.TG (16) guidance, Barnsley Metropolitan Borough Council has prepared an air quality action plan (BMBC, 2012) following the declaration of the air quality management areas (AQMA). The AQAP includes 22 measures to improve air quality. These include:

- A low emission strategy package;
- Barnsley MBC Travel Plans
- ECO Stars HDV recognition scheme
- Targeted vehicle emissions testing
- BMBC will continue to ensure that air quality is considered with regards to new development. The council will look for evidence that developers have taken appropriate steps to mitigate pollution impacts. Where appropriate, the council will seek to gain air quality improvements using Section 106 agreements;
- BMBC will ensure that all major traffic schemes are assessed for air quality impacts against the NAQS objectives;
- BMBC will continue to work with developers and employers to improve sustainable transport links to new economic and residential developments;
- Encourage uptake of lower emission vehicles and alternative fuels by participating in the LTP funded South Yorkshire 'Low carbon re-fuelling infrastructure' project.

2.7 Assessment Guidance

The results of the assessment have been analysed and interpreted with reference to:

- IAQM (2014) Guidance on the assessment of dust from demolition and construction;
- EPUK/IAQM (2015) Land Use Planning & Development Control: Planning for Air Quality;
- NPPF (2014); and,
- Barnsley Metropolitan Borough Council (2014) Air Quality and Emissions Good Practice Planning Guidance.

3 Assessment Methodology

3.1 Scope of Assessment

The potential for air quality impacts have been assessed for two distinct phases:

- The 'construction' phase: during which the greatest impact is expected to be from dust; and
- The 'operational' phase: when the impacts will be primarily associated with vehicle emissions.

3.2 Construction Phase

The impacts associated with the construction phase of the proposed development have been qualitatively assessed with reference to the IAQM published 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014).

According to the IAQM, the main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM₁₀ concentrations, as a result of dust generating activities on site; and
- An increase in concentration of airborne particles and NO₂ due to exhaust emissions from diesel powered vehicles and equipment on site and vehicles accessing the site.

Information regarding the number of construction phase Heavy Goods Vehicle (HGV) (>3.5 tonnes) movements associated with the proposed development were unknown at the time of writing. According to the EPUK Guidance (EPUK, 2010) criteria, a quantitative construction phase assessment of potential emissions from vehicles should only be undertaken for, 'large, long term construction sites that would generate large HGV flows (>200 movements per day) over a period of a year or more'. Taking into consideration the scale of the site and the proposed works, it is very unlikely that the EPUK Guidance criteria would be exceeded. Therefore a quantitative assessment is not considered to be required and the impacts due to vehicle emissions during this phase should be considered insignificant.

It is noted that a development has been granted planning permission to the east of Capitol Close. It is unknown the exact timings of the construction phase of this development; however, if it coincides with the construction phase of the assessed development then the number of construction phase vehicles is likely to still be below the EPUK Guidance criteria to undertake a quantitative assessment.

Activities on construction sites are classified into four types to reflect their different potential impacts:

- Demolition;
- Earthworks;
- Construction; and
- Track-out (The transportation 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).

The following steps, as defined by the IAQM, were followed:

- STEP 1 Screen the requirement for a detailed assessment. Human and ecological receptors were identified and distance to the site and construction routes were determined;
- STEP 2 Assess the risk of dust impacts. The potential risk of dust impacts occurring for each activity was determined, based on the magnitude of the potential dust emissions and the sensitivity of the area;
- STEP 3 Identify the need for site-specific mitigation. Based on the risk of impacts occurring, site specific mitigation measures were determined; and
- STEP 4 Define impacts and their significance. The significance of the potential residual dust impacts (taking mitigation into account) for each activity was determined.

Further details are provided in Appendix B.

3.3 Operational Phase

The local air quality assessment has been undertaken in accordance with the BMBC (2014) 'Air Quality and Emissions Good Practice Planning Guidance' as well as the EPUK/IAQM (2015) 'Land-use planning & development control: planning for air quality' guidance.

According to the BMBC guidance document an air quality assessment within the borough should follow a 3 stage process:

- Stage 1: Determining the classification of the development proposal;
- Stage 2: Assessing and quantifying the impact on local air quality; and
- Stage 3: Determining the level of mitigation required by the proposal to meet Local Development Plan requirements.

3.3.1 Stage 1: Development Type Classification

Using adapted criteria from the Department for Transport guidance which determines when a Transport Assessment is required, three levels of development type classification are identified (minor, medium or major). The criteria is summarised below:

Table 1: Criteria for Development Classification

Land Use	Description	Transport Assessment Required
Business (B1)	a) Offices other than in use within Class A2 (financial and professional) b) Research & Development c) Light Industry	>2,500 m ² Gross Floor Area (GFA)
General Industry (B2)	General Industry (other than B1)	>4000 m ² GFA
Storage or Distribution (B8)	Storage or distribution centres – wholesale warehouses, distribution centres and repositories	>5000m ² GFA
Other		
Any development generating 30 or more 2-way vehicle movements in any hour		
Any development generating 100 or more 2-way vehicle movements per day		
Any development proposing 100 or more parking spaces		
Any relevant development proposed in a location adjacent to an air quality management area (AQMA)		

Table 2: Additional Trigger Criteria for Major Developments

<ul style="list-style-type: none"> • Where the proposed development falls within the Town and Country Planning (EIA) (England and Wales) Regulations 2011 and includes air quality and/or transport as a specific likely impact. • Proposals that include additional HGV movements by more than 10% of total trips. • Where significant demolition and construction works are proposed.
--

Minor Proposal: developments proposals that fall below the above criteria in Table 1

Medium Proposals: development proposal that meet the criteria in Table 1;

Major proposals: Development that meet the criteria in Tables 1 and 2.

The intended use of the proposed units will be for industrial and office purposes; however, further information regarding the type of industrial use is unknown at this stage. It is estimated that 930 m² of GFA will be for office use with the remaining 15,570 m² for industrial use. The area intended for industrial use exceeds the criteria in Table 1, regardless of its specific use.

The proposed development is anticipated to generate an additional 880 vehicle movements on the local road network per day of which approximately 10% will be HGV movements (further details are provided in Section 3.3.2).

With consideration for the overall scale of the proposed development and contribution to the local traffic flow, the Major development triggers have not been met and therefore it is considered that the proposed development should be classified as 'Medium'.

3.3.2 Stage 2: Air Quality Impact Assessment

The BMBC guidance states that for Medium classified developments an assessment should be undertaken to determine the likelihood of introducing additional exposure, and to determine the level of mitigation required to make the development acceptable.

Chris Shields, Technical Officer (pollution control) Regulatory Services at BMBC, requested that a quantitative assessment should be undertaken in accordance with the EPUK/IAQM (2015) Guidance to determine the local air quality impacts at existing

sensitive receptors due to the proposed development. It should be noted that this is not a requirement of a 'Medium' development as defined by the BMBC guidance; however, it does allow for a more thorough assessment of the potential air quality impacts of the development.

As discussed, a detailed level air quality assessment has been undertaken with reference to the EPUK/IAQM (2015) 'Land-Use Planning & Development Control: Planning for Air Quality' guidance. ADMS roads modelling software has been used to predict concentrations of road transport derived pollutants, NO₂, PM₁₀ and PM_{2.5}, at selected sensitive receptors. The following scenarios were assessed:

1. 2015 Base;
2. 2021 Base;
3. 2021 Base + Committed Development; and
4. 2021 Base + Committed Development + Development

In order to ensure that the impact of committed developments was included in the assessment, Scenario 4 was compared to Scenarios 2 and 3. This approach is in accordance with the EPUK/IAQM Guidance.

Emissions Modelling

This assessment has used the latest version of dispersion model software 'ADMS-Roads' (v4.0) to quantify pollution levels at selected receptors. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (CERC, 2014).

The emission factors applied to the model were derived from the UK Emission Factor Toolkit v6.0.2; however, a cautious approach was taken and it was assumed that there were no improvements in vehicle emissions between 2015 and 2021. Such an approach is considered to be prudent given current concern regarding 'real world' NO₂ emissions from diesel-fuelled vehicles. As a result absolute concentrations are likely to be over-predicted in the 2021 scenarios, and this has been considered when analysing the results of the assessment.

Details of general model conditions are provided in Table 3.

Table 3: General ADMS-Roads Model Conditions

Variables	ADMS Roads Model Input
Surface roughness at source	0.5
Minimum Monin-Obukhov length for stable conditions	30
Terrain types	Flat
Receptor location	See Table 4 and Appendix D
Emissions	NO ₂ , PM ₁₀ and PM _{2.5}
Emission factors	UK Emission Factor Toolkit v6.0.2
Meteorological data	Robin Hood Airport, Doncaster 2014
Emission profiles	No
Receptors	Selected receptors only
Model output	Long-term annual mean NO _x concentrations
	Long-term annual mean PM ₁₀ concentrations
	Long-term annual mean PM _{2.5} concentrations

Conversion of NO_x to NO₂

The proportion of NO₂ in NO_x varies greatly with location and time according to a number of factors including the amount of oxidant available and the distance from the emission source. NO_x concentrations are expected to decline in future years due to falling emissions, therefore NO₂ concentration will not be limited as much by ozone and consequently it is likely that the NO₂/NO_x ratio will in the future increase. In addition, a trend has been noted in recent years whereby roadside NO₂ concentrations have been increasing at certain roadside monitoring sites, despite emissions of NO_x falling. The direct NO₂ phenomenon is having an

increasingly marked effect at many urban locations throughout the UK and must be considered when undertaking modelling studies.

In this study modelled NO_x values were converted to NO₂ using the 'NO_x to NO₂' calculator, released in June 2014, and available at the Air Quality Archive (AQA, 2014). The year and region for which the modelling has been undertaken are specified and local factors, such as an appropriate factor of NO_x emitted as NO₂, are used in the calculation.

