



Thurnscoe Bridge Lane, Barnsley

Air Quality Assessment

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Basis of Report

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1.0 Introduction

SLR Consulting Ltd (SLR) has been commissioned by Avant Homes Yorkshire ('Avant') to undertake an Air Quality Assessment to accompany the planning application for a residential development comprising 296 dwellings and associated infrastructure (the 'Proposed Development'), on land to the west of Thurnscoe Bridge Lane, Barnsley (the 'Site').

It is noted that the Site is allocated for residential use within the Barnsley Local Plan (2019)¹, forming part of policy reference: *HS52 Land west of Thurnscoe Bridge Lane and south of Derry Grove, Thurnscoe Indicative number of dwellings 308* (see Section 2.2.2 for further details).

The Site currently comprises agricultural land and is located at the approximate National Grid Reference (NGR): x445400, y404900. The surrounding area comprises:

- Agricultural land immediately to the north of the western extent of the Site;
- Existing residential dwellings forming Derry Grove immediately to the north of the eastern extent of the Site, with their associated gardens adjacent to the Site boundary;
- Thurnscoe Bridge Lane adjacent to the eastern Site boundary, beyond which is vacant land;
- The Swinton and Milford Junction Rail Line runs north to south, approximately 95m east of the Site at its closest point;
- A mature treeline adjacent to the length of the southern Site boundary comprising a disused rail line forming a bund, beyond which is a gun club, scrap metal yard and a disused dog track; and
- Open agricultural land to the west.

Primary vehicular access to both parcels will be via Thurnscoe Bridge Lane to the east.

1.1 Proposed Development Description

The full description of the Proposed Development for planning purposes is as follows:

“The site is located off Thurnscoe Bridge Lane, in Thurnscoe, Barnsley South Yorkshire, and covers an area of approximately 13.7 hectares being approximately 8.6 miles east of Barnsley town centre and forming part of the (HS52) allocation within the Barnsley Metropolitan Borough Council Local Plan. The site is greenfield in nature having been used for agricultural use. The allocation parcel slopes from north to south as well as down towards the western boundary. The site is bounded by existing residential dwellings to the north and bounded by established trees on the West, South and eastern boundaries. A former railway embankment is present on the southern side of the main land parcel along the adjacent Thurnscoe Rifle Club, Wallis Metals and Highgate Stadium. The southwestern triangular portion of the site (~3.7 ha) is proposed to be utilised in part for biodiversity mitigation being relatively flat in nature and bounded by Thurnscoe Dike to the south. Access to the site is provided from the existing adopted highway running adjacent the eastern boundary; Thurnscoe Bridge Lane. A public right of way crosses the site North to South leading from the existing POS on Derry Grove linking through to the existing public bridleway on the Southern boundary.”

¹ Barnsley Metropolitan Borough Council, Barnsley Local Plan, adopted January 2019.



1.2 Scope of Assessment

Consultation with the Environmental Health Officer (EHO) at Barnsley Metropolitan Borough Council (BMBC) was attempted to agree upon the extent and methodology of the Air Quality Assessment². At the time of writing, no response has been received. Notwithstanding, the following scope of works has been undertaken as part of this Air Quality Assessment as proposed to BMBC in line with published guidance and best practice including the BMBC *Air Quality and Emissions Good Practice Planning Guidance*³:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Construction Phase – Identification and assessment of potential air quality impacts associated with the construction phase of the Proposed Development;
- Operational Phase – Identification and assessment of potential air quality impacts associated with the operational phase of the Proposed Development; and
- Mitigation Measures – Identification of mitigation measures, as appropriate.

As mentioned above, the Swinton and Milford Junction Rail Line is situated approximately 95m to the east of the Site. However, this rail line is not identified within the Department for Environment Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance (LAQM.TG(22))⁴ as requiring assessment to determine potential emission impacts from moving diesel locomotives. Notwithstanding, the minimum separation distance of 95m between the boundary of the Proposed Development and the Swinton and Milford Junction Rail Line is far in excess of the 'within 30m' screening distance identified within LAQM.TG(22) for such assessment of potential emission impacts from moving diesel locomotives.

Furthermore, all proposed residential units are at a distance greater than 15m from the rail lines and, therefore, beyond the distance requiring potential assessment of stationary diesel or steam locomotives. Therefore, consideration of emissions from the Swinton and Milford Junction Rail Line has been scoped out from further assessment.

² Email sent from SLR Consulting Ltd to BMBC, dated 5th November 2024.

³ Barnsley Metropolitan Borough Council, Air Quality and Emissions Good Practice Planning Guidance, November 2021.

⁴ Local Air Quality Management Technical Guidance (22), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. August 2022.



2.0 Background Context

2.1 Legislation

A dual set of regulations, applicable to National and Local Government separately are currently operable within the UK.

2.1.1 National Obligations

The Air Quality Standards Regulations 2010⁵ (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation, in order to align and mirror European obligations. The AQSR includes Limit Values which are legally binding ambient concentration thresholds, however, must be assessed at specific locations (micro and macroscale sampling points). Carriageways or central reservations of roads and any location where the public do not have access (e.g. industrial sites) are exempt. If the sampling point does not comply with the siting locations (Schedule 1: AQSR), then strict comparison cannot be made.

Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020⁶ was introduced to mirror revisions to supporting EU legislation. The fine particulate matter (PM_{2.5}) Limit Value is 20µg/m³ (to be met by 2020).

The responsibility of achieving the AQSR (and European equivalent Directives) is a national obligation for Central Government and Devolved Administrations who undertake assessments on an annual basis. Local Authorities have no responsibility to achieve the AQSR or the European equivalent Directives, unless otherwise instructed to assist Central Government under Ministerial Direction.

In response to persistent exceedances, the Government published its 2017 plan⁷ for reducing roadside nitrogen dioxide (NO₂) concentrations in order to achieve compliance in the shortest time possible. This has resulted in the introduction of Clean Air Zones across England. However, BMBC were not identified as required to conduct a feasibility study to achieve compliance.

2.1.1.1 Environment Targets (Fine Particulate Matter) Regulations

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023⁸ introduced an annual mean concentration target of 10µg/m³ to be met across England by 2040. Central Government and Devolved Administrations is responsible for meeting this target, however not until 2040. Local Authorities have no responsibility to achieve this target.

2.1.2 Local Obligations

Part IV of the Environment Act 1995 (as amended) requires the Secretary of State to review the national Air Quality Strategy (AQS) every five years and modify if required. It also established the system of Local Air Quality Management (LAQM) for Local Authorities to regularly review and assess air quality within its area.

⁵ The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

⁶ The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313, The Stationary Office Limited.

⁷ UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations, 2017.

⁸ The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. UK Statutory Instruments 2023 No. 96.



The Air Quality (England) Regulations 2000 (as amended) ('the Regulations') provide the statutory basis for the Air Quality Objectives Local Authorities must adhere to under LAQM in England. PM_{2.5} is not currently cited within the Regulations; Local Authorities are however required to work towards reducing PM_{2.5}.

The Air Quality Objectives apply at locations where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period (relevant exposure). Table B provides an indication of those locations. Where any of the prescribed Air Quality Objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective.

The latest AQS for England was published in 2023⁹. The AQS provides the delivery framework for air quality management across England for local authorities and summarises the air quality standards and objectives operable within England for the protection of public health and the environment.

The ambient air quality standards of relevance this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table A. These are primarily based upon the Air Quality Objectives Local Authorities are responsible for achieving – reflective of the Local Planning Authority's duties. The PM_{2.5} AQSR AQAL has also been included for completeness, to provide an indicative assessment (as the sampling point may not comply with the siting locations prescribed under Schedule 1: AQSR).

Table A: Relevant Ambient AQALs

Pollutant	AQAL (µg/m ³)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per annum)
Particles (as PM ₁₀)	40	Annual mean
	50	24-hour mean (not to be exceeded on more than 35 occasions per annum)
Particles (as PM _{2.5})	20	Annual mean

Table Notes:
The PM_{2.5} AQAL is not prescribed within the Air Quality (England) Regulations 2000 / 2002 and there is no requirement for local authorities to meet it. Exceedances are only valid at specific siting locations (Schedule 1: AQSR).

Table B: Human Health Relevant Exposure

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
Annual Mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites

⁹ Air Quality Strategy: Framework for Local Authority Delivery, Department for Environment Food and Rural Affairs, April 2023.



AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.1.3 Clean Air Strategy

The 2019 Clean Air Strategy¹⁰ sets out the Government’s proposals aimed at delivering cleaner air in England and indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.1.4 Environment Improvement Plan 2023

The 2023 Environment Improvement Plan¹¹ is the first revision of the UK Government’s 25 Year Environment Plan (25YEP) – planned on a five-year rolling cycle. This document sets out the 5-year delivery plan to improve the natural environment. The 2023 Environment Improvement Plan builds on the 2019 Clean Air Strategy by setting environmental targets and commitments to reduce air pollution.

2.1.5 Environmental Protection Act 1990

The Environmental Protection Act 1990¹² sets out provisions for the regulation of statutory nuisances. Section 79 sets out this statutory nuisance as, ‘*any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance*’.

Section 79 requires that, where a complaint of a statutory nuisance is made to it by a person living within its area, a Local Authority must take steps as are reasonably practicable to investigate the complaint and decide whether the odour is prejudicial to health or a nuisance. Proposed developments which result in the introduction of future sensitive receptors are however subject to the Agent of Change principle to ensure potential interactions with the existing environment and operations are assessed and mitigated to minimise restrictions being placed on existing businesses.

Fractions of dust greater than 10µm (i.e. greater than PM₁₀) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

¹⁰ The Clean Air Strategy, Defra. January 2019.

¹¹ Environment Improvement Plan 2023, Defra. 2023.

¹² The Environmental Protection Act 1990. Available at <http://www.legislation.gov.uk/ukpga/1990/43/contents>.



2.2 Policy

2.2.1 National Policy

2.2.1.1 National Planning Policy Framework

The December 2023 update to the National Planning Policy Framework¹³ (NPPF) sets out planning policy for England. The NPPF states that the planning system should contribute to and enhance the natural and local environment, by preventing new development from contributing to or being adversely affected by unacceptable concentrations of air pollution and development should, wherever possible, help to improve local environmental conditions such as air quality.

In specific relation to air quality policy, the document states:

“Chapter 15 - Conserving and Enhancing the Natural Environment

Para 192: Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG)¹⁴ which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

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

“Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species).”

The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that *“Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific. [...] Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact”*.

¹³ National Planning Policy Framework, Ministry of Housing, Communities & Local Government. 2023.

¹⁴ Planning Practice Guidance: Air Quality. Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government. November 2019.



2.2.2 Local Policy

2.2.2.1 Local Plan

The Barnsley Local Plan¹ is the currently adopted strategic planning document within BMBC and provides a framework for guiding planning decisions. The Local Plan was adopted in January 2019 and contains the following policies relating to air quality and the Proposed Development:

“Policy T5: 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.”

“Policy AQ1: Development in Air Quality Management Areas

Development which impacts on areas sensitive to air pollution 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), taking into account any suitable and proportionate mitigation required for the development.