Traffic Emissions

Traffic data in the form of Annual Average Daily Traffic (AADT) flows, Heavy Goods Vehicle (HGV; vehicles greater than 3.5t) flows and average vehicle speeds were required for each road link included in the model domain to predict pollutant concentrations arising from traffic. The traffic data applied to the assessment is provided in Appendix C.

The proposed development is anticipated to generate an additional 880 vehicle movements on the local road network per day, of which approximately 88 (10%) will be HGV movements. Access to the site will be from Capitol Close, which is a no through road and therefore all vehicles associated with the development will use Whinby Road to gain access to the wider road network. At the roundabout between Whinby Road and Capitol Close, approximately 20% are anticipated to gain access to and from Capitol Close from the west (on Whinby Road) and 80% to and from the east. At the junction 37 roundabout vehicles associated with the development are predicted to split fairly evenly regarding their direction of travel with 40% travelling into Barnsley via Dodworth Road, 40% travelling southwards on the M1 and the remaining 20% travelling northwards on the M1.

HGV percentages were provided for all roads for the base year scenarios and it was estimated that 10% of the traffic movements associated with the development would be HGVs movements. The traffic speeds have been estimated from national speed limits, but modified to account for slowing at junctions.

Traffic data were provided by AECOM Transportation for all the scenarios in Section 3.3.2; however, base year traffic data was provided for 2016 rather than the assessed base year of 2015. Traffic flows are likely to have increased slightly between 2015 and 2016, although the change was considered to be insignificant. AECOM Transportation provided traffic data for all roads except the M1, where traffic flows for 2015 were derived from the Department for Transport (DfT, 2016). AECOM Transportation provided a suitable growth factor to apply to the 2015 traffic flows on the motorway to derive 2021 data.

The following committed developments were included in the traffic data provided:

- Residential development for 163 properties on Moorland Avenue, east of the M1 (Taylor Wimpey);
- Industrial development on Capitol Close, opposite the proposed site considered in this assessment

Receptors

Air quality receptors susceptible to changes in air quality typically include residential properties, schools, care homes, hospitals and designated ecological sites.

Seven sensitive receptors were selected, at which pollutant concentrations were modelled, all of which are residential properties (Table 4 and Appendix D, Figure 1). The receptors were selected based on the traffic data and their proximity to the roads so as to ensure that the greatest impacts of the development were modelled.

There are no ecological receptors located within 200 m of the Site or roads included in the assessment.

Table 4: Modelled Receptors

ID	Location	Height (m)	X	Y
1	Barnsley Road, north	1.5	432062	405849
2	Whinby Road/Dodworth Road Roundabout	1.5	432114	405833
3	Dodworth Road west	1.5	432288	405925
4	Dodworth Road/Broadway	1.5	432655	406128
5	Dodworth Road	1.5	432960	406315
6	Dodworth Road/May Terrace	1.5	433187	406343
7	Dodworth Road east	1.5	433633	406271

Meteorological Data

The meteorological dataset used in the assessment was recorded at the meteorological station at Robin Hood airport, Doncaster, located approximately 35 km to the south east of the site. The meteorological site is considered to be representative of regional meteorological conditions and sufficient to satisfy the requirements of this assessment.

The wind rose for this site and further details are provided in Appendix E.

Model Verification

When using modelling techniques to predict concentrations, it is necessary to make a comparison between the modelling results and the monitoring data, to ensure that the model is reproducing actual observations. The accuracy of the future year modelling results are relative to the accuracy of the base year results, therefore greater confidence can be placed in the future year concentrations if good agreement is found for the base year.

Modelling results are subject to systematic and random error; systematic error arises due to many factors, such as uncertainty in the traffic data and the composition of the vehicle fleet, and uncertainty in the meteorological dataset. This can be addressed and, if necessary, adjusted for by comparison with monitoring data.

BMBC undertakes NO₂ monitoring using passive diffusion tubes at ten locations within the study area. Comparison of the modelled and monitored 2015 concentrations using the methodology defined in LAQM.TG(16) determined that an adjustment factor of 1.8 should be applied to the model outputs. It was recognised that the concentrations recorded at Sites DT20 and DT79 increased substantially between 2014 and 2015 (see Section 4.2.2). As these data were used for the purposes of model verification, then it is likely that they will increase the tendency of the model to over-predict slightly, which would be a cautious approach to the assessment.

Further details of the verification procedure are provided in Appendix F; the monitoring site locations are indicated in Appendix G.

Significance Criteria

With regard to road traffic emissions, the change in pollutant concentrations, with respect to the baseline concentrations, has been described at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations in the modelled scenarios is also described, and this is used to identify the risk of the Air Quality Objective values being exceeded in each scenario.

For consideration of a change in annual mean concentrations of a given magnitude, the EPUK/ IAQM (2015) have jointly published recommendations for describing the effects of such impacts at individual receptors, as set out in Table 5.

Table 5: Effects Descriptors at Individual Receptors – Annual Mean NO₂ and PM₁₀

Annual Mean Pollutant Concentration at Receptor in Assessment Year (µg/m ³)	Change in Annual Mean Concentration of NO ₂ / PM ₁₀ (µg/m ³)				
	< 0.2	0.2 – 0.6	0.6 – 2.2	2.2 - 4	> 4
≤30.2	Negligible	Negligible	Negligible	Minor	Moderate
30.2 – 37.8	Negligible	Negligible	Minor	Moderate	Moderate
37.8 – 41.0	Negligible	Minor	Moderate	Moderate	Major
41.0 – 43.8	Negligible	Moderate	Moderate	Major	Major
≥43.8	Negligible	Moderate	Major	Major	Major

Table 5 has been adapted from the EPUK / IAQM guidance. 'Major' is used instead of 'Substantial', and 'Minor' in place of 'Slight'. The description of each significance level, as well as the terms 'Moderate' and 'Negligible' remain the same.

The EPUK / IAQM guidance includes seven explanatory notes to accompany the terminology for the effect descriptors. In particular it is noted that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. Additionally, it is noted that 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 objective value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the objective value, rather than being exactly equal to it.

A change in predicted annual mean concentrations of NO₂ or PM₁₀ of less than 0.5% (0.2 µg/m³) is considered to be so small as to be negligible. A change (impact) that is negligible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

A change in predicted annual mean concentrations of PM_{2.5} of less than 0.5% (0.12 µg/m³) is considered to be so small as to be negligible. A change (impact) that is negligible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

The EPUK / IAQM guidance indicates that it is the intention of the effect descriptors for smaller changes in pollutant concentrations to capture the potential risk associated with cumulative development. Changes of 1% of a relevant Air Quality Objective could, under the EPUK / IAQM guidance, result in slight to moderate air quality effects at individual receptors. In practice this assessment inherently considers cumulative impacts through the use of traffic data, Defra background concentrations and predictions at committed developments. Therefore, it is considered highly unlikely that significant air quality impacts could occur with the development for changes in concentrations of 1%.

Additionally, the EPUK / IAQM guidance also includes the potential for minor to major air quality effects as a result of changes in pollutant concentrations between 2 and 5% of relevant Air Quality Objectives. For annual average NO₂ concentrations, this relates to changes in concentrations ranging from 0.6 – 2.1µg/m³. In practice, changes in concentration of this magnitude, and in particular changes at the lower end of this band are likely to be very difficult to distinguish through any post operational monitoring regime due to the number of sources of NO₂ in an urban environment and the inter annual effects of varying meteorological conditions. Therefore, in the overall evaluation of significance the potential for significant air quality impacts within this band will be considered in this context.

Changes in concentration of more than 5% (the two highest bands) are considered to be of a magnitude which is far more likely to be discernible and as such carry additional weight within the overall evaluation of significance for air quality.

All relevant receptors that have been selected to represent locations where people are likely to be present are based on Air Quality Objectives that are relevant to public exposure. The Air Quality Objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, the elderly or people who are unwell. As such the sensitivity of receptors was considered in the definition of the Air Quality Objective values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

Overall Determination of Significance

The significance of all the reported impacts is then considered for the development in overall terms. The potential for the development to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change in the likelihood of future achievement of the Air Quality Objective values for the following pollutants:

- Annual mean nitrogen dioxide (NO₂) concentration of 40 µg/m³;
- 1-hour mean NO₂ concentration of 200 µg/m³ not to be exceeded on more than 18 times per year;
- Annual mean particulate matter (PM₁₀) concentration of 40 µg/m³;
- 24-hour mean PM₁₀ concentration of 50 µg/m³ not to be exceeded on more than 35 days per year; and
- Annual mean fine particulate matter (PM_{2.5}) concentrations of 25 µg/m³.

The achievements of local authority goals for local air quality management are directly linked to the achievement of the Air Quality Objective Values described above and as such this assessment focuses on the likelihood of future achievement of the Air Quality Objective Values.

In terms of the significance of the consequences of any adverse impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'substantial' this is deemed to be 'significant'. Effects found to be 'minor' are considered to be 'not significant', although they may be a matter of local concern. 'Negligible' effects are considered to be 'not significant'.

3.3.3 Stage 3 Mitigation

The outcome of Stage 2 identifies the level of air quality impact which should then be used to determine the level of mitigation required to negate the potential effects upon health and the local environment. .

3.4 Consultation

Chris Shields, Technical Officer (pollution control) Regulatory Services at BMBC, stated that due to the proximity of the proposed development to two air quality management areas, an air quality assessment is required.

Mr Shields requested that the assessment should take account of the requirements of the Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance with regard to required mitigation, along with an assessment of change of air pollution concentrations due to the proposed development, especially within the AQMAs, in line with assessment procedures as detailed within Land-Use Planning and Development Control: Planning for Air Quality (EPUK/IAQM, 2015, v1.1).

Chris Shields was also contacted on 18th May 2016 to request 2015 diffusion tube monitoring data, which was provided.

4 Baseline

4.1 Local Air Quality Management

The local air quality management review and assessment responsibilities for the area around the proposed development site are undertaken by Barnsley Metropolitan Borough Council (BMBC).