We will only allow residential development which impacts on areas sensitive to air pollution, where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.

We will only allow development which impacts on areas sensitive to air pollution 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, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development.”

Furthermore and as referenced within Section 1.0, the Site is allocated for residential use within the Barnsley Local Plan¹, under policy reference HS52. The wording of the policy is as follows:

“Policy HS52: Land west of Thurnscoe Bridge Lane and south of Derry Grove, Thurnscoe Indicative number of dwellings 308

The development will be subject to the production of a masterplan covering the entire site to ensure that development is brought forward in a comprehensive manner.

The development will be expected to:

Ensure that the trees and hedgerows around the periphery of the site, in particular on the southern boundary are retained; and

Provide off site highway enhancements. [...]”

It is noted that the Site does not constitute the entirety of the allocation area. The full allocation further includes the area of agricultural land located to the north of the western extent of the Site, south of Howell Gardens.



The above policies have been considered as part of this assessment.

2.3 Assessment Guidance

This assessment has been carried out in accordance with the following principles contained within the guidance documents below.

- BMBC: Air Quality and Emissions Good Practice Planning Guidance³ (hereafter referred to as the 'BMBC Guidance');
- Defra: Local Air Quality Management Technical Guidance (LAQM.TG(22))⁴;
- Defra: COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021¹⁵;
- Design Manual for Roads and Bridges LA 105 Air Quality¹⁶;
- Environmental Policy Implementation Community (EPIC) (previously Environmental Protection UK (EPUK)) and the Institute of Air Quality Management (IAQM): Land-Use Planning and Development Control: Planning for Air Quality¹⁷ (hereafter referred to as the 'EPIC & IAQM Guidance');
- IAQM: Guidance on the Assessment Dust from Demolition and Construction¹⁸; and
- IAQM: Use of 2020 and 2021 Monitoring Datasets¹⁹.

¹⁵ Defra and the Greater London Authority, COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021. April 2021.

¹⁶ DMRB, LA 105-Air Quality, Highways England, 2019.

¹⁷ EPIC and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, v1.2 2017.

¹⁸ IAQM, Guidance on the Assessment Dust from Demolition and Construction, v2.2, January 2024.

¹⁹ IAQM, Use of 2020 and 2021 Monitoring Datasets, v1.1, December 2023.



3.0 Assessment Methodology

3.1 Development Classification

The Proposed Development comprises 296 dwellings and associated infrastructure. This meets the criteria for 'Medium' development, presented in Table C below and as referenced within the BMBC Guidance.

Table C: Relevant BMBC Guidance Development Classification Criteria

Land Use	Description	Criteria
Dwelling Houses (C3)	Dwellings for individuals, families or not more than six people in a single household.	>50 units

It is not considered that any of the 'additional trigger for major developments' have been met, as outlined in Table 4 of the BMBC Guidance.

As such, the Proposed Development is classified as 'medium'.

3.2 Construction Phase

A construction dust assessment has been undertaken in accordance with the IAQM guidance. The assessment of risk is determined by considering the risk of dust effects arising from four activities in the absence of mitigation:

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

The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects:

- Annoyance due to dust soiling;
- The risk of health effects due to an increase in exposure to PM₁₀; and
- Harm to ecological receptors.

The first stage of the assessment involves a screening review to determine if there are sensitive receptors within threshold distances of the Site activities associated with the construction phase of the scheme. A detailed assessment is required where a:

- Human receptor is located within 250m of the Site, and/or within 50m of routes used by construction vehicles, up to 250m from the Site entrance(s); and/or
- Ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 250m from the Site entrance(s).

The dust emission class (or magnitude) for each activity is determined on the basis of the guidance, indicative thresholds and professional judgement by a technically competent assessor. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application, residual effects are considered to be 'not significant'.



Given the short-term nature of the construction phase and the comparatively low volume of vehicle movements that will likely arise (when compared to the operational phase, for which an assessment of road traffic emissions has been undertaken), it is unlikely that significant air quality effects from development related road traffic emissions during the construction phase will arise. Such potential impacts have therefore been scoped out from requiring detailed assessment based on their assumed 'insignificant' effect in reference to the EPIC & IAQM guidance.

3.3 Operational Phase

In order to appropriately assess road traffic emission impacts associated with the operation of the Proposed Development as well as the suitability of the Site for residential purposes, detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5 dispersion model, focussing on concentrations of NO₂, PM₁₀ and PM_{2.5} for the following scenarios:

- 2022 Base Case (2022 BC) – Base flows for the year (2022);
- 2030 Do Minimum (2030 DM) – Without development flows for the assumed year of opening, inclusive of any relevant committed development flows; and
- 2030 Do Something (2030 DS) – 'Do Minimum' flows, plus all trips associated with the Proposed Development for the proposed year of opening.

For the above base case (2022) and future year (2030) scenarios, concurrent emission factors and background pollutant concentrations have been used.

Details of model inputs are discussed in turn, below. Advanced inputs are discussed in Appendix A.

3.3.1 Traffic Inputs

Traffic data was provided by TPS – the appointed transport consultant to the Applicant.

Traffic speeds were modelled at the relevant speed limit for each road, or the average speed of the links as surveyed from a period of localised automatic traffic counter (ATC) locations, as relevant. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue, in accordance with LAQM.TG(22). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

The Emissions Factors Toolkit (EFT) version 12.1 developed by Defra²⁰ has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

To inform the spatial extent of the model, changes in traffic volumes on the local road network were compared to the 'indicative criteria for assessment' provided by EPIC & IAQM guidance. These are as follows:

- Outside of an AQMA:
 - A change of Light-Duty Vehicle (LDV) flows of more than 500 Annual Average Daily Traffic (AADT); and/or
 - A change of Heavy-Duty Vehicle (HDV) flows of more than 100 AADT.
- Within an AQMA:
 - A change of LDV flows of more than 100 AADT; and/or

²⁰ Defra, EFT v12.1 (2024). <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>.



- A change of HDV flows of more than 25 AADT.

Where available, neighbouring road links (i.e. links within 200m of a modelled receptor) were also included within the dispersion model to facilitate a robust assessment, rather than rely on their individual contributions being represented within the appropriate background datasets. For those links where distributed operational phase Proposed Development trips fall below the EPIC & IAQM indicative criteria for assessment, it can be concluded that at adjacent receptor locations trips will result in an 'insignificant' effect on air quality.

Details of the traffic flows used in this assessment are provided in Appendix A, whilst the modelled roads in relation to the Site are presented in Figure 2.

3.3.2 Meteorological Data

To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using 2022 data from the Doncaster Sheffield Robin Hood Airport meteorological station, located approximately 22km to the east-south-east of the Site.

LAQM.TG(22) recommends that meteorological data should have a percentage of usable hours greater than 85%. 2022 meteorological data from the Doncaster Sheffield Robin Hood Airport meteorological station includes 8,760 lines of usable hourly data for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise.

The determination of surface roughness utilised the CORINE (Coordination of Information on the Environment) Land Cover dataset from the European Environment Agency's Copernicus Land Monitoring Service²¹. A surface roughness value of 0.5m was used to represent the Site locale (corresponding to 'parkland and open suburbia'), whilst a surface roughness value of 0.005m was used to represent the meteorological station setting (corresponding to 'short grass').

A wind rose for Doncaster Sheffield Robin Hood Airport meteorological station is presented in Figure 1.

²¹ <https://land.copernicus.eu/en/products/corine-land-cover>, accessed October 2024.



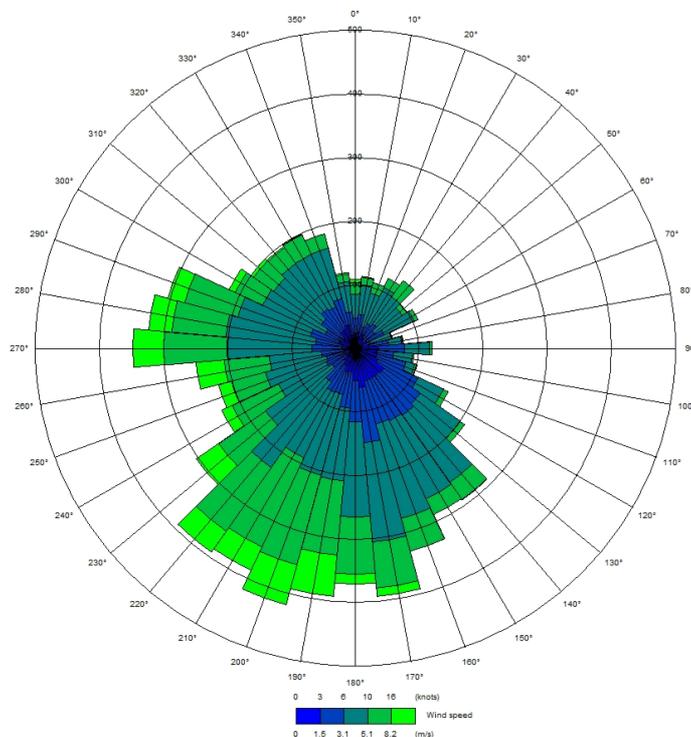


Figure 1: Wind Rose for Doncaster Sheffield Robin Hood Airport Meteorological Station (2022)

3.3.3 Background Concentrations

In the absence of available locally representative background monitoring sites, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year)²², based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 4.0.

3.3.4 Sensitive Receptors

3.3.4.1 Human Receptors

Human receptors considered in the assessment of emissions from road traffic are shown Table D, whilst their locations are illustrated in Figure 2.

Receptors ER1 – ER16 are representative of worst-case exposure locations at existing receptors within the Site locale, relative to the affected road network discussed. New receptors introduced as a result of the Proposed Development, PR1 – PR3, are selected as the locations of proposed dwellings at potential worst-case exposure on the Site relative to the surrounding modelled road network.

The majority of receptors were considered in relation to exposure at breathing height relative to the adjacent modelled road at ground level (i.e. 1.5m height). Receptor locations representing the Highgate Primary School were considered at a height of 1m, to represent the breathing height of children at this schooling stage.

²² Defra Background Maps (2018-Reference) <http://uk-air.defra.gov.uk/data/laqm-background-home>.



Receptor locations represent relevant exposure to the annual mean AQAL – in accordance with LAQM.TG(22) presented in Table B.