BMBC have declared seven Air Quality Management Areas (AQMA) due to exceedences of the annual mean objective for NO₂:

1. M1 motorway, 100 m either side of the central reservation within the Barnsley Borough;
2. A628 Dodworth Road;
3. Junction of A61 Wakefield Road and Burton Road;
4. A61 Harborough Hill Road;
5. Junction of A633 Rotherham Road and Burton Road;
6. A616 passing through Langsett; and
7. Junction of A61 Sheffield and A6133 Cemetery Road

AQMAs 1 and 2 are located within the study area, with AQMA 1 located approximately 140 m to the east and AQMA 2 located approximately 440 m to the south east of the site. The locations of the AQMAs are illustrated in Appendix G Figure 4.

4.2 Pollutant Monitoring

BMBC undertakes monitoring of NO₂ and PM₁₀ using both continuous and passive techniques.

4.2.1 Continuous Monitoring

BMBC operates 4 continuous analysers which monitor NO₂ and PM₁₀. The nearest continuous monitoring location to the proposed site is AM3, Barnsley A628, which is a roadside site located approximately 850 m to the east of the site. Only NO₂ is monitored at this location. The nearest site at which PM₁₀ (and NO₂) is monitored is AM2, Barnsley A635, which is a roadside site located approximately 4.3 km to the south east.

Annual mean NO₂ concentrations have been below the objective between 2011 and 2015 at both sites, except in 2011 at AM2. Annual mean NO₂ concentrations have generally remained stable at AM3 between 2011 and 2014; however, they increased significantly in 2015. In contrast annual mean NO₂ concentrations have steadily decreased at AM2 between 2011 and 2014. The number of exceedences of the 1 hour standard was well below the permitted 18 exceedences per year at both monitoring sites between 2011 and 2015.

Table 6: Continuous Monitoring, NO₂ Concentrations

Location		Type	Within AQMA?	Annual Mean NO ₂ (µg/m ³) (Exceedences of the 1 hour standard are indicated in brackets)				
				2011	2012	2013	2014	2015
AM3	Barnsley A628	Roadside	No	33(0)	34(0)	32(0)	31(0)	38 (2)
AM2	Barnsley A635	Roadside	Yes	41(2)	39(11)	37(0)	35(1)	-

Exceedences of the objective are highlighted in bold, No data were available for NO₂ at AM2 in 2015.

Continuous monitoring of PM₁₀ commenced in 2014 at AM2. Annual mean PM₁₀ concentrations have been below the objective in 2014 and 2015 and exceedences of the 24 hour standard were below the permitted 35 exceedences per year.

Table 7: Continuous Monitoring, PM₁₀ Concentrations

Location		Type	Within AQMA?	Annual Mean PM ₁₀ (µg/m ³) (Exceedences of the daily hour standard are indicated in brackets)	
				2014	2015
AM2	Barnsley A635	Roadside	Yes	25(13)	20 (9)

4.2.2 Diffusion Tube Monitoring

BMBC currently operates an extensive network of 205 passive diffusion tubes across the district. The annual mean NO₂ concentrations recorded at the monitoring locations near to the site are provided in Table 8, with their locations illustrated in Appendix G, Figure 4.

Generally annual mean NO₂ concentrations decreased between 2012 and 2013 and then increased between 2013 and 2015. In 2015, six sites recorded an exceedance of the objective compared to five sites in 2014 and four sites in 2013. All these sites are located on Dodworth Road and within the AQMA.

The highest concentrations in 2015 were recorded at Sites 78 and 79 located on Dodworth Road. Sites 20, 80 and 98, all located on Dodworth Road recorded exceedances of the objective in 2015 but not in 2014. Sites 20, 78 and 79 all recorded a significant increase in concentration in 2015 compared to the previous years.

Annual mean NO₂ concentrations at Sites 73, 74 and 75, co-located with the continuous monitor (AM3), decreased between 2012 and 2015. The concentration recorded at these sites was notably higher than that recorded by the continuous monitoring unit.

It was recognised that the concentrations recorded at Sites DT20, DT78 and DT79 increased substantially between 2014 and 2015. As these data were used for the purposes of model verification (see Section 3.3.2 and Appendix F), then it is likely that they will increase the tendency of the model to over-predict slightly, which would be a cautious approach to the assessment.

Monitoring ceased at Sites 81, 82 and 85 in 2014 due to continued annual mean NO₂ concentrations recorded below the objective.

Table 8: Passive Monitoring, NO₂ Concentrations

Location		Classification	Within AQMA?	Annual Mean NO ₂ (µg/m ³)			
				2012	2013	2014	2015
20	Dodworth Road, SE of Pogmoor Crossroads	Roadside	Yes	36.9	34.9	37.3	49.8
73	Pogmoor Crossroads	Roadside	Yes	41.7	39.2	40.7	39.5
74	Pogmoor Crossroads	Roadside	Yes	43.0	41.0	39.9	37.1
75	Pogmoor Crossroads	Roadside	Yes	41.7	40.4	40.6	39.2
76	249 Dodworth Rd West Crossroads	Roadside	Yes	41.4	38.4	40.0	44.4
77	Post Office, Crown Hill Road	Roadside	Yes	34.3	30.8	34.1	30.9
78	305 Dodworth Road	Roadside	Yes	47.1	42.2	45.9	58.1
79	315 Dodworth Road	Kerbside	Yes	43.0	40.8	41.7	53.2
80	329 Dodworth Road	Roadside	Yes	42.3	39.9	39.1	44.5
81	M1 Junction 37	Roadside	Yes	32.1	30.2	31.2	-
82	30 Barnsley Road	Roadside	No	31.2	28.9	31.0	-
85	Woodbine Cottages, Barnsley Road	Roadside	No	34.1	32.2	34.1	-
98	Dodworth Road, Pogmoor	Roadside	Yes	41.0	37.5	38.2	44.7

NB exceedances of the objective are highlighted in Bold.

4.3 Background Concentrations

A large number of sources of air pollutants exist which individually may not be significant, but collectively, over a large area, need to be considered. The concentrations calculated by the model due to vehicle emissions can then be added to these background concentrations to give the total concentration.

4.3.1 Monitored Background Concentrations

According to BMBC 2015 Updating and Screening Assessment (BMBC, 2015), BMBC undertakes monitoring at four background locations; one continuous monitoring site and three passive diffusion tubes. The annual mean NO₂ concentrations recorded at these sites are provided in Table 9. It should be noted however that DT2 and DT89 are located within 30 m of the M1, hence the

higher concentrations compared to AM4 and DT21. LAQM.TG(16) (Defra, 2016) defines a background site as 'a location distanced from sources and therefore broadly representative of city-wide background conditions'. Emissions from the M1 are very likely to have contributed to the higher concentrations at these sites and therefore are not representative of background concentrations.

Annual mean NO₂ concentrations have decreased slightly at AM4 but remained stable at DT21. Similar concentrations were recorded at these sites in 2012 and 2013, although in 2014 and 2015, concentrations at DT21 were slightly higher than at AM4.

No monitoring of PM₁₀ was undertaken by BMBC at a background location.

Table 9: Monitored Background NO₂ Concentrations

Location		Type	Distance from Site	Annual Mean NO ₂ (µg/m ³)			
				2012	2013	2014	2015
AM4	Barnsley Gawber	Continuous Monitor	1.7 km	21	22	19	18.6
DT2	5 Moor Lane, Birdwell	Diffusion Tube	6 km	32.5	31.0	32.8	32.7
DT21	Mexborough Road	Diffusion Tube	15.2 km	22.6	22.2	23.9	23.7
DT89	Lansdowne Crescent, Darton	Diffusion Tube	3.4 km	31.6	28.8	30.3	29.6

4.3.2 Modelled Background Concentrations

Modelled estimations of background air quality concentrations are provided by Defra (Defra, 2011) for each 1 km square in the UK for each year between 2010 and 2030. Road sources were discounted from the total background pollutant concentrations, to give 'adjusted' values. Estimated average background concentrations for the Ordnance Survey grid square containing the development site are provided in Table 10 for 2015 and 2021. These data were downloaded in May 2016.

Table 10: Modelled Background Pollutant Concentrations (µg/m³)

Pollutant	2015		2021	
	Total	Adjusted	Total	Adjusted
NO ₂	14.8	12.7	11.4	9.8
PM ₁₀	15.0	14.9	14.4	14.3
PM _{2.5}	10.3	10.2	9.7	9.7

4.3.3 Summary

For modelling purposes it is preferential to use actual monitored rather than modelled background concentrations. For the reasons discussed in Section 4.3.1, monitoring sites DT2 and DT89 were considered to be unsuitable. The continuous monitoring site at Barnsley Gawber is located closer to the proposed site than DT21 and therefore the NO₂ concentrations recorded at this site in 2015 were applied to the assessment. As no monitoring of PM₁₀ or PM_{2.5} was undertaken by BMBC at background locations, the modelled 2015 concentrations in Table 10 were applied to the assessment.

A cautious approach was taken and it was assumed that there was no reduction in background concentrations between 2015 and 2021. The 2015 and 2021 background concentrations used the assessment are provided in Table 11.

Table 11: Background Pollutant Concentrations Applied to the Model

Pollutant	2015	2021
NO ₂	18.6	18.6
PM ₁₀	14.9	14.9
PM _{2.5}	10.2	10.2

5 Predicted Impacts

5.1 Construction Phase

As discussed in the assessment methodology, a four step process was followed to determine the risk of potential impacts during the construction phase.

5.1.1 STEP 1: Screen the Requirement for a more Detailed Assessment

The proposed site is located on undeveloped land to the west of the M1. The nearest sensitive receptors to the proposed site is Lane Head Farm, located adjacent to the northern boundary of the site as well as the residential properties to the south on Thornely Avenue and Highams Lane, the nearest of which is approximately 40 m away.