Table D: Receptor Locations Considered

Receptor		NGR (m)		Height (m)
ID	Description	X	Y	
<i>Existing Receptors</i>				
ER1	Existing dwelling on Nicholas Lane	445443	404362	1.5
ER2	Highgate Primary School playing field ^(A)	445419	404350	1.0
ER3	Highgate Primary School	445413	404284	1.0
ER4	Existing dwelling on Nicholas Lane	445434	404268	1.5
ER5	Existing dwelling on Nicholas Lane / Barnsley Road	445408	404243	1.5
ER6	Existing dwelling on Turnesc Grove / Thurnscoe Bridge Lane	445626	405011	1.5
ER7	Existing dwelling on Thurnscoe Bridge Lane	445678	405205	1.5
ER8	Existing dwelling on Thurnscoe Bridge Lane	445659	405314	1.5
ER9	Existing dwelling on Shepherd Lane	445645	405376	1.5
ER10	Existing dwelling on Shepherd Lane	445679	405398	1.5
ER11	Existing dwelling on the A635 Doncaster Road ^(B)	447994	405306	1.5
ER12	Existing dwelling on the A635 Doncaster Road ^(B)	448055	405314	1.5
ER13	Existing dwelling on the A635 Doncaster Road ^(B)	448148	405317	1.5
ER14	Existing dwelling on the A635 Doncaster Road ^(B)	448154	405300	1.5
ER15	Existing dwelling on the A635 Doncaster Road ^(B)	448227	405309	1.5
ER16	Existing dwelling on the A635 Doncaster Road ^(B)	448228	405318	1.5
<i>New Receptors</i>				
PR1	Proposed dwelling north of Site access road	445599	404904	1.5
PR2	Proposed dwelling south of Site access road	445604	404883	1.5
PR3	South-eastern most proposed dwelling	445625	404837	1.5
Table Notes:				
(A) Representative of the short-term AQAL's (see Table A).				
(B) Located within the City of Doncaster Council's (CoDC) 'AQMA No. 7'.				

3.3.5 Model Outputs

The background pollutant concentrations discussed in Section 4.3 have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} for each respective scenario.

For the prediction of annual mean NO₂ concentrations for all modelled scenarios at receptor locations, the road NO_x contributions (adjusted as per Appendix A) have been converted to total NO₂ following the methodology in LAQM.TG(22) using the latest version of Defra's NO_x



to NO₂ conversion tool (v8.1)²³. The traffic mix within the calculator was set to “All Other Urban UK traffic” and “Barnsley District” or “Doncaster District” (as relevant) was selected as the local authority. The modelled NO₂ road contribution was then added to the appropriate NO₂ background concentration value to obtain an overall total annual mean NO₂ concentration.

For the prediction of short-term NO₂ impacts, LAQM.TG(22) advises that it is valid to assume that exceedences of the 1-hour mean NO₂ AQAL are unlikely to occur where the annual mean NO₂ concentration is <60µg/m³. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations with an applicable exposure period.

For the prediction of short-term PM₁₀, LAQM.TG(22) provides an empirical relationship between the annual mean and the number of exceedences of the 24-hour mean AQAL for PM₁₀ that can be calculated as follows:

$$\text{No. 24-hour mean exceedences} = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$$

This relationship has thus been adopted to determine whether exceedences of the short-term PM₁₀ AQAL are likely in this assessment.

Verification of the ADMS-Roads assessment has been undertaken as per Appendix A.1.1. All results presented in the assessment are calculated following the process of model verification.

3.3.6 Assessing Significance

Guidance for determining operational phase effects associated with air quality is provided by EPIC & IAQM.

Existing Receptors

When describing the developmental impact at a specific existing receptor, the resultant total concentration as well as the magnitude of change in relation to respective AQALs are both considered – using the approach detailed in Table E.

Table E: Impact Descriptor Matrix for Receptors

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration relative to AQAL			
	1% (A)	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
Note: (A) Changes <0.5% will be described as Negligible.				

²³ Defra NOx to NO2 Calculator v8.1 (2020), available at <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/>.



Following derivation of impacts at all receptor locations assessed, the overall significance of the developmental 'effect' is determined based upon consideration, as necessary, of the following factors:

- The existing and future air quality in the absence of the Proposed Development;
- The extent of current and future population exposure to the impacts;
- The worst-case assumptions adopted when undertaking the prediction of impacts; and
- The extent to which the Proposed Development has adopted best practice to eliminate and minimise emissions.

New Receptors

Modelled pollutant concentrations predicted at future receptors have been compared with the relevant AQALs to determine the suitability of the Site for residential use.

As per the EPIC & IAQM guidance, *“where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means”*.

3.3.7 Uncertainty

Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest representative publicly available local monitoring data, as collected by CoDC.

In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data²⁴. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 12.1 utilising COPERT 5.6 emission factors, and associated tools/datasets published by Defra.

The IAQM published a Position Statement on *‘Dealing with Uncertainty in Vehicle NOx Emissions Within Air Quality Assessments’* in July 2018²⁵ within which it was suggested to include a sensitivity test to account for predicted large reductions in NOx emissions that were not borne out in measured roadside concentrations. However, the latest iterations of the EFT (from version 9 onwards), reflect the real-world NOx emissions more accurately. As such, the IAQM has withdrawn its position statement saying as such and including:

“It is judged that an exclusively vehicle emissions-based sensitivity test is no longer necessary.

On this basis, the EFT may be used for future year modelling with greater confidence when considering the per vehicle emission, provided that the assessment is verified against measurements made in the year 2016 or later.”

Given the above, use of further sensitivity modelling is not considered relevant or appropriate (i.e. too pessimistic).

3.4 Exposure Assessment

In accordance with the BMBC Guidance and as required for all 'minor' and 'medium' developments, an 'exposure assessment' has been undertaken to determine whether future occupants of the scheme are likely to be exposed to existing levels of poor air quality. With

²⁴ Carslaw, et al. (2011). Trends in NOx and NO₂ emissions and ambient measurements in the UK.

²⁵ IAQM, Dealing with Uncertainty in Vehicle NOx Emissions Within Air Quality Assessments, July 2018.



reference to Section 7.0, proposed receptor locations have been included within the road traffic emissions assessment to determine pollutant concentrations at the Site, in fulfilment of the requirements of the BMBC 'exposure assessment'.

Guidance for determining operational phase effects associated with air quality is provided by EPIC & IAQM. As per the EPIC & IAQM guidance, *“where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means”*.



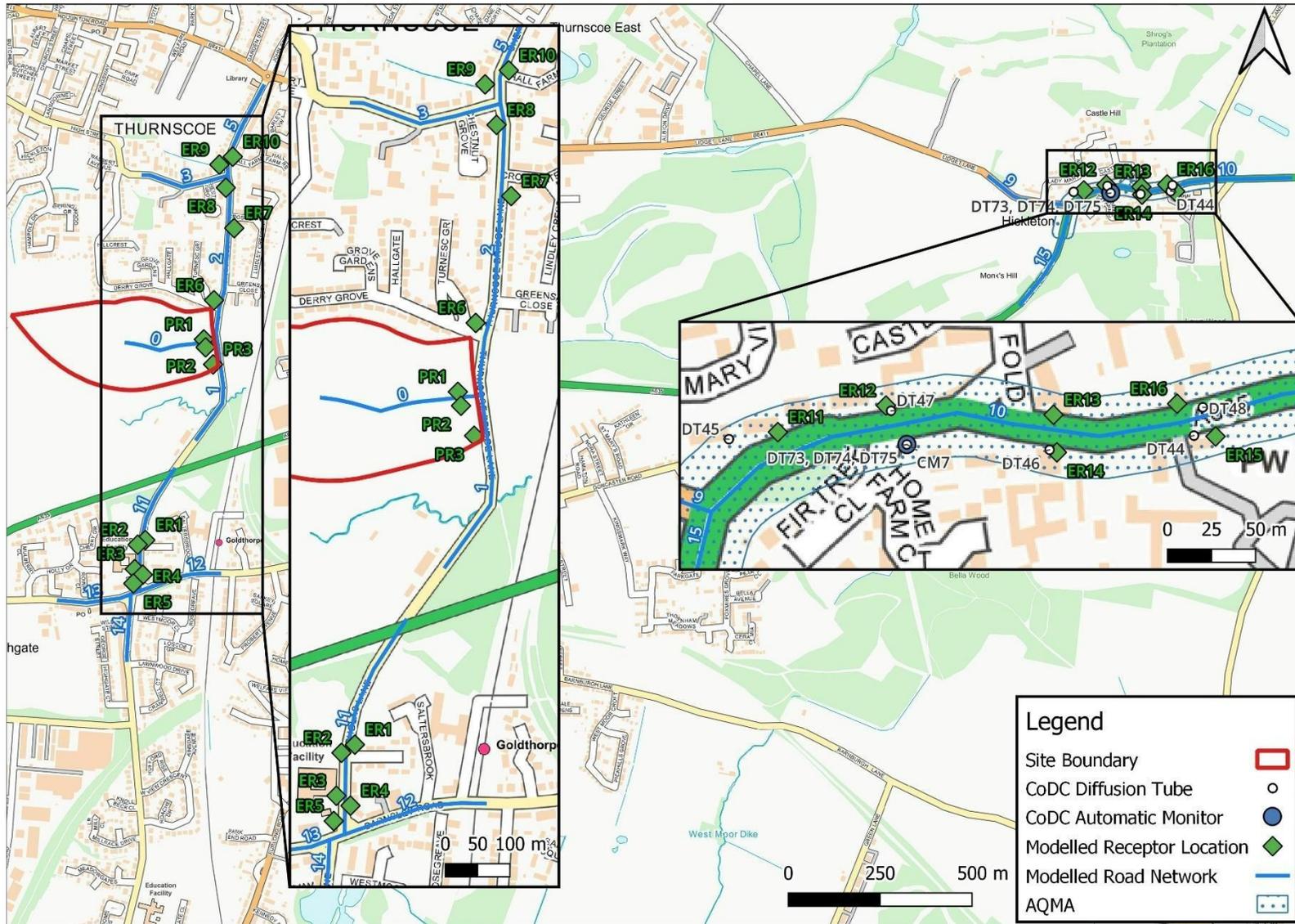


Figure 2: Site Setting, Modelled Road Network & Receptors and LAQM Monitoring



4.0 Baseline Environment

4.1 LAQM Review and Assessment

BMBC, in fulfilment of statutory requirements, has conducted an on-going exercise to review and assess air quality within their administrative area. The latest publicly available LAQM report for BMBC at the time of writing is the 2023 Annual Status Report²⁶ (ASR).

BMBC currently has five declared AQMAs within its administrative area, three of which have been declared only due to exceedences of the annual mean NO₂ AQAL (i.e. AQMAs No.1, No.2A & No.4), whilst AQMAs No.6 & No.7 have been declared for exceedences of both the annual mean and the 1-hour mean NO₂ AQALs. The closest of these BMBC AQMAs are located approximately 10km to the west of the Site (AQMA No.7 & AQMA No.4). Given the separation distance between the Site and the BMBC AQMAs, it is not considered that the Proposed Development would have an impact upon their declarations. Furthermore, no operational phase trip generation data was provided by the appointed transport consultant within either of these designations. As such, no further consideration has been given to the BMBC AQMAs within this assessment.

The administrative boundary of CoDC is located approximately 1.3km east of the Site at its closest point. Given this proximity and the indication of operational phase development trips dispersing into CoDC, a review of the latest publicly available LAQM report for CoDC at the time of writing (2023 ASR²⁷) has been undertaken.

CoDC currently has eight declared AQMAs within its administrative area, all of which have been declared due to exceedences of the annual mean NO₂ AQAL, whilst 'AQMA 7' has additionally been declared for exceedences of the 1-hour mean NO₂ AQAL. The closest of the CoDC AQMAs to the Site is 'AQMA No. 7', located approximately 2.3km to the east. 'AQMA No. 7' was declared in 2015 and is described within CoDC's 2023 ASR as: "A village with residential properties along the A635". The geometry of the road network between the Site and 'AQMA No. 7' means that any operational phase development trips travelling east beyond Thurnscoe and Goldthorpe would travel through the AQMA No. 7 designation. As such, consideration of potential operational phase road traffic emission impacts at receptor locations within 'AQMA No. 7' has been included within this assessment.

4.2 Review of Air Quality Monitoring

4.2.1 Automatic Air Quality Monitoring

BMBC undertook automatic monitoring at three locations within its administrative area during 2022. The nearest automatic monitor to the Site is the 'BAR9' monitor, located approximately 8.8km to the west. Given the separation distance between this monitor and the Site and the differences in local characteristics, comparable pollutant concentrations are not anticipated. Therefore, no further consideration has been given to the BMBC automatic monitoring network within this assessment.

The nearest Automatic Urban and Rural Network (AURN) automatic monitor is located approximately 11km to the west of the Site (i.e. the 'Barnsley 12' AURN). Given the separation distance between the Site and the 'Barnsley 12' AURN, comparable pollutant concentrations are not anticipated, and no further consideration has been given to the AURN monitors within this assessment.

²⁶ Barnsley Metropolitan Borough Council, Air Quality Annual Status Report 2023, October 2023.

²⁷ City of Doncaster Council, Air Quality Annual Status Report 2023, June 2023.



CoDC undertook automatic monitoring at eight locations within its administrative area during 2022. The nearest automatic monitor to the Site is the 'CM7' monitor, located approximately 2.5km to the east and within 'AQMA No. 7'. Further details of this automatic monitoring site and associated monitored pollutant concentrations are presented in Table F to Table I. It is noted that the 'CM7' automatic monitor was commissioned in 2022.

Table F: LAQM Automatic Monitoring Sites: Details

Site ID	Site Type	NGR (m)		Height (m)	Within AQMA	Distance and Direction to Site (km)
		X	Y			
CoDC CM7	Roadside ^(A)	448067	405300	2	Yes: CoDC 'AQMA No. 7'	2.5, E
Note: (A) Roadside site defined by LAQM.TG(22) as: "a site sampling typically within one to five metres of the kerb of a busy road".						

Table G: LAQM Automatic Monitoring: NO₂ Results

Monitoring Location	2022 Data Capture (%)	Annual Mean NO ₂ Concentration (µg/m ³)				
		2018	2019	2020	2021	2022
CoDC CM7	73	-	-	-	-	19.1
		1-hour Means >200µg/m ³ ^(A)				
		-	-	-	-	0 (83) ^(B)
Table notes: (A) 18 1-hour mean concentrations in excess of 200µg/m ³ are permitted. (B) Where the period of valid data is less than 85%, the 99.8 th percentile of 1-hour means is provided in brackets.						

As shown in Table G, CoDC's 'CM7' automatic monitor recorded an annual mean NO₂ concentration of 19.1µg/m³ in 2022, representing 47.8% of the AQAL (40µg/m³). There were no monitored 1-hour mean NO₂ concentrations in excess of 200µg/m³, compared to the 18 permitted across the calendar year. However, given the low data capture in 2022 at the 'CM7' monitor it is possible at particular pollution episodes may have been missed. Nonetheless, the calculated 99.8th percentile is less than the AQAL indicating exceedences of the 1-hour mean AQAL are unlikely.

It is not possible to determine any trends in monitored NO₂ concentrations, given that the 'CM7' automatic monitor was commissioned in 2022.

Table H: LAQM Automatic Monitoring: PM₁₀ Results

Monitoring Location	2022 Data Capture (%)	Annual Mean PM ₁₀ Concentration (µg/m ³)				
		2018	2019	2020	2021	2022
CoDC CM7	86	-	-	-	-	12.6
		24-hour Means >50µg/m ³ ^(A)				
		-	-	-	-	2
Table notes:						



Monitoring Location	2022 Data Capture (%)	Annual Mean PM ₁₀ Concentration (µg/m ³)				
		2018	2019	2020	2021	2022
(A) 35 24-hour mean concentrations in excess of 50µg/m ³ are permitted.						

As shown in Table H, CoDC's 'CM7' automatic monitor recorded an annual mean PM₁₀ concentration of 12.6µg/m³ in 2022, representing 31.5% of the AQAL (40µg/m³). There were two monitored 24-hour mean PM₁₀ concentrations in excess of 50µg/m³, compared to the 35 permitted across the calendar year.

It is not possible to determine any trends in monitored PM₁₀ concentrations, given that the 'CM7' automatic monitor was commissioned in 2022.

Table I: LAQM Automatic Monitoring: PM_{2.5} Results

Monitoring Location	2022 Data Capture (%)	Annual Mean PM _{2.5} Concentration (µg/m ³)				
		2018	2019	2020	2021	2022
CM7	86	-	-	-	-	8.6

As shown in Table I, CoDC's 'CM7' automatic monitor recorded an annual mean PM_{2.5} concentration of 8.6µg/m³ in 2022, representing 43% of the AQAL (20µg/m³).

It is not possible to determine any trends in monitored PM_{2.5} concentrations, given that the 'CM7' automatic monitor was commissioned in 2022.

4.2.2 Passive Diffusion Tube Monitoring

Passive NO₂ diffusion tube monitoring is currently undertaken by BMBC at 64 locations within its administrative area. The nearest BMBC passive NO₂ diffusion tube monitoring location is approximately 7.5km to the west of the Site. Given the separation distance between the Site and the BMBC diffusion tube network, comparable pollutant concentrations are not anticipated, and no further consideration has been given to these monitoring locations within this assessment.

Additionally, passive NO₂ diffusion tube monitoring is currently undertaken by CoDC at 64 locations within its administrative area (with an additional three diffusion tubes co-located each at both 'CM2' and 'CM7' automatic monitors).

The details and results of the monitoring location of relevance to this assessment are presented in Table J and Table K, respectively, whilst also shown in Figure 2. All monitoring data presented has been ratified by CoDC.

Table J: Local NO₂ Diffusion Tube Monitoring Sites: Details

Site ID	Site Type	NGR (m)		Height (m)	Within AQMA?	Distance and Direction to Site (km)
		X	Y			
CoDC DT45	Roadside (B)	447966	405303	2	Yes: CoDC 'AQMA No. 7'	2.4, E
CoDC DT47	Kerbside (C)	448058	405319	2	Yes: CoDC 'AQMA No. 7'	2.5, E
CoDC DT73, DT74, DT75 (A)	Kerbside (C)	448067	405300	2	Yes: CoDC 'AQMA No. 7'	2.5, E



Site ID	Site Type	NGR (m)		Height (m)	Within AQMA?	Distance and Direction to Site (km)
		X	Y			
CoDC DT46	Suburban (D)	448148	405297	2	Yes: CoDC 'AQMA No. 7'	2.5, E
CoDC DT44	Kerbside (C)	448230	405305	2	Yes: CoDC 'AQMA No. 7'	2.6, E
CoDC DT48	Kerbside (C)	448235	405321	2	Yes: CoDC 'AQMA No. 7'	2.6, E

Note:

- (A) Triplicate diffusion tubes co-located with the 'CM7' automatic monitor.
- (B) Roadside site defined by LAQM.TG(22) as: "a site sampling typically within one to five metres of the kerb of a busy road".
- (C) Kerbside site defined by LAQM.TG(22) as: "a site sampling within one metre of the kerb of a busy road".
- (D) Suburban site defined by LAQM.TG(22) as: "a location type situated in a residential area on the outskirts of a town or city".

Table K: Local NO₂ Diffusion Tube Monitoring Sites: Results

Site ID	2022 Data Capture %	Annual Mean NO ₂ Concentration (µg/m ³)				
		2018	2019	2020 (A)	2021 (A)	2022
DT45	100	25.0	22.0	16.8	15.9	15.3
DT47	76.4	91.0	76.0	59.4	54.1	54.2
DT73, DT74, DT75 (B)	100	-	-	-	-	14.8
DT46	100	40.0	35.0	24.9	26.0	25.8
DT44	100	70.0	67.0	50.7	51.0	52.0
DT48	93.7	87.0	80.0	55.8	55.2	61.1

Table Notes:

- (A) As per guidance published by Defra¹⁵ and the IAQM's Position Statement¹⁹, monitoring results obtained in 2020 and 2021 are likely to be atypical due to the impacts of the COVID-19 pandemic. The IAQM's Position Statement¹⁹ further states "the 2022 (or later year) monitoring data is likely to represent a post-pandemic baseline".
- (B) Monitoring location commissioned in 2022.

As shown in Table K, there are six passive NO₂ diffusion tube monitoring locations of relevance to this assessment; all of which are located within the CoDC 'AQMA No. 7'. Given their presence within the AQMA, elevated annual mean NO₂ concentrations are anticipated. In 2022, three of the monitoring locations recorded an exceedence of the annual mean NO₂ AQAL (i.e. DT47, DT44 and DT48). The highest recorded 2022 annual mean NO₂ concentration was at DT48, with a concentration of 61.1µg/m³, representing 152.8% of the AQAL.

DT44 and DT48 are located on either side of the A635 Doncaster Road, in a section of the 'AQMA No. 7' characterised by a street canyon where reduced dispersion of road traffic emissions is expected. DT47 is situated on the kerbside of the A635 Doncaster Road (with a minimal separation distance of 0.8m from the kerb), in a section of the 'AQMA No. 7' characterised by an approximate 7% road gradient, which would result in a greater road traffic emission contribution.



Overall, there has been a downward trend in monitored annual mean NO₂ concentrations at each of the considered monitoring locations between 2018 and 2022, with some slight year-on-year fluctuations.

The empirical relationship given in LAQM.TG(22) states that exceedences of the 1-hour mean NO₂ AQAL is unlikely to occur where annual mean concentrations are <60µg/m³. DT48 recorded an annual mean NO₂ concentration of 61.1µg/m³ in 2022, suggesting that there is a chance of an exceedance of the 1-hour mean NO₂ AQAL at this location. Furthermore, monitored annual mean NO₂ concentrations in excess of 60µg/m³ have been recorded at DT47, DT44 and DT48 in 2018 and 2019.

4.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution which is routinely used to support LAQM requirements and air quality assessments. The data sets include annual average concentration estimates for NO_x, NO₂, PM₁₀ and PM_{2.5} using a base year of 2018 (the year in which comparisons between modelled and monitoring are made).

The Defra mapped background concentrations for the base year (2022) and the earliest predicted opening year of the Proposed Development (2030) are presented in Table L below.

All of the mapped background concentrations presented are “well-below” the respective annual mean AQALs.

Table L: Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y) (m)	Year	Annual Mean Concentration (µg/m ³)			
		NO _x	NO ₂	PM ₁₀	PM _{2.5}
445500, 404500	2022	13.6	10.3	11.8	7.3
	2030	11.2	8.6	11.4	7.0
445500, 405500	2022	13.1	10.0	11.2	7.2
	2030	10.8	8.3	10.8	6.8
447500, 405500	2022	11.1	8.6	12.0	7.2
	2030	9.1	7.1	11.6	6.8
448500, 405500	2022	11.2	8.7	12.7	7.3
	2030	9.1	7.1	12.3	7.0
AQAL		-	40	40	20



5.0 Construction Phase Assessment

This section presents the potential air quality impacts and effects associated with the construction of the Proposed Development.