In addition, a hotel is located approximately 150 m to the south east and a restaurant is located approximately 230 m to the south east.

There are no ecological receptors, as defined by the IAQM Guidance (IAQM, 2014), located within 50 m of the proposed development site.

Taking the above into consideration, in accordance with the IAQM Guidance there is a need to proceed to a detailed assessment.

5.1.2 STEP 2: Assess the Risk of Dust Impacts

Step 2A – Define the Potential Dust Emission Magnitude

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping. The site area is > 10,000 m² and therefore in accordance with the IAQM Guidance (2014) the earthwork is considered to have a '**Large**' magnitude of potential dust emissions.

Construction

The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials and duration of build. The volume of the proposed buildings is likely to be > 100,000 m³ and therefore in accordance with the IAQM Guidance (2014), the potential dust emission classification was considered to be '**Large**'.

Track-out

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology and duration. With regard to the criteria for the dust-generating potential of the surface material and the length of unpaved road, it is considered appropriate to classify the potential dust effects as '**Small**'.

A summary of the dust emission magnitude for each activity is provided in Table 12.

Table 12: Summary of the Dust Emission Magnitude

Source	Dust Emission Classification
Earthworks	Large
Construction	Large
Track-out	Small

Step 2B – Define the Sensitivity of the Area

The following were taken into consideration when determining the sensitivity of the area to dust soiling and health impacts of PM₁₀.

- The site is located near the residential area of Dodworth and therefore the receptor sensitivity is considered to be High;
- There are between 1 and 10 residential properties located within 50 m of the site; and

- PM₁₀ monitoring undertaken at the continuous monitor AM3, located on Dodworth Road, indicated that PM₁₀ concentrations were 20 µg/m³ in 2015.

Taking the above into consideration the sensitivity of the area to dust soiling impacts is **Medium**, and **Low** for human health impacts.

Step 2C – Define Risk of Impacts

Taking into consideration the conclusion from Steps 2A and 2B, the risk of dust impacts for each activity are provided in Table 13.

Table 13: Risk of Unmitigated Dust Impacts

Source	Dust Soiling	Human Health
Earthworks	Medium	Low
Construction	Medium	Low
Track Out	Negligible	Negligible

5.2 Operational Phase

The local air quality assessment has been undertaken in accordance with the BMBC Air Quality and Emissions Good Practice Planning Guidance as well as the EPUK/IAQM (2015) 'Land-Use Planning & Development Control: Planning for Air Quality' guidance.

As discussed in Section 3.3, the BMBC planning guidance requires a three stage approach to determining the impact of a proposal on air quality.

5.2.1 Stage 1: Development Type Classification

For the reasons discussed in Section 3.3.1, the proposal was considered to be a 'Medium' development.

5.2.2 Stage 2: Air Quality Impact Assessment

As discussed in Section 3.3.2, a detailed level air quality assessment has been undertaken using ADMS roads modelling software to predict concentrations of road transport derived pollutants, NO₂, PM₁₀ and PM_{2.5}, at selected sensitive receptors. The following scenarios were assessed:

1. 2015 Base;
2. 2021 Base;
3. 2021 Base + Committed Development; and
4. 2021 Base + Committed Development + Development

The EPUK/IAQM guidance documents require committed developments in the vicinity of the site to be considered. Therefore Scenario 4 was compared to Scenarios 2 and Scenario 3 to determine the impact of the development and other committed developments (comparison of Scenario 4 and Scenario 2) as well as the impact of the development only (comparison of Scenario 4 and Scenario 3).

5.2.3 Nitrogen Dioxide

Annual mean concentrations of NO₂ were predicted at the selected receptor locations for each scenario described above. The results are presented in Table 14. The impact of the development is presented as the magnitude of change as a proportion of the objective (% impact). The description of the impact at each receptor takes into consideration this predicted change in concentration in the context of the total concentration and its relationship with the objective (refer to Table 5).

Table 14: Predicted Annual Mean NO₂ Concentrations (µg/m³)

ID	2015	2021			Impact		Impact Description	
		Base	Base + Committed Development	Base + Committed Development + Development	Development Impact	Cumulative Impact	Development Impact	Cumulative Impact
1	30.7	31.8	32.0	32.2	0.2	0.4	Negligible	Negligible
2	35.0	36.5	36.7	36.9	0.2	0.4	Negligible	Negligible
3	42.6	44.4	44.8	45.0	0.2	0.6	Moderate Adverse	Moderate Adverse
4	35.4	36.5	36.9	37.2	0.3	0.7	Negligible	Minor Adverse
5	24.1	24.6	24.8	24.9	0.1	0.3	Negligible	Negligible
6	23.9	24.3	24.5	24.6	0.1	0.3	Negligible	Negligible
7	24.0	23.9	24.6	24.8	0.2	0.9	Negligible	Negligible

According to Table 14, the highest annual mean NO₂ concentration was predicted to be experienced at Receptor 3, located adjacent to the east of the Junction 37 roundabout. A concentration of 45.0 µg/m³ was predicted at this receptor in 2021 with the committed development and the assessed development operational. Exceedences of the annual mean NO₂ objective were predicted at this receptor in all modelled scenarios.

However, it should be recognised that the model approach was cautious, and it was assumed that background pollutant concentrations and exhaust emission rates would not change between 2015 to 2021. Therefore, although increased future baseline pollutant concentration was predicted in 2021, this was considered cautious as they are likely to decrease over time. In addition monitored concentrations at DT80, very close to Receptor 3, have been below 40 µg/m³ in two of the past four years.

The results indicated that when considering the impacts of the development only, detrimental impacts were predicted at all modelled receptors. The largest detrimental impacts due to the proposed development (i.e. excluding the committed development) were predicted at residential properties at the junction between Dodworth Road and Broadway (Receptor 4) and on Dodworth Road, near the Junction 37 roundabout (Receptor 3). The reasons for this are due to the predicted increase in traffic flow, slow speeds (particularly near the Dodworth Road / Broadway crossroads) and proximity of the receptor to the road (i.e. emission source). However, due to the absolute concentrations predicted at Receptor 4, the impact is described as Negligible. The impact at Receptor 3 is described as Moderate Adverse due to the high absolute concentrations near to the M1, although as noted, compared to the monitoring the modelled values were high. It should be noted that an increase of 0.2 µg/m³ was predicted at this receptor; a value of less than 0.2 would have resulted in a 'negligible' impact. Negligible Impacts were predicted at all other receptors.

In accordance with the EPUK/IAQM (2015) guidance, the impact of the development as well as committed developments (i.e. the cumulative impact) was considered. The largest cumulative impact was predicted to be experienced at Receptor 7, located to the east of Dodworth Road. The reason for this is due to the residential development which has been granted planning permission on Broadway. This development will increase the number of vehicle movements on Broadway and Dodworth Road which resulted in significantly higher impacts at Receptors 3, 4, 5, 6 and 7, than when considering the development impacts only. The impact was described as Moderate Adverse at Receptor 3, and Negligible at all other locations.

The EPUK/IAQM guidance (EPUK/IAQM 2015) requires the overall significance of the development to be determined. Based on the above results the impact of the development is considered to be Not Significant, as the impacts were predicted to be negligible at all locations except at 1-2 properties on Dodworth Road near Junction 37, where the annual mean annual mean NO₂ objective was predicted to be exceeded either with, or without, the proposed development going ahead.

As discussed in Section 2.3.1, analysis of the relationship between 1-hour and annual mean NO₂ concentrations at roadside sites indicate that exceedences of the 1-hour objective are unlikely where the annual mean is below 60 µg/m³ (Defra, 2016). Taking this into consideration, it is unlikely that the 1 hour objective will be exceeded at any modelled receptors and therefore the impact can be described as Negligible.

5.2.4 PM₁₀

Annual mean concentrations of PM₁₀ were predicted at the selected receptor locations for each scenario described above. The results are presented in Table 15. The impact of the development is presented as the magnitude of change as a proportion of the objective (% impact). The description of the impact at each receptor takes into consideration this predicted change in concentration in the context of the total concentration and its relationship with the objective (refer to Table 5).

Table 15: Predicted Annual Mean PM₁₀ Concentrations (µg/m³)

ID	2015	2021			Impact		Impact Description	
		Base	Base + Committed Development	Base + Committed Development + Development	Development Impact	Cumulative Impact	Development Impact	Cumulative Impact
1	16.6	16.7	16.8	16.8	0.0	0.1	Negligible	Negligible
2	17.0	17.2	17.3	17.3	0.0	0.1	Negligible	Negligible
3	17.8	18.1	18.2	18.2	0.0	0.1	Negligible	Negligible
4	16.9	17.0	17.1	17.1	0.0	0.1	Negligible	Negligible
5	15.8	15.9	15.9	16.0	0.1	0.1	Negligible	Negligible
6	15.8	15.9	15.9	15.9	0.0	0.0	Negligible	Negligible
7	15.9	15.8	16.0	16.0	0.0	0.2	Negligible	Negligible

According to Table 15, the highest annual mean PM₁₀ concentration was predicted to be experienced at Receptor 3, located adjacent to the east of Junction 37 roundabout. A concentration of 18.2 µg/m³ was predicted at this receptor in 2021 with the committed development and the assessed development operational. Annual mean PM₁₀ concentrations were below the objective in all scenarios at all modelled receptors.

The results indicated that when considering the impacts of the development only, detrimental impacts were predicted at all modelled receptors. The impact at all receptors was described as Negligible.

In accordance with the EPUK/IAQM (2015) guidance, the impact of the development as well as committed developments was considered. The impact at all modelled receptors was described as Negligible.

Based on the above results, the impact of the development is considered to be not significant with regards to the annual mean PM₁₀ objective.

The number of exceedance of the PM₁₀ daily mean objective has been calculated using the formula provided in LAQM.TG(16). (Defra, 2016). The results are presented in Table 16.