5.1 Construction Dust Assessment

Where figures relating to area and volume of the Site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

5.1.1 Assessment Screening

There are 'human receptors' within 250m of the Site but no designated habitat sites within 50m of the Site boundary or up to 250m of the Site entrance(s) / 50m of the roads anticipated to witness construction traffic movements. Therefore, an assessment of construction dust on human receptors, only, is required.

5.1.2 Potential Dust Emissions Magnitude

5.1.2.1 Demolition

The Site currently comprises partially wooded open green space, with no buildings or structures which require demolition. As such, impacts associated with demolition have been scoped out of this assessment.

5.1.2.2 Earthworks

The total area of the Site is approximately 99,000m². Site earthworks are therefore required over an area between 18,000m² – 110,000m². In addition, according to Magic²⁸, the main surface texture class of the underlying soil is regarded to be 'loamy', which is considered to have a moderate dust generating potential.

The dust emission magnitude for earthworks is therefore considered to be 'medium'.

5.1.2.3 Construction

The proposals constitute a total of 296 dwellings. The total building volume associated with the Proposed Development is predicted to be >12,000m³. However, in recognition of the phased construction of residential schemes, the total building volume associated with the Proposed Development is considered likely to be <75,000m³ at any given time. Building materials are anticipated to be as standard brick masonry.

As such, the dust emission magnitude for construction is therefore initially considered to be 'medium'.

5.1.2.4 Trackout

Construction vehicles will access the Site from Thurnscoe Bridge Lane. Given the scale and nature of works required, there are anticipated to be a maximum 20 – 50 HDV outward movements in any worst-case day. Due to the size of the Site, the unpaved road length may be 50 – 100m at any given time.

Therefore, the dust emission magnitude for earthworks is considered to be 'medium'.

²⁸ <https://magic.defra.gov.uk/MagicMap.aspx>.



5.1.2.5 Summary

A summary of the potential dust emission magnitude for each of the activities is displayed in Table M.

Table M: Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Medium
Construction	Medium
Trackout	Medium

5.1.3 Sensitivity of the Area

5.1.3.1 Dust Soiling Impacts

Overall, there are anticipated to be 10 – 100 residential properties (highly sensitive receptors) within 20m of the Site boundary.

Furthermore, there are believed to be 10 – 100 residential receptors within 20m of sections of the Site access within 250m of the Site entrance.

The sensitivity of the area with respect to dust soiling effects on people and property in relation to earthworks, construction and trackout is therefore considered to be 'high'.

5.1.3.2 Human Health Impacts

The maximum background PM₁₀ concentration for the 1km² grid square which covers the development (x445500, y404500) is estimated to be 11.8µg/m³, based upon 2022 mapped background estimates (i.e. falls into the <24µg/m³ class).

Given the above information regarding the number and nature of surrounding receptors within specified screening distances of the Site boundary, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is considered to be 'low'.

5.1.3.3 Summary

A summary of the sensitivity of the area defined for each potential impact is displayed in Table N, whereas the spatial densities of receptors discussed in relation to the Site boundary are illustrated in Figure 3.

Table N: Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	High	High	High
Human Health	N/A	Low	Low	Low

5.1.4 Risk of Impacts (Unmitigated)

The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined in Table O below to determine the risk of impact which is used to inform the selection of appropriate mitigation.



Table O: Risk of Dust Impacts (Unmitigated)

Potential Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium Risk	Medium Risk	Medium Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk

5.1.5 Mitigation

Following the construction dust assessment, the Site is found to be at worst ‘medium risk’ in relation to dust soiling effects on people and property and ‘low risk’ in relation to human health impacts (Table O). However, potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

Nonetheless, commensurate with the above designation of dust risk, mitigation measures as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the Proposed Development are reduced and, where possible, completely removed. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Section 7.1, construction dust effects are considered to be ‘not significant’.





Figure 3: Construction Dust Buffers



6.0 Exposure Assessment

This section presents a review of monitoring data and the BMBC Guidance in consideration with the Proposed Development, for the purposes of identifying requirements for mitigation to be embedded into the scheme design.

6.1 BMBC Guidance – Exposure Assessment

The BMBC Guidance requires an ‘exposure assessment’ to determine whether future occupants of the scheme are likely to be exposure to existing levels of poor air quality. An ‘exposure assessment’ is required if the development meets any of the following criteria:

- The proposal is adjacent to or within an AQMA;
- The proposal is in a location 20m from roads at or above the relevant national objective highlighted on the Defra GIS modelled maps²⁹ and is one of the following Land Use Types;
 - C1 to C3;
 - C4 (Homes of Multiple Occupation); or
 - D1 in table1.
- And the Proposal is within the areas identified on Map 1 [of the BMBC Guidance] (this includes the area within or adjacent to an AQMA; applicable roads; and includes roads at or above the relevant national objective highlighted on the Defra GIS modelled maps.

In consideration of the above criterion:

- The Site is not located within or adjacent to an AQMA as discussed in Section 4.1;
- The Proposed Development is for C3 use-class but is not located within 20m of a road identified as being above the annual mean roadside NO₂ AQAL;
- The Site is not located within the areas identified on Map 1 of the BMBC Guidance.

Therefore, based upon the above there is no requirement to quantify air pollutant concentrations at the Site and no requirement for mitigation measure to make the scheme acceptable.

Overall, the findings of the exposure assessment show the Site is suitable for the proposed residential use, and no further assessment is required. Effects associated with the likely exposure of future occupants in relation to NO₂, PM₁₀ and PM_{2.5} concentrations are considered to be ‘not significant’ in reference to the stated EPIC & IAQM guidance and no further mitigation measures are required.

Notwithstanding, proposed receptor locations have been included within the operational phase road traffic emissions assessment to determine worst-case pollutant concentrations at the Site.

²⁹ <http://uk-air.defra.gov.uk/data/gismapping>.



7.0 Operational Phase Assessment

This section presents the potential air quality impacts and effects associated with the operational phase of the Proposed Development.

7.1 NO₂ Modelling Results

Table P presents the annual mean NO₂ concentrations predicted at all assessed receptor locations for the 2022 BC, 2030 DM and 2030 DS scenarios.

Table P: Predicted Annual Mean NO₂ Concentrations – 2030 Development Opening Year

Receptor	Predicted Annual Mean NO ₂ Concentration (µg/m ³)			% Change of AQAL	% of 2030 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2022 BC	2030 DM	2030 DS			
<i>Existing Receptors</i>						
ER1	14.0	9.9	10.1	+0.3	25.2	Negligible
ER2	15.9	10.7	10.9	+0.5	27.2	Negligible
ER3	15.4	10.5	10.6	+0.3	26.5	Negligible
ER4	17.6	11.3	11.5	+0.5	28.8	Negligible
ER5	16.0	10.7	10.8	+0.3	27.0	Negligible
ER6	12.5	9.3	9.4	+0.2	23.6	Negligible
ER7	14.2	10.1	10.2	+0.2	25.4	Negligible
ER8	14.1	10.0	10.1	+0.2	25.3	Negligible
ER9	12.3	9.2	9.3	+0.2	23.3	Negligible
ER10	13.3	9.7	9.8	+0.2	24.4	Negligible
ER11	22.0	12.7	12.8	+0.2	31.9	Negligible
ER12	32.3	17.3	17.5	+0.4	43.7	Negligible
ER13	28.1	15.6	15.7	+0.2	39.2	Negligible
ER14	21.5	12.6	12.6	+0.2	31.6	Negligible
ER15	28.0	15.5	15.7	+0.3	39.1	Negligible
ER16	56.8	30.0	30.2	+0.7	75.5	Negligible
<i>New Receptors</i>						
PR1	-	-	9.4	-	23.4	-
PR2	-	-	9.2	-	22.9	-
PR3	-	-	9.4	-	23.6	-

The maximum predicted annual mean NO₂ concentration at all existing receptors during the 2022 BC scenario was at Receptor ER16 with a predicted concentration of 56.8µg/m³, representing 142% of the AQAL. Receptor ER16 is situated within the CoDC 'AQMA No. 7', where elevated annual mean NO₂ concentrations have been monitored (see Section 4.0). Specifically, Receptor ER16 represents a residential dwelling which forms the edge of a street canyon, which results in the reduced dispersion of pollutants. Furthermore, Receptor ER16 is situated at the crest of a hill of approximately 7% gradient. Vehicles travelling along gradients present a greater emission contribution compared to when travelling on a flat road.



The A635 Doncaster Road, considered to be the greatest emission source within the CoDC 'AQMA No. 7', has the highest baseline traffic flow and the highest proportion of HDVs than any other considered links within this assessment (see Table T). It is considered that the combination of these factors are the cause of the elevated predicted concentrations at Receptor ER16. The predicted 2022 annual mean NO₂ concentration at Receptor ER16 is comparable to the monitored 2022 annual mean NO₂ concentration at DT48 (see Table K), which is located more centrally within the street canyon and closer to the kerbside of the road relative to ER16. It is noted that Receptor ER15 is situated adjacent to Receptor ER16, on the southern side of the A635 Doncaster Road. Receptor ER15 is not considered to be located within the street canyon and is set back at a much greater distance from the kerbside of the road when compared to Receptor ER16, explaining the lower predicted concentration at this location.

The maximum predicted annual mean NO₂ concentration at existing receptors with the Proposed Development in place (2030 DS) was at Receptor ER16 with a predicted concentration of 30.2µg/m³, representing 75.5% of the AQAL. The change in the annual mean NO₂ concentrations at this location, due to the Proposed Development (2030 DS vs. 2030 DM) relative to the AQAL was +0.7% (i.e. 0.2µg/m³). The observed increase in annual mean NO₂ concentration at Receptor ER16 is the greatest of all considered existing receptors.

In accordance with EPIC & IAQM guidance, the impact of the Proposed Development on annual mean NO₂ concentrations at all assessed existing receptors (of relevant exposure) is considered to be 'negligible'. Given the marginal increase in annual mean NO₂ concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean NO₂ AQAL, unmitigated effects associated with annual mean NO₂ concentrations at all existing assessed receptor locations are therefore considered to be 'not significant'.

The maximum predicted annual mean NO₂ concentration (2030 DS) at all receptors newly introduced by the Proposed Development was at Receptor PR3 with a predicted annual mean NO₂ concentration of 9.42µg/m³ (values rounded in Table P), representing 23.6% of the AQAL (i.e. 'well-below'). Receptor PR3 is located at the south-eastern most dwelling of the Proposed Development and at the closest extent to Thurnscoe Bridge Road than other proposed receptor locations. Thurnscoe Bridge Road is considered to be the largest source of road traffic emission contributions / ambient air quality at the Site. As such, the Site is considered to be suitable for residential development in relation to NO₂ concentrations and unmitigated effects from air quality would be considered 'not significant'.