Table 16: Exceedences of the daily mean PM₁₀ objective

ID	2015	2021		
		Base	Base + Committed Development	Base + Committed Development + Development
1	1	1	1	1
2	1	1	1	1
3	1	1	2	2
4	1	1	1	1
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0

According to Table 16, no more than 2 exceedences of the daily mean objective were predicted at any modelled receptors. This is well below the permitted 35 exceedences per year. Therefore the impact of the proposed development with regards to the daily mean PM₁₀ objective is considered to be not significant.

5.2.5 PM_{2.5}

Annual mean concentrations of PM_{2.5} were predicted at the selected receptor locations for each scenario described above. The results are presented in Table 17. The impact of the development is presented as the magnitude of change as a proportion of the objective (% impact). The description of the impact at each receptor takes into consideration this predicted change in concentration in the context of the total concentration and its relationship with the objective (refer to Table 5).

Table 17: Predicted Annual Mean PM_{2.5} Concentrations (µg/m³)

ID	2015	2021			% Impact		Impact Description	
		Base	Base + Committed Development	Base + Committed Development + Development	Development Impact	Cumulative Impact	Development Impact	Cumulative Impact
1	11.3	11.4	11.4	11.4	0.0	0.0	Negligible	Negligible
2	11.6	11.7	11.7	11.7	0.0	0.0	Negligible	Negligible
3	12.1	12.3	12.3	12.3	0.0	0.0	Negligible	Negligible
4	11.5	11.6	11.6	11.6	0.0	0.0	Negligible	Negligible
5	10.8	10.8	10.8	10.8	0.0	0.0	Negligible	Negligible
6	10.7	10.8	10.8	10.8	0.0	0.0	Negligible	Negligible
7	10.8	10.8	10.8	10.9	0.1	0.1	Negligible	Negligible

According to Table 17, the highest annual mean PM_{2.5} concentration was predicted to be experienced at Receptor 3, located adjacent to the Junction 37 roundabout. A concentration of 12.3 µg/m³ was predicted at this receptor in 2021 with the committed development and the assessed development operational as well as with the development operational only. Annual mean PM_{2.5} concentrations were below the objective in all scenarios at all modelled receptors

The results indicated that when considering the impacts of the development only, detrimental impacts were predicted at all modelled receptors. The impact at all receptors was described as Negligible.

In accordance with the EPUK/IAQM (2015) guidance, the impact of the development as well as committed developments was considered. The impact at all receptors was described as Negligible.

Based on the above results, the impact of the development is considered to be not significant with regards to the annual mean PM_{2.5} objective.

6 Mitigation

6.1 Construction Phase

Determining site-specific mitigation measures corresponds to Step 3 of the assessment methodology (Section 3.2).

A number of mitigation measures can be adopted to reduce the production and/or dispersal of dust to lessen the nuisance and limit the human health impacts. Ideally dust should be controlled at the source as once airborne it is difficult to suppress.

Appropriate mitigation measures are provided in the IAQM 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014). However, additional mitigation measures are provided in the following guidance documents:

- BRE (2003a): Guidance on the Control of Dust from Construction and Demolition Activities;
- BRE (2003b): Controlling Particulates, Vapours and Noise Pollution from Construction Sites; and,
- Greater London Councils (2006): The control of dust and emissions from construction and demolition: Best Practice Guidance.

According to the IAQM Guidance (IAQM, 2014), the dust risk for each of the activities determined in Step 2C should be used to define the appropriate site specific mitigation measures to be adopted. Where a negligible risk of dust impacts was determined, no mitigation measures, beyond those required by legislation are required. However, mitigation measures may be applied as part as good practice.

Appropriate mitigation measures, taking into consideration the risk of dust impacts determined in Step 2C, are provided in Table 18. Mitigation should be implemented through a site-specific Construction Environmental Management Plan (CEMP), and the measures should be enforced and adhered to. Contractors should also carry the 'Considerate Contractors' registration.

Table 18: Potential Site Operations and Possible Methods of Controlling Dust

Activity	Possible Dust Control Methods
Communication	<ul style="list-style-type: none"> • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. • Display the head or regional office contact information.
Site Management	<ul style="list-style-type: none"> • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in the log book
Monitoring	<ul style="list-style-type: none"> • Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results and make the log available to the local authority when asked. • Carry out regular site inspections, record inspection results and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Preparing and maintaining the site	<ul style="list-style-type: none"> • Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible. • Erect solid screens or barriers around dusty activities that are at least as high as any stockpiles on site. • Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site. • Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel	<ul style="list-style-type: none"> • Ensure all vehicles switch off engines when stationary – no idling vehicles. • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. • Impose and signpost a maximum speed limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work area.

Activity	Possible Dust Control Methods
Operations	<ul style="list-style-type: none"> • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and conveyors and covered skips • Minimise drop heights
Waste Management	<ul style="list-style-type: none"> • Avoid bonfires and burning of waste materials
Earthworks	<ul style="list-style-type: none"> • Re-vegetate earthworks and exposed areas/ soil stockpiles to stabilise surfaces as soon as practicable. • Use Hessian or mulches where it is not possible to re-vegetate or cover the topsoil as soon as practicable. • Only remove the cover in small areas during work and not all at once.
Construction	<ul style="list-style-type: none"> • Avoid scabbling, if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out
Track out	<ul style="list-style-type: none"> • Use water assisted dust sweeper(s) 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 escape of materials during transport. • Implement a wheel washing system.

6.2 Operational Phase

The Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance lists possible mitigation controls that may be implemented.

It is recognised that the mitigation controls may need to be implemented by the site operators through management and policy.

The following mitigation controls are suggested by BMBC, with reference to the scale of the proposed scheme (i.e. 'Medium'):

- Provide 10% parking spaces with an electric charging point. This may be phased with an initial 5% provision and that remainder allocated at an agreed trigger level.
- Provision of a Travel Plan, which may include
 - Strategy to discourage high emission vehicle use
 - Improved pedestrian access to public transport
 - New or improved bus stop infrastructure
 - Site layout to encourage walking and cycling.
- Commercial vehicles operated at the site should comply with the most recent emission standards.
- If future operators of the site maintain an HGV fleet, they should provide a strategy for reducing emissions, and promoting the uptake of low-emission technologies
- Fleet operators should consider joining accreditation scheme such as South Yorkshire Eco Stars

7 Residual Impacts

7.1 Construction Phase

Determining the residual impacts corresponds to Step 4 of the assessment methodology (Section 3.2).

The impacts associated with the construction phase of the proposed development have been qualitatively assessed with reference to the Institute of Air Quality Management (IAQM) published draft 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014).

The IAQM guidance states that *'in the case of demolition / construction it is assumed that mitigation (secured by planning conditions, legal requirements or required by regulations) will ensure that a potential significant adverse effect will not occur, so the residual effect will normally be 'not significant'.*

Therefore, overall it is considered that the impacts during the construction phase will be of **'Negligible'** significance.

It is acknowledged that a development has been granted planning permission to the east of Capitol Close. It is unknown if the construction of this development and the assessed development will coincide or not. However, it is assumed that the construction works of the permitted development will adopt best practice mitigation measures and therefore the residual impacts will remain of Negligible significance.

7.2 Operational Phase

The operational phase mitigation is outlined in Section 6.2.

The receptors which are expected to be affected most are the 1-2 properties closest to the motorway. These impacts are related to the high baseline pollutant concentrations in this area, which may continue to exceed the annual mean objective with, or without, the proposed scheme going ahead.

The mitigation controls described in Section 6.2 would reduce the overall emissions of the proposed scheme.

8 Summary and Conclusions

AECOM was commissioned to undertake a local air quality assessment for a proposed development in Dodworth, Barnsley. The proposed site is located on undeveloped land on Capitol Close and will consist of four units for industrial and office use, with parking for approximately 300 vehicles.

A qualitative construction phase assessment has been undertaken in accordance with the Institute of Air Quality Management (IAQM, 2014) 'Guidance on the assessment of dust from demolition and construction' to determine the potential dust and vehicle emission impacts. Taking into consideration the risk of potential impacts, appropriate mitigation measures were recommended.

A quantitative operational phase assessment has been undertaken in accordance with the EPUK/IAQM 'Land Use Planning & Development Control: Planning for Air Quality' (EPUK/IAQM, 2015) and the Barnsley Metropolitan Borough Council 'Air Quality and Emissions Good Practice Planning Guidance' (BMBC, 2014). Detailed dispersion modelling, using the ADMS Roads software, was undertaken to determine the impact of traffic derived pollutant concentrations at nearby sensitive receptors. The assessment was conducted for the following scenarios:

1. 2015 Base;
2. 2021 Base;
3. 2021 Base + Committed Development; and
4. 2021 Base + Committed Development + Development

8.1 Construction Phase

With regard to potential impacts during the construction phase, the assessment concludes the following:

- The nearest residential receptor to the proposed development site is Lane Head Farm located adjacent to the northern boundary of the site. No ecological receptors are located within 50 m of the proposed site.
- No PM₁₀ monitoring is undertaken in the vicinity of the proposed site; however, the modelled background concentrations indicate that PM₁₀ concentrations were 15 µg/m³ in 2015.
- Taking the above into consideration the sensitivity of the area to dust soiling impacts was considered to be Medium and Low for human health impacts.
- The potential risk of dust soiling was determined to be Medium during earthworks and construction works and Low during track-out.
- The potential risk of human health impacts was considered to be Low during earthworks, construction works and during track out.
- Appropriate mitigation measures were recommended to effectively control the effects during the construction phase.
- Therefore, overall it is considered that the impacts during the construction phase will be of Negligible significance.