It is unlikely that an exceedence of the 1-hour mean NO₂ AQAL will occur in reference to the empirical relationship given in LAQM.TG(22) and predicted maximum absolute annual mean NO₂ concentrations. Effects associated with likely 1-hour mean NO₂ concentrations at all assessed receptor locations (including those on Site) are therefore considered to be 'not significant'.

7.2 PM₁₀ Modelling Results

Table Q presents the annual mean PM₁₀ concentrations predicted at all assessed receptor locations for the 2022 BC, 2030 DM and 2030 DS scenarios.



Table Q: Predicted Annual Mean PM₁₀ Concentrations – 2030 Development Opening Year

Receptor	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)			% Change of AQAL	% of 2030 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2022 BC	2030 DM	2030 DS			
<i>Existing Receptors</i>						
ER1	12.8	12.4	12.5	+0.2	31.2	Negligible
ER2	13.3	12.9	13.0	+0.3	32.5	Negligible
ER3	13.0	12.6	12.7	+0.2	31.7	Negligible
ER4	13.5	13.0	13.2	+0.3	32.9	Negligible
ER5	13.1	12.6	12.7	+0.2	31.7	Negligible
ER6	11.9	11.5	11.5	+0.1	28.8	Negligible
ER7	12.4	11.9	12.0	+0.2	30.0	Negligible
ER8	12.3	11.9	11.9	+0.2	29.9	Negligible
ER9	11.8	11.4	11.4	+0.1	28.6	Negligible
ER10	12.1	11.7	11.7	+0.1	29.3	Negligible
ER11	15.1	14.7	14.7	+0.1	36.8	Negligible
ER12	18.4	18.1	18.2	+0.2	45.4	Negligible
ER13	16.8	16.4	16.5	+0.2	41.2	Negligible
ER14	15.4	15.0	15.0	+0.1	37.5	Negligible
ER15	16.7	16.3	16.4	+0.2	40.9	Negligible
ER16	23.9	23.6	23.8	+0.5	59.5	Negligible
<i>New Receptors</i>						
PR1	-	-	12.0	-	30.0	-
PR2	-	-	11.9	-	29.7	-
PR3	-	-	12.0	-	30.1	-

The maximum predicted annual mean PM₁₀ concentration at all existing receptors during the 2022 BC scenario was at Receptor ER16 with a predicted concentration of 23.9µg/m³, representing 59.8% of the AQAL (i.e. 'well-below').

The maximum predicted annual mean PM₁₀ concentration at existing receptors with the Proposed Development in place (2030 DS) was at Receptor ER16 with a predicted concentration of 23.8µg/m³, representing 59.5% of the AQAL. The change in the annual mean PM₁₀ concentrations at this location, due to the Proposed Development (2030 DS vs. 2030 DM) relative to the AQAL was +0.5% (i.e. 0.2µg/m³). The observed increase in annual mean PM₁₀ concentration at Receptor ER16 is the greatest of all considered existing receptors.

In accordance with EPIC & IAQM guidance, the impact of the Proposed Development on annual mean PM₁₀ concentrations at all assessed existing receptors (of relevant exposure) is considered to be 'negligible'. Given the marginal increase in annual mean PM₁₀ concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM₁₀ AQAL, unmitigated effects associated with annual mean PM₁₀ concentrations at all existing assessed receptor locations are therefore considered to be 'not significant'.



The maximum predicted annual mean PM₁₀ concentration (2030 DS) at all receptors newly introduced by the Proposed Development was at Receptor PR3 with a predicted concentration of 12.04µg/m³ (values rounded in Table H), representing 30.1% of the AQAL (i.e. ‘well-below’). As such, the site is considered to be suitable for residential development in relation to PM₁₀ concentrations and unmitigated effects from air quality would be considered ‘not significant’.

Based upon the maximum predicted annual mean PM₁₀ concentration of 23.8µg/m³ (predicted at Receptor ER16 – 2030 DS), this equates to 10 days where 24-hour mean PM₁₀ concentrations are predicted to be greater than 50µg/m³. This is below the 35 permitted 24-hour mean concentrations in excess of 50µg/m³ prescribed within the 24-hour mean AQAL. Effects associated with likely 24-hour mean PM₁₀ concentrations at all assessed receptor locations (both existing and newly introduced) are therefore considered to be ‘not significant’.

7.3 PM_{2.5} Modelling Results

Table R presents the annual mean PM_{2.5} concentrations predicted at all assessed receptor locations for the 2022 BC, 2030 DM and 2030 DS scenarios.

Table R: Predicted Annual Mean PM_{2.5} Concentrations – 2030 Development Opening Year

Receptor	Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)			% Change of AQAL	% of 2030 DS Relative to AQAL	EPIC & IAQM Impact Descriptor
	2022 BC	2030 DM	2030 DS			
<i>Existing Receptors</i>						
ER1	7.9	7.5	7.5	+0.2	37.7	Negligible
ER2	8.1	7.7	7.8	+0.3	39.0	Negligible
ER3	8.0	7.6	7.6	+0.2	38.2	Negligible
ER4	8.2	7.8	7.9	+0.3	39.4	Negligible
ER5	8.0	7.6	7.6	+0.2	38.2	Negligible
ER6	7.5	7.2	7.2	+0.1	36.0	Negligible
ER7	7.8	7.4	7.4	+0.2	37.2	Negligible
ER8	7.8	7.4	7.4	+0.2	37.1	Negligible
ER9	7.5	7.1	7.2	+0.1	35.8	Negligible
ER10	7.7	7.3	7.3	+0.2	36.6	Negligible
ER11	8.8	8.4	8.4	+0.1	42.2	Negligible
ER12	10.4	10.0	10.1	+0.2	50.3	Negligible
ER13	9.5	9.1	9.2	+0.2	45.9	Negligible
ER14	8.8	8.4	8.4	+0.1	42.1	Negligible
ER15	9.5	9.1	9.1	+0.2	45.6	Negligible
ER16	13.4	12.9	13.0	+0.5	64.8	Negligible
<i>New Receptors</i>						
PR1	-	-	7.3	-	36.4	-
PR2	-	-	7.2	-	36.2	-
PR3	-	-	7.3	-	36.6	-



The maximum predicted annual mean PM_{2.5} concentration at existing receptors during the 2022 BC scenario was at Receptor ER16 with a predicted concentration of 13.4µg/m³, representing 67.0% of the AQAL (i.e. 'well-below').

The maximum predicted annual mean PM_{2.5} concentration at existing receptors with the Proposed Development in place (2030 DS) was at Receptor ER16 with a predicted concentration of 13.0µg/m³, representing 64.8% of the AQAL. The change in the annual mean PM_{2.5} concentrations at this location, due to the Proposed Development (2030 DS vs. 2030 DM) relative to the AQAL was +0.5% (i.e. 0.1µg/m³). The observed increase in annual mean PM_{2.5} concentration at Receptor ER16 is the greatest of all considered existing receptors.

In accordance with EPIC & IAQM guidance, the impact of the Proposed Development on annual mean PM_{2.5} concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean PM_{2.5} concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM_{2.5} AQAL, unmitigated effects associated with annual mean PM_{2.5} concentrations at all existing assessed receptor locations are therefore considered to be 'not significant'.

The predicted annual mean PM_{2.5} concentration (2030 DS) at receptors newly introduced by the Proposed Development was at Receptor PR3 with a predicted concentration of 7.32µg/m³ (values rounded in Table I), representing 49.5% of the AQAL (i.e. 'well-below'). As such, the site is considered to be suitable for residential development in relation to PM_{2.5} concentrations and unmitigated effects from air quality would be considered 'not significant'.



8.0 Mitigation Measures

This section presents any proportionate mitigation measures required during the construction and operational phases of the Proposed Development.

8.1 Construction Dust

As discussed in Section 5.0, construction impacts associated to the Proposed Development would result in the generation of dust and PM₁₀.

In order to control potential impacts, Table S presents a range of mitigation measures which could be applied and align with the IAQM guidance. With the effective application of the dust mitigation measures, residual effects will be 'not significant'.

Table S: Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Operating Vehicle/Machinery and Sustainable Travel	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.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.



Site Application	Mitigation Measures
	<p>Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.</p> <p>Use enclosed chutes and conveyors and covered skips.</p> <p>Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.</p> <p>Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.</p>
Preparing and Maintaining the Site	<p>Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.</p> <p>Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.</p> <p>Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.</p> <p>Avoid site runoff of water or mud.</p> <p>Keep site fencing, barriers and scaffolding clean using wet methods.</p> <p>Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.</p> <p>Cover, seed or fence stockpiles to prevent wind whipping.</p>
Site Management	<p>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.</p> <p>Make the complaints log available to the local authority when asked.</p> <p>Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.</p>
Trackout	<p>Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.</p> <p>Avoid dry sweeping of large areas.</p> <p>Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.</p> <p>Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.</p> <p>Record all inspections of haul routes and any subsequent action in a site log book.</p> <p>Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.</p> <p>Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).</p> <p>Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.</p> <p>Access gates to be located at least 10m from receptors where possible.</p>



Site Application	Mitigation Measures
Waste Management	Avoid bonfires and burning of waste materials.
<i>Desirable</i>	
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
	Only remove the cover in small areas during work and not all at once.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

8.2 Operational Phase

In accordance with the EPIC & IAQM guidance, road traffic impacts associated with the operation of the Proposed Development can be considered as having an ‘insignificant’ effect on local air quality. Furthermore, the Proposed Development is found to be suitable for residential purposes in accordance with both the Exposure Assessment (Section 6.0) and the Detailed Assessment of Road Traffic Emissions (Section 7.0), with site-suitability effects concluded to be ‘not significant’. As such, long-term scheme-specific mitigation measures in relation to operational effects arising from road traffic emissions are therefore not considered to be necessary.

Nonetheless, in accordance with the BMBC Guidance, all ‘minor’ and ‘medium’ proposals are expected to implement the ‘Type 1’ and ‘Type 2’ mitigation measures detailed within the guidance document, as follows:

Type 1

- 1 charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking).

Each dwelling will be fitted with an electric vehicle (EV) charge point commensurate with the requirements of Approved Document S: Infrastructure for Charging Electric Vehicles of the



Building Regulations³⁰. The specific detail for such will come forward post-planning as a building control requirement.

Type 2

- Travel Plan including agreed mechanisms for discouraging high emission vehicle use and encouraging modal shift (i.e. public transport, cycling and walking) as well as the uptake of low emission fuels and technologies;
- Improved pedestrian links to public transport stops;
- New or improved bus stop infrastructure including shelters, raised kerbing, information displays;
- Provision of subsidised or free public transport ticketing;
- Site layout designed to encourage walking;
- Cycle paths to link to local cycle network; and
- Improved convenient and segregated cycle paths to link to local cycle network.

A Travel Plan³¹ has been produced by the appointed transport consultant to the Client. Within the Travel Plan there are a number of measures aimed to encourage the occupants to use more sustainable modes of transport to and from the Site. These measures would subsequently have a knock-on effect in terms of reducing road traffic emissions from personal car use. The measures within the Travel Plan are as follows:

- Engagement on Travel Choices:
 - Bespoke Travel Choices Website;
 - Bespoke Travel Choice Guide; and
 - Annual Travel Choices Newsletter.
- Support for Sustainable Travel Choices:
 - Discounts with Sustainable Travel Providers; and
 - Personal Journey Planning Support.
- Management of the Travel Choices Programme.

³⁰ <https://www.gov.uk/government/publications/infrastructure-for-charging-electric-vehicles-approved-document-s>.

³¹ TPS, Travel Plan: Residential Development, Thurnscoe Bridge Lane, Barnsley, April 2024.



9.0 Conclusions

SLR Consulting Ltd has been commissioned by Avant Homes Yorkshire to undertake an Air Quality Assessment to accompany the planning application for a residential development comprising 296 dwellings and associated infrastructure, on land to the west of Thurnscoe Bridge Lane, Barnsley.

9.1 Construction Phase

A qualitative assessment of the potential dust impacts during the construction of the development has been undertaken following IAQM guidance. Following the construction dust assessment, the Site is found to be at worst 'medium risk' in relation to dust soiling effects on people and property, and 'low risk' in relation to human health impacts.

Providing effective mitigation measures are implemented, such as those outlined in Table S of this report, residual effects from dust emissions during the construction phase are deemed to be 'not significant'.

Given the short-term nature of the construction phase and the comparatively low volume of vehicle movements that will likely arise (when compared to the operational phase, for which a full assessment has been undertaken), there is predicted to be an 'insignificant' effect on air quality from construction-generated road traffic emissions.

9.2 Operational Phase

The assessment of operational phase effects considered impacts on all relevant receptors from road traffic emissions associated with the Proposed Development.

The ADMS-Roads dispersion model was used to determine the likely NO₂, PM₁₀, and PM_{2.5} concentrations at all assessed existing and proposed receptor locations for a series of scenarios, in accordance with technical guidance published in LAQM.TG(22). Predicted pollutant concentration changes at relevant receptor locations are a result of the Proposed Development were assessed using the EPIC & IAQM significance criteria.

In accordance with EPIC & IAQM guidance, the impacts of the Proposed Development on NO₂, PM₁₀ and PM_{2.5} concentrations at all existing assessed receptor locations are considered to be 'negligible'. There are no predicted exceedences of the relevant NO₂, PM₁₀ and PM_{2.5} AQALs at existing receptors or proposed locations of relevant exposure across the Site. Unmitigated effects associated with NO₂, PM₁₀ and PM_{2.5} concentrations at all assessed receptor locations are therefore considered to be 'not significant' and the Site is considered to be suitable for residential development.





Appendix A Model Inputs and Verification

Thurnscoe Bridge Lane, Barnsley

Air Quality Assessment

Avant Homes Yorkshire

SLR Project No.: 410.065475.00001

20 November 2024

A.1 Traffic Data

Table T details the traffic data used within the assessment.

Table T: Traffic Data Used Within the Assessment

Link		2022 BC		2030 DM		2030 DS		Speed
ID	Description	AADT	% HDV	AADT	% HDV	AADT	% HDV	(kph) (A)
0	Site Access	0	0.0	0	0.0	1,500	0.0	32.2
1	Thurnscoe Bridge Lane (South of site access)	9,495	0.4	10,429	0.4	11,256	0.3	55.0
2	Thurnscoe Bridge Lane (North of site access)	9,512	1.7	10,447	1.7	11,119	1.6	51.7
3	High Street	2,113	1.7	2,321	1.7	2,520	1.5	48.3
5	Shepherd Lane (north of High Street)	6,283	2.4	6,901	2.4	7,375	2.2	48.3
9	Lidget Lane	4,701	1.6	5,163	1.6	5,558	1.5	45.9
10	A635 Doncaster Road (N of Lidget Lane)	19,178	4.9	21,064	4.9	21,459	4.8	38.6
11	Nicholas Lane	8,119	2.2	8,917	2.2	9,744	2.0	48.3
12	Barnsley Road East	7,739	3.4	8,500	3.4	8,651	3.3	48.3
13	Barnsley Road West	6,151	3.7	6,755	3.7	7,104	3.5	48.3
14	Highgate Lane	7,589	2.4	8,335	2.4	8,662	2.3	48.3
15	A635 Doncaster Road (S of Lidget Lane)	19,178	4.9	21,064	4.9	21,064	4.9	38.6

Note:

(A) Traffic speeds were modelled at the relevant speed limit for each road or the average speed of the links as surveyed from a period of localised ATC locations. Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(22).

A.1.1 Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(22) guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

A.1.2 NO_x / NO₂ Verification

NO_x / NO₂ verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.



For NO_x / NO₂ model verification, 2022 LAQM CoDC monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists. Table U presents all local monitoring data available for model verification.

It is noted that the CoDC automatic monitor, CM7, has been discounted from the NO_x / NO₂ verification process on the basis of its 2022 data capture being below the LAQM.TG(22) recommended limit of 75%.

Table U: Local Monitoring Data Available for Model Verification

Site ID	NGR X (m)	NGR Y (m)	2022 Monitored Annual Mean NO ₂ (µg/m ³)	2022 Data Capture (%)
DT44	448230	405305	52.0	100.0
DT45	447966	405303	15.3	100.0
DT46	448148	405297	25.8	100.0
DT47	448058	405319	54.2	76.4
DT48	448235	405321	61.1	93.7
DT73, 74, 75	448067	405300	14.8	100.0

NO_x was back calculated using the latest version of Defra's NO_x to NO₂ Calculator (v8.1) for all monitors – given the absence of data. The NO_x to NO₂ Calculator was also used to facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO₂.

Verification was completed using the 2022 Defra background mapped concentrations (2018 base year) for the relevant 1km x 1km grid squares (i.e. those within which the model verification locations are located), as discussed in Section 4.3.

Comparison of the modelled vs. monitored road NO_x contribution at the verification locations detailed in Table U is provided in Table V. An initial adjustment factor of 2.121 has been derived, based on a linear regression forced through zero as shown in Figure 4.

Table V: NO_x / NO₂ Model Verification (2.121) – Initial Stage

Site ID	Monitored Road NO _x (µg/m ³)	Modelled Road NO _x (µg/m ³)	Ratio (Monitored vs. Modelled Road NO _x)	Adjustment Factor	Adjusted Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
DT44	95.3	57.8	1.6	2.121	62.0	52.0	+19.2
DT45	12.6	8.2	1.5		17.8	15.3	+16.0
DT46	33.9	16.3	2.1		26.1	25.8	+1.1
DT47	101.2	23.5	4.3		33.3	54.2	-38.7
DT48	120.1	52.1	2.3		57.6	61.1	-5.7
DT73, 74, 75	12.2	9.7	1.3		19.2	14.8	+29.7



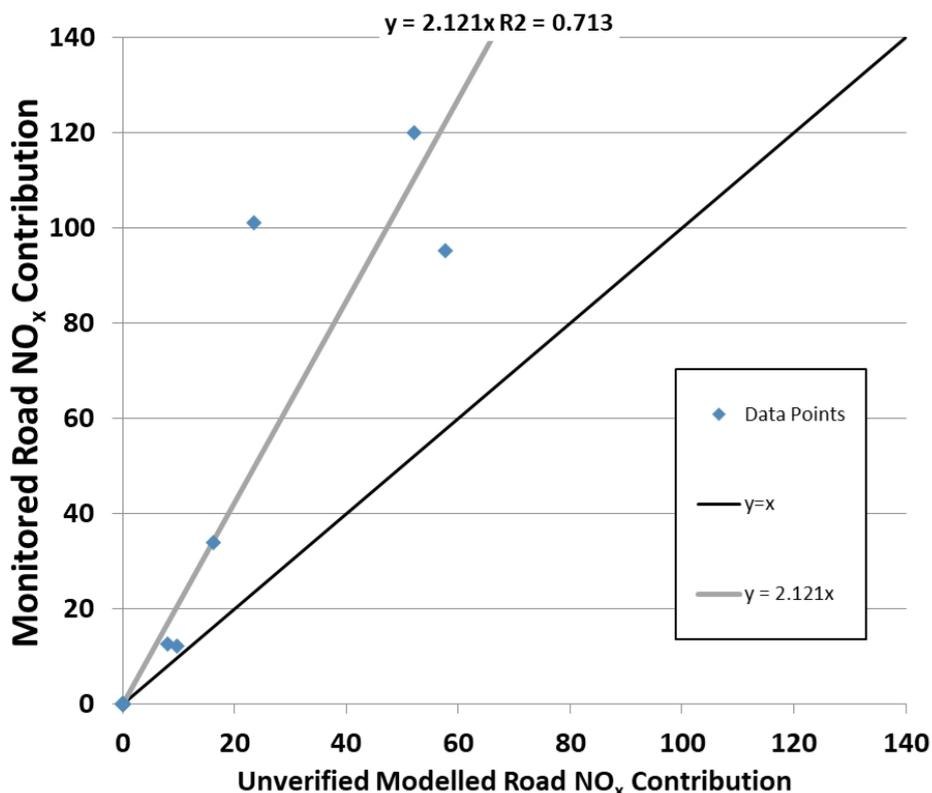


Figure 4: Comparison of Modelled vs. Monitored Road NO_x Contribution (2.121) – Initial Stage

LAQM.TG(22) states that:

“In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%”.

As noted in Table V, the difference between the adjusted modelled NO₂ and monitored NO₂ concentrations is outside of the LAQM.TG(22) minimum tolerances of 25% at DT47 and the DT73, 74, 75 collocated diffusion tubes. Although the difference is within the minimum tolerance the remaining locations, the adjusted modelled total NO₂ is within the LAQM.TG(22) preferred tolerances of 10% at only two locations (DT46 and DT48), with a large variability in locations under- and over-predicting. The model is therefore not showing consistency across all monitoring sites. A review of the suitability of each verification location (and corresponding inputs) was therefore undertaken in consideration of the setting of each monitoring location relative to the considered receptor locations.

As shown in Table V, the model was performing poorly at DT47 with a modelled road NO_x of 23.5µg/m³, versus a monitored road NO_x of 101.2µg/m³. A review of the placement of DT47 via Google Streetview imagery shows that DT47 is situated at a kerbside classification, in accordance with LAQM.TG(22), approximately 0.8m from the kerbside of the A635 Doncaster Road and adjacent to a section of road with an approximate 7% gradient. The model was not able to replicate these conditions based upon the applied inputs, resulting in a high ratio between modelled versus monitored road NO_x. This is supported by LAQM.TG(22) which states:

“Kerbside sites are generally not recommended for the adjustment of road traffic modelling results as the inclusion of these sites may lead to an over-adjustment of modelling at roadside sites.”



As such, it is considered appropriate to remove DT47 from the model verification process, in order to achieve greater consistency between the remaining monitoring locations and considered receptor locations which are predominantly of a 'roadside' classification.

Comparison of the modelled vs. monitored road NO_x contribution at the remaining verification locations is provided in Table V. An adjustment factor of 1.935 has been derived, based on a linear regression forced through zero as shown in Figure 4.