8.2 Operational Phase

With regard to potential impacts during the operational phase, the assessment concludes the following:

- The annual mean background pollutant concentrations at the proposal site are well below the annual mean objectives for both NO₂ and PM₁₀.
- Annual mean NO₂ impacts described as Moderate Adverse were predicted at one modelled receptor on Dodworth Road, adjacent to Junction 37. This was due to the magnitude of change in concentration at this receptor associated with the proposed development, and also concentrations in excess of the annual mean objective due to the proximity to the M1. However, the predicted change in pollutant concentration was very close to being described as negligible, and based on nearby monitoring results it is considered likely that the model approach has resulted in an overestimation of concentrations at this location.
- Furthermore, the model approach was cautious, and it was assumed that background pollutant concentrations and exhaust emission rates would not change between 2015 to 2021, although it is likely to actually decrease over time.
- Therefore, the overall impact to annual mean NO₂ were considered to be **not significant**.
- Negligible impacts were predicted at all receptors with regards to the 1-hour NO₂ objective in all modelled scenarios;
- Negligible impacts were predicted at all receptors with regards to the annual mean PM₁₀ objective in all modelled scenarios

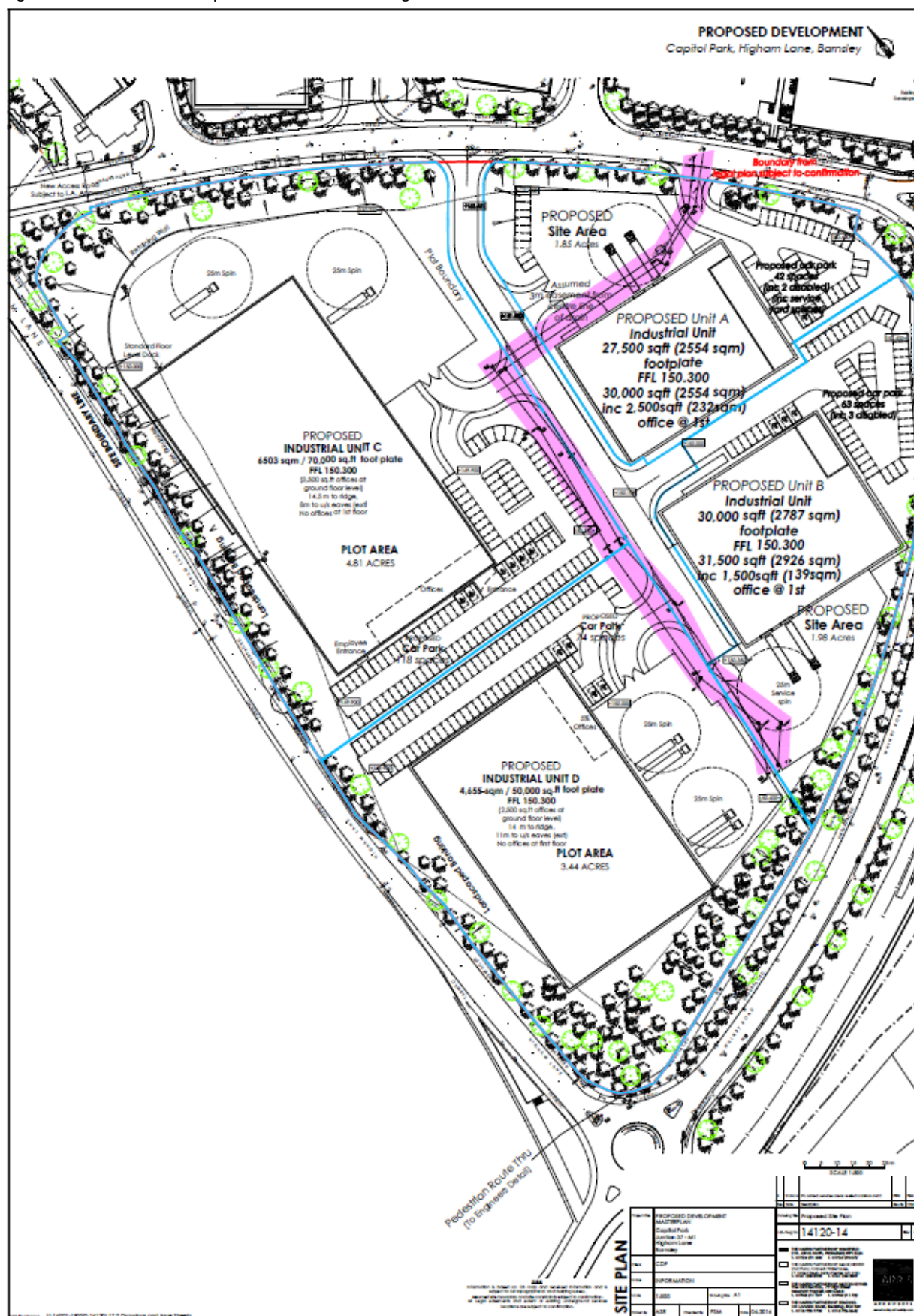
- Negligible impacts were predicted at all receptors with regards to the daily mean PM_{10} objective in all modelled scenarios
- Negligible impacts were predicted at all receptors with regards to the annual mean $PM_{2.5}$ objective in all modelled scenarios

9 References

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- Defra <http://archive.defra.gov.uk/environment/quality/air/airquality/panels/igcb/qanda.htm> (accessed May 2016)
- Defra (2016). *Local Air Quality Management Technical Guidance LAQM.TG(16)*
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- Environmental Protection UK and Institute of Air Quality Management (2015) *Land Use Planning & Development Control: Planning for Air Quality*
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- Institute of Air Quality Management (IAQM) (2014) *Guidance on the assessment of dust from demolition and construction*

Appendix A: Indicative Masterplan

Figure 1: Indicative Masterplan for Outline Planning Permission



Appendix B: Dust Assessment Methodology

STEP 1: Screen the Requirement for a Detailed Assessment

Sensitive receptors were identified and the distance to the site and construction routes were determined according to the examples of sensitivity shown in Table 19. According to the IAQM, an assessment will normally be required where there are sensitive receptors within 350 metres (m) of the boundary of a site and/or within 50 m of route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance. A human receptor, as considered within the IAQM guidance, is any location where a person or property may experience: The annoyance effects of airborne dust or dust soiling e.g. dwellings, industrial or commercial premises such as a vehicle showroom, food manufacturers, electronics manufacturers, amenity areas and horticultural operations; or

- Exposure to PM₁₀ over a period relevant to the air quality objectives.

Ecological receptors within 50 m of the boundary of the site or routes used by construction vehicles on the public highway, up to 500 m from the site entrance, also need to be identified.

There are no ecological receptors which need to be considered as part of this assessment.

Table 19: Examples of Dust Sensitive Receptors

Sensitivity	Dust Soiling	Human Health	Ecological
High	<ul style="list-style-type: none"> - Dwellings, - Museum and other culturally important collections, - Medium and long term car parks - Car showrooms. 	<ul style="list-style-type: none"> - Residential properties. - Hospitals, - Schools - Residential care homes 	<ul style="list-style-type: none"> - Locations with an international or national designation (e.g. SAC) and the designated features may be affected by dust soiling
Medium	<ul style="list-style-type: none"> - Parks - Places of work. 	<ul style="list-style-type: none"> - Office and shop workers, but will generally not include workers occupationally exposed to PM₁₀, as protection is covered by Health and Safety at Work legislation. 	<ul style="list-style-type: none"> - Locations with a national designation (e.g. SSSI) where the features may be affected by dust deposition
Low	<ul style="list-style-type: none"> - Playing fields - Farmland (unless commercially-sensitive horticultural), - Footpaths, - Short term car parks - Roads 	<ul style="list-style-type: none"> - Public footpaths, - Playing fields, - Parks - Shopping streets. 	<ul style="list-style-type: none"> - Locations with a local designation where the features may be affected by dust deposition local Nature Reserve with dust sensitive features.

SAC: Special Area of Conservation; SSSI: Site of Special Scientific Interest

STEP 2: Assess the Risk of Dust Impacts

The risk of dust arising in sufficient quantities to cause annoyance and/or health effects was determined for each activity (demolition, earthworks, construction works and track out), taking account of:

- The scale and nature of the works, which determines the potential dust emission magnitude (small, medium or large) (Step 2A); and
- The sensitivity of the area (low, medium or high) (Step 2B).

These factors were then combined to give the risk of dust effects with no mitigation applied, as Negligible, Low, Medium or High.

It should be noted that where detailed information was not available to inform the risk category, professional judgement and experience was used and a cautious approach adopted, in accordance with the guidance.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

No Demolition Works will be undertaken.

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. The classifications in Table 20 are based on examples of suitable criteria. Factors such as existing land use, topography, seasonality, duration and scale were also taken into consideration, where possible.

Table 20: Potential Earthworks Dust Emission Classification

Potential Dust Emission Classes	Criteria
Large	<ul style="list-style-type: none"> - Total site area: >10,000 m² - Potentially dusty soil type (e.g. clay) - >10 heavy earth moving vehicle active at any one time - Formation of bunds >8 m in height - Total material moved >100,000 tonnes
Medium	<ul style="list-style-type: none"> - Total site area: 2,500 - 10,000 m² - Moderately dusty soil type (e.g. silt) - 5 -10 heavy earth moving vehicle active at any one time - Formation of bunds 4 - 8 m in height - Total material moved 20,000 – 100,000 tonnes
Small	<ul style="list-style-type: none"> - Total site area: <2,500 m² - Soil type with large grain size (e.g. sand) - < 5 heavy earth moving vehicle active at any one time - Formation of bunds < 4 m in height - Total material moved <20,000 tonnes - Earthworks during wetter months

Construction

The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials and duration of build. The classifications in Table 21 are based on examples of suitable criteria. Factors such as seasonality, building type, duration and scale were also taken into consideration, where possible.

Table 21: Potential Construction Works Dust Emission Classification

Potential Dust Emission Classes	Criteria
Large	<ul style="list-style-type: none"> - Total building volume >100,000m³ - Piling, on site concrete batching, sandblasting
Medium	<ul style="list-style-type: none"> - Total building volume 25,000 – 100,000m³ - Potentially dusty construction material (e.g. concrete) - On-site concrete batching
Small	<ul style="list-style-type: none"> - Total building volume <25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)

Track-out

Track-out is the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the local road network. The classifications in Table 22 are based on examples of suitable criteria. Factors such as vehicle size, speed, numbers, geology and duration were also taken into consideration, where possible.

Table 22: Potential Track Out Dust Emission Classification

Potential Dust Emission Classes	Criteria
Large	<ul style="list-style-type: none"> - 50 HGV (>3.5t) outward movements in any one day - Potentially dusty surface material - Unpaved road length > 100 m
Medium	<ul style="list-style-type: none"> - 25 – 100 HGV (>3.5t) outward movements in any one day - Moderately dusty surface material - Unpaved road length 50 – 100 m
Small	<ul style="list-style-type: none"> - < 25 HGV (>3.5t) outward movements in any one day - Surface material with low potential for dust release - Unpaved road length < 50m

Step 2B – Define the Sensitivity of the Area

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

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

The sensitivity of the area is determined separately for dust soiling impacts on people and properties (Table 23), human health impacts (Table 24).

Table 23: Sensitivity of the Area to Dust Soiling Effects 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 24: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance to Source				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 – 32 µg/m ³	>100	High	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 – 28 µg/m ³	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Step 2C - Define the Risk of Impacts

The dust emission magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of effects with no mitigation applied (Table 25 to Table 27). This Step is undertaken for each activity undertaken on site.

Table 25: Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Classification		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 26: Risk of Dust Impacts - Construction

Sensitivity of Area	Dust Emission Classification		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 27: Risk of Dust Impacts – Track-out

Sensitivity of Area	Dust Emission Classification		
	Large	Medium	Small
High	High	Medium	Medium
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

STEP 3: Identify the need for Site-Specific Mitigation

Based on the risk of effects determined in Step 2C for each activity, appropriate site-specific mitigation measures were recommended. Appropriate mitigation measures are set out in the IAQM Guidance.

STEP 4: Define impacts and their significance

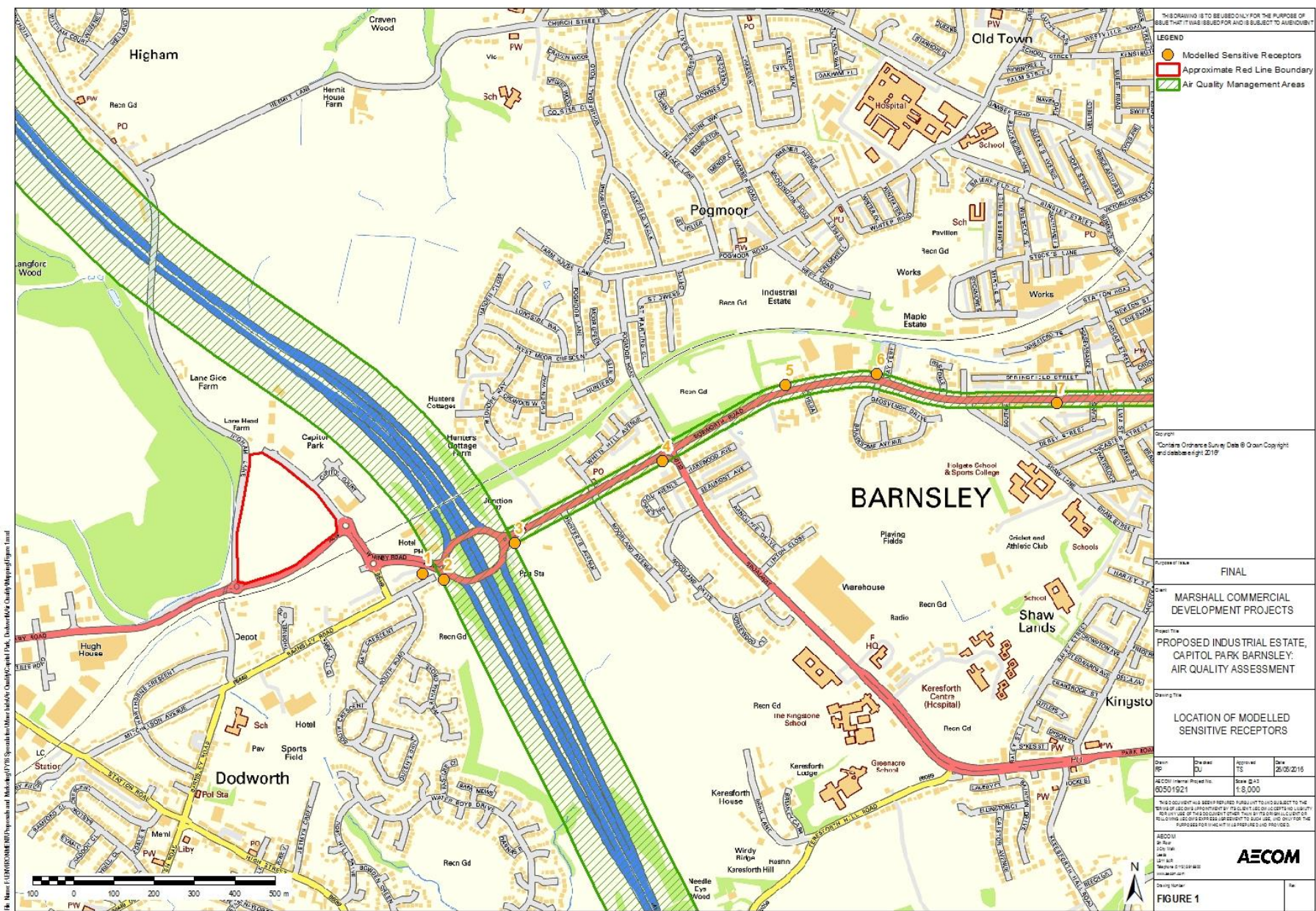
Finally the significance of the potential residual dust impacts, i.e. after mitigation, was determined. According to the IAQM Guidance¹ the residual impacts assumes that all mitigation measures (recommended in Step 3) to avoid or reduce impacts are adhered to, and therefore the residual impacts should be considered to be 'not significant'.

Appendix C: Traffic Data

Table 28: Traffic Data

Road	AADT				Number of HGV				Speed, km/hr (HGV Speed))
	2015	2021	2021 + Committed Development	2021 +Committed Development + Development	2015	2021	2021 + Committed Development	2021 +Committed Development + Development	
Whinby Road west	15416	16501	16795	16982	462	495	504	528	64
Whinby Road between roundabouts	15838	16953	18041	18443	475	509	541	594	64
Whinby Road (west of M1)	21433	22942	23837	24406	643	688	715	789	64
Capitol Close	672	720	2102	2983	0	0	0	88	48
Site Access	0	0	0	881	0	0	0	88	48
B6449	7544	8076	8270	8393	0	0	0	12	48
M1 north of Junction	85948	93495	93729	93850	8249	8973	8996	9020	112 (80)
M1 South of Junction	97510	106056	106435	106649	8538	9286	9320	9360	112 (80)
M1 between slip roads	75524	82050	82050	82050	6797	7384	7384	7384	112 (80)
Sliproad north of Junction onto M1	7521	8051	8187	8249	677	725	737	749	80
Sliproad north of Junction off M1	4120	4410	4507	4566	371	397	406	417	80
Sliproad south of Junction onto M1	12793	13693	13901	14011	1151	1232	1251	1272	80
Sliproad south of Junction off M1	9193	9840	10012	10116	827	886	901	921	80
Dodworth Road, west of Broadway	22713	24312	24856	25092	454	486	497	525	24
Dodworth Rd, between Broadway and Shaw Ln	10740	11496	12078	12303	215	230	242	269	48
Dodworth Road, east of Shaw Lane	10529	11271	11742	11967	211	225	235	262	48
Broadway	3002	3213	3352	3352	30	32	34	34	48
Pogmoor Road	7166	7670	7736	7746	0	0	0	1	48

Appendix D: Location of Modelled Sensitive Receptors

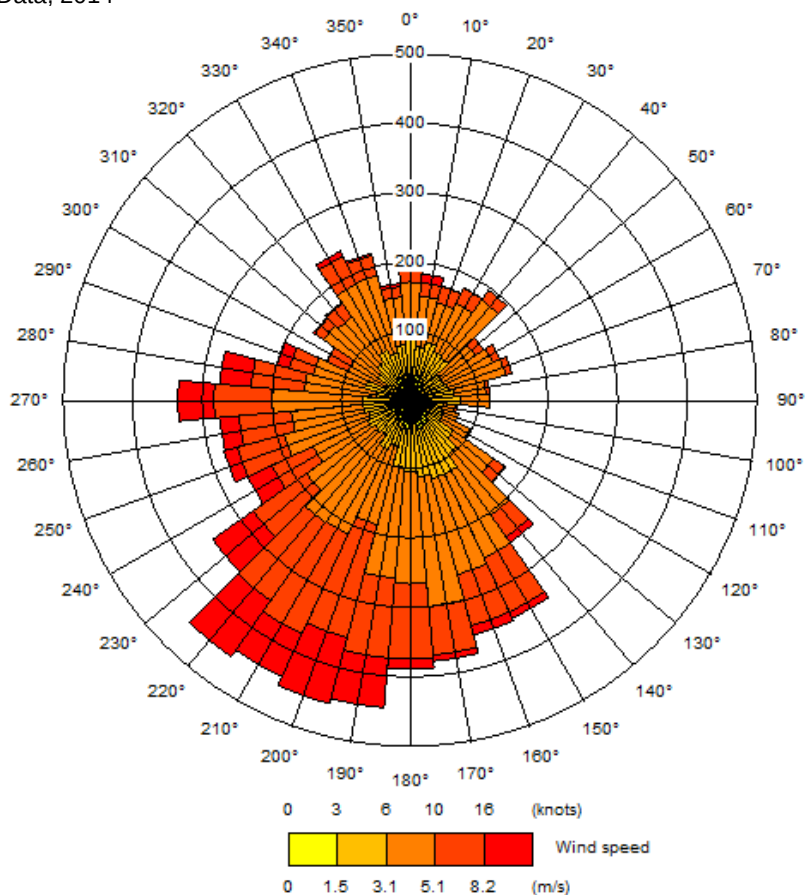


Appendix E: Meteorological Data

The meteorological dataset used in the assessment was recorded at the meteorological station at Robin Hood airport in Doncaster in 2014, located approximately 35 km to the south east of the proposed development site. This site is considered to be representative of regional meteorological conditions and sufficient to satisfy the requirements of this assessment.