Table W: NO_x / NO₂ Model Verification (1.935)

Site ID	Monitored Road NO _x (µg/m ³)	Modelled Road NO _x (µg/m ³)	Ratio (Monitored vs. Modelled Road NO _x)	Adjustment Factor	Adjusted Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
DT44	95.3	57.8	1.6	1.935	58.1	52.0	11.8
DT45	12.6	8.2	1.5		17.0	15.3	10.8
DT46	33.9	16.3	2.1		24.6	25.8	-4.6
DT48	120.1	52.1	2.3		54.1	61.1	-11.5
DT73, 74, 75	12.2	9.7	1.3		18.3	14.8	23.4

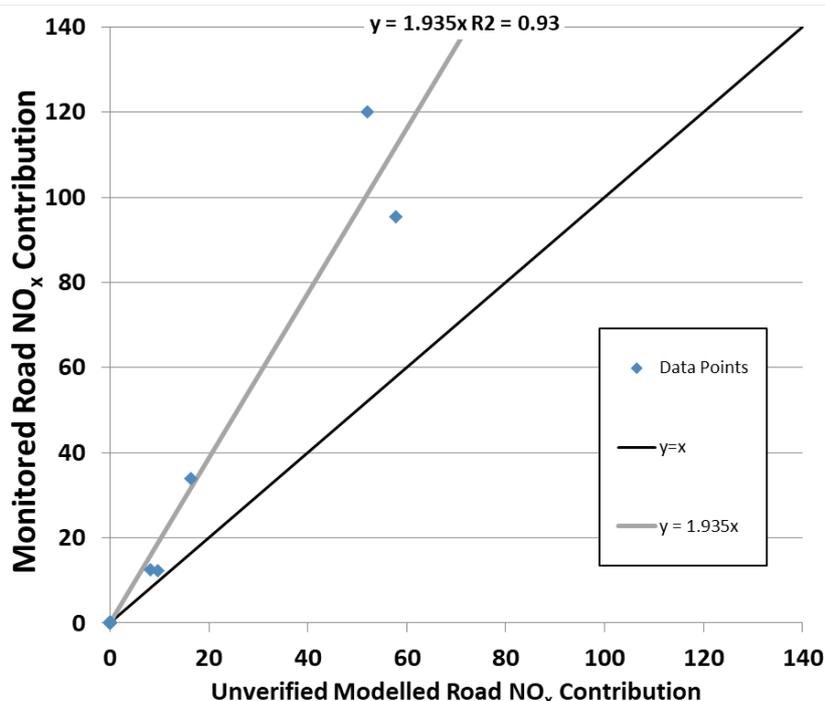


Figure 5: Comparison of Modelled vs. Monitored Road NO_x Contribution (1.935)

As shown in Table W, all monitoring locations are now within LAQM.TG(22) prescribed tolerances. However, there is still some variability in the differences between adjusted modelled NO₂ versus monitored NO₂ at the monitoring locations, with some over- and some under-predicting. It is evident that the dispersion model is performing differently at locations within the verification study area. This is additionally indicated by large deviation in monitored annual NO₂ concentrations within. Given the much greater monitored annual mean NO₂ concentrations recorded at DT44 and DT48, it was considered appropriate to



isolate this area to provide more accurate concentrations relevant to this area. To obtain a verification factor more relevant to distinct locations within the modelling domain, a further review was undertaken of the setting of each monitoring location.

Following this review, the model was split into two verification domains in order to provide more confidence in the model predictions:

- Domain A – Receptor locations outside of the street canyon present at DT44 and DT48; and
- Domain B – Receptor locations within the street canyon at DT44 and DT48.

A revision to the verification procedure relative to Domain A and Domain B is provided in the following sections.

Domain A

Comparison of the modelled vs. monitored road NO_x contributions for those verification locations located within Domain A is provided in Table X. An adjustment factor of 1.816 has been derived, based on a linear regression forced through zero, as shown in Table X.

Table X: NO_x / NO₂ Model Verification – Domain A (1.816): Final Stage

Site ID	Monitored Road NO _x (µg/m ³)	Modelled Road NO _x (µg/m ³)	Ratio (Monitored vs. Modelled Road NO _x)	Adjustment Factor	Adjusted Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
DT45	12.6	8.2	1.5	1.816	16.5	15.3	7.5
DT46	33.9	16.3	2.1		23.7	25.8	-8.2
DT73, 74, 75	12.2	9.7	1.3		17.7	14.8	19.3

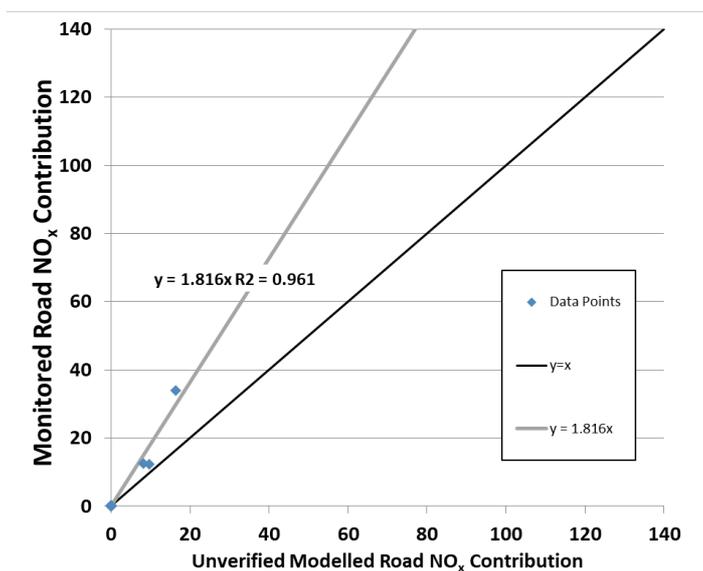


Figure 6: Comparison of Modelled vs. Monitored Road NO_x Contribution (1.816): Final Stage

Table X illustrates that the difference between modelled and monitored NO₂ concentrations are within 10% at DT45 and DT46 (i.e. within the LAQM.TG(22) preferred prescribed limits),



and comfortably within the minimum prescribed limits of 25% at DT73, 74, 75. In addition, a verification factor of 1.816 reduces the Root Mean Square Error (RMSE) from a value of $5.354\mu\text{g}/\text{m}^3$ to $2.160\mu\text{g}/\text{m}^3$ (5.4% of the AQAL)– i.e. within the LAQM.TG(22) prescribed preferred limit ($4\mu\text{g}/\text{m}^3$ / 10% of the AQAL). On this basis, the derived verification factor (1.816) was considered acceptable and was subsequently applied to all road-NOx concentrations predicted within Domain A as described above (as output of the ADMS Roads dispersion model).

Domain B

Comparison of the modelled vs. monitored road NOx contributions for those verification locations located within Domain B is provided in Table Y. An adjustment factor of 1.943 has been derived, based on a linear regression forced through zero, as shown in Table Y.

Table Y: NOx / NO₂ Model Verification – Domain B (1.943): Final Stage

Site ID	Monitored Road NOx ($\mu\text{g}/\text{m}^3$)	Modelled Road NOx ($\mu\text{g}/\text{m}^3$)	Ratio (Monitored vs. Modelled Road NOx)	Adjustment Factor	Adjusted Modelled Total NO ₂ ($\mu\text{g}/\text{m}^3$)	Monitored Total NO ₂ ($\mu\text{g}/\text{m}^3$)	% Difference (Adjusted Modelled NO ₂ vs Monitored NO ₂)
DT44	95.3	57.8	1.6	1.943	58.3	52.0	12.1
DT48	120.1	52.1	2.3		54.2	61.1	-11.2

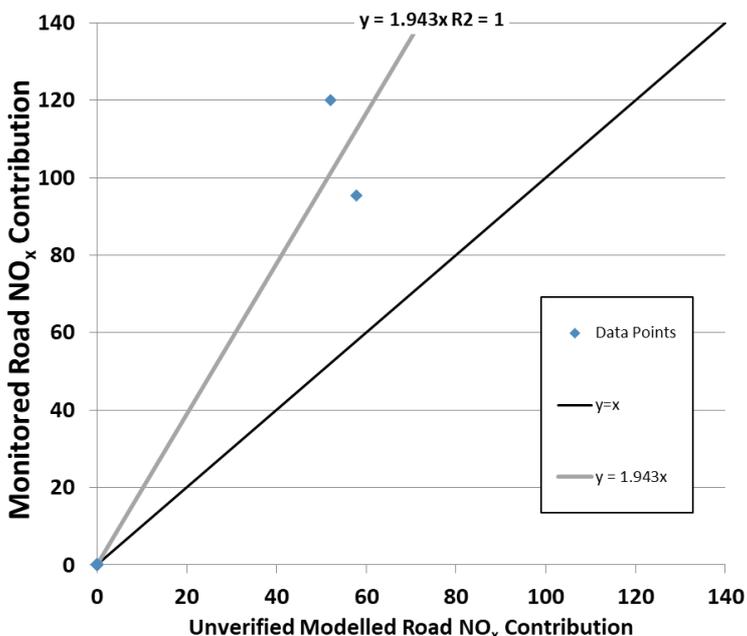


Figure 7: Comparison of Modelled vs. Monitored Road NOx Contribution (1.943): Final Stage

Table Y illustrates that the difference between modelled and monitored NO₂ concentrations are within 25% at all locations within Domain B (i.e. within the LAQM.TG(22) minimum prescribed limits). In addition, a verification factor of 1.943 reduces the RMSE from a value of $21.837\mu\text{g}/\text{m}^3$ to $6.596\mu\text{g}/\text{m}^3$ – i.e. within the LAQM.TG(22) prescribed minimum limit. On this basis, the derived verification factor (1.943) was considered acceptable and was subsequently applied to all road-NOx concentrations predicted within Domain B as described above (as output of the ADMS Roads dispersion model).



A.1.3 Verification Factor – Summary

The applied verification factors have been applied as follows:

- **Domain A** – Receptor locations outside of the street canyon present at DT44 and DT48; verification factor of 1.816:
 - Existing receptors: ER1 – ER14; and
 - Proposed receptors: PR1 – PR3.
- **Domain B** – Receptor locations within the street canyon at DT44 and DT48; verification factor of 1.943:
 - Existing receptors: ER15 – ER16.

A.1.4 PM₁₀ / PM_{2.5} Verification

Verification of modelled PM₁₀ and PM_{2.5} concentrations was attempted using the 2022 monitored concentrations at CoDC's 'CM7' automatic monitor. However, the ratio between monitored annual mean concentrations and modelled road contributions for both pollutants was considered unacceptable, with monitored concentrations substantially higher than modelled road contributions. This is due to the vast majority of roadside particulate matter originating from resuspension on the road surface, as opposed to the vehicles themselves. Resuspension of particulate matter from the road surface is not captured within the EFT, which are limited to brake and tyre wear, and exhaust contributions. As such, to avoid a severe over adjustment of modelled particulate matter concentrations, the adjustment factors of 1.816 (Domain A) and 1.943 (Domain B) were also applied to road-PM₁₀ and PM_{2.5} concentrations (as output of the ADMS Roads dispersion model), following the recommendations of LAQM.TG(22).