The meteorological data were used to produce a wind/stability rose (Figure 2). This illustrates the wind direction and wind speed as a function of the proportion of the year.

Figure 2: Meteorological Data, 2014



Appendix F: Model Verification

The model was verified by comparison with NO₂ diffusion tubes operated by Barnsley Metropolitan Borough Council (BMBC) in 2015. The model under-estimated concentrations when compared to the monitoring data and so the modelled results for NO₂ and PM₁₀ were adjusted in accordance with the procedure detailed in technical guidance LAQM.TG(16).

Table 29: Comparison of Modelled and Monitored NO₂ Concentrations, 2015

Monitoring Site		Monitor Type	Monitored Total NO ₂	Modelled Total NO ₂	% Difference [(modelled-monitored)/monitored]
ID	Location				
DT73	Pogmoor Crossroads	Diffusion Tube	39.5	28.0	-29%
DT74	Pogmoor Crossroads	Diffusion Tube	37.1	28.0	-25%
DT75	Pogmoor Crossroads	Diffusion Tube	39.2	28.0	-29%
DT76	249 Dodworth Rd West Crossroads	Diffusion Tube	44.4	32.6	-26%
DT77	Post Office, Crown Hill Road	Diffusion Tube	30.9	27.8	-10%
DT78	305 Dodworth Road	Diffusion Tube	58.1	37.5	-35%
DT79	315 Dodworth Road	Diffusion Tube	53.2	39.6	-26%
DT80	329 Dodworth Road	Diffusion Tube	44.5	41.7	-6%
DT20	Dodworth Road, SE of Pogmoor Crossroads	Diffusion Tube	49.8	26.5	-47%
DT98	Dodworth Road, Pogmoor	Diffusion Tube	44.7	31.0	-31%
AM3	Barnsley A628	Continuous Monitor	38.0	28.0	-26%

An adjustment factors were calculated as follows:

$$\text{NO}_x \text{ [monitored, traffic contribution]} = \text{NO}_x \text{ [monitored]} - \text{NO}_x \text{ [background]}$$

$$\text{NO}_x \text{ [modelled, traffic contribution]} = \text{NO}_x \text{ [modelled]} - \text{NO}_x \text{ [background]}$$

$$\text{Adjustment Factor} = \text{NO}_x \text{ [monitored, traffic contribution]} / \text{NO}_x \text{ [modelled, traffic contribution]}$$

An adjustment factor of **1.862** was calculated.

The adjustment factors were subsequently applied to the modelled NO_x concentrations, and background NO_x added to give the adjusted NO_x concentrations (NO_x [model adjusted]) (Table 30):

$$\text{NO}_x \text{ [model adjusted, traffic contribution]} = \text{NO}_x \text{ [modelled, traffic contribution]} \times \text{Adjustment Factor}$$

$$\text{NO}_x \text{ [model adjusted]} = \text{NO}_x \text{ [model adjusted, traffic contribution]} + \text{NO}_x \text{ [background]}$$

The adjusted NO_x concentrations were then converted to NO₂. using version 2.1 of the 'NO₂ to NO_x' calculator provided by the Air Quality Archive and in accordance with the technical guidance, LAQM.TG(16).

In the absence of suitable PM₁₀ data for verification, the road-NO_x adjustment factor was also applied to the modelled road-PM₁₀. This is in accordance with LAQM.TG(16).

Table 30: Determination of Modelled and Monitored Rd NO₂ and Modelled Rd NO_x

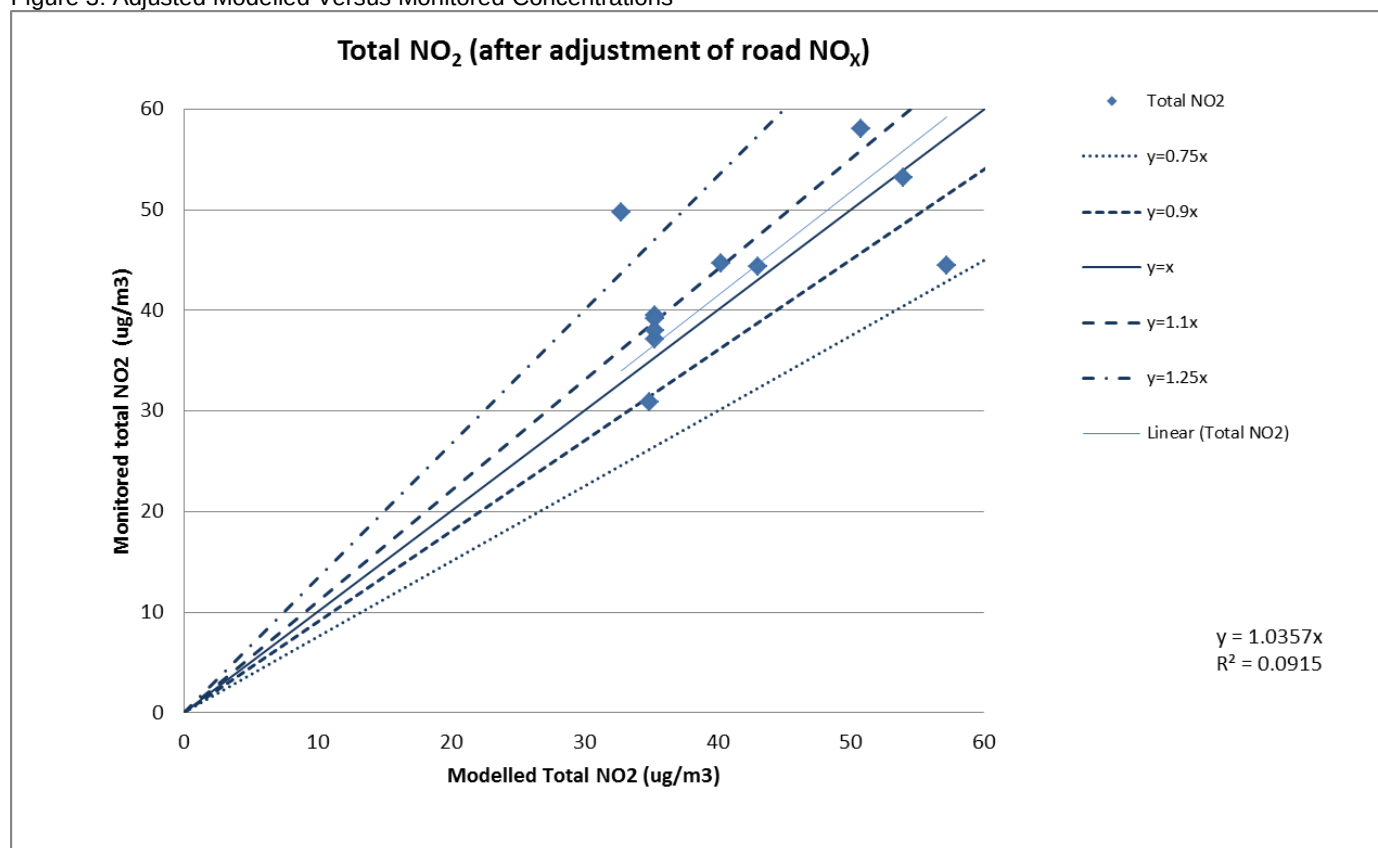
ID	Monitored Total NO ₂	Monitored Road NO _x	Background NO ₂	Monitored Road Contribution NO ₂ (total-background)	Monitored Road Contribution NO _x (total-background)	Modelled Road Contribution NO _x (excluding background)
DT73	39.5	45.9	18.6	20.9	45.9	19.2
DT74	37.1	40.0	18.6	18.5	40.0	19.2
DT75	39.2	45.2	18.6	20.6	45.2	19.2
DT76	44.4	58.6	18.6	25.8	58.6	29.5
DT77	30.9	25.6	18.6	12.3	25.6	18.7
DT78	58.1	98.6	18.6	39.5	98.6	41.0
DT79	53.2	83.5	18.6	34.6	83.5	46.0
DT80	44.5	58.8	18.6	25.9	58.8	51.4

DT20	49.8	73.5	18.6	31.2	73.5	16.1
DT98	44.7	59.4	18.6	26.1	59.4	25.8
AM3	38.0	42.2	18.6	19.4	42.2	19.2

Table 31: Determination of the Adjustment Factor and Total Adjusted NO₂

ID	Adjustment Factor for Modelled Road Contribution	Adjusted Modelled Road Contribution NO _x	Adjusted Modelled Total NO ₂	Monitored Total NO ₂	% Difference [(mod-mon)/mon]
DT73	35.8	35.8	35.3	39.5	-11%
DT74	35.8	35.8	35.3	37.1	-5%
DT75	35.8	35.8	35.3	39.2	-10%
DT76	55.0	55.0	43.1	44.4	-3%
DT77	34.8	34.8	34.9	30.9	13%
DT78	76.3	76.3	50.8	58.1	-13%
DT79	85.7	85.7	54.0	53.2	1%
DT80	95.7	95.7	57.2	44.5	29%
DT20	29.9	29.9	32.8	49.8	-34%
DT98	48.0	48.0	40.3	44.7	-10%
AM3	35.8	35.8	35.3	38.0	-7%

Figure 3: Adjusted Modelled Versus Monitored Concentrations



Appendix G: Location of Council Monitoring Sites

