

Air Quality Assessment
Lee Lane, Royston

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Executive Summary

Redmore Environmental Ltd was commissioned by Homes by Honey Ltd to undertake an Air Quality Assessment in support of a proposed residential development on land off Lee Lane, Royston.

An Air Quality Assessment was undertaken to:

- Assess potential impacts associated with fugitive dust emissions during the construction phase of the proposed development;
- Assess potential impacts associated with road transport emissions during the operational phase of the proposed development;
- Assess the potential for future resident exposure to any existing air quality issues; and,
- Identify any requirement for relevant mitigation measures.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of earthworks, construction and trackout activities. It is considered that the use of the identified site-specific control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Potential impacts during the operational phase of the proposals may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the development. There is also the potential for exposure of future residents to any existing air quality issues. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the highway network both with and without the development in place. Results were subsequently verified using local monitoring data.

Review of the dispersion modelling results indicated that air quality impacts as a result of traffic generated by the development were not predicted to be significant at any sensitive location in the vicinity of the site.

The dispersion modelling also indicated that predicted pollutant levels were below the relevant criteria across the development. As such, the site is considered suitable for the proposed end-use from an air quality perspective.

A number of mitigation measures were identified in line with the requirements of the Barnsley Air Quality and Emissions Good Practice Planning Guidance in order to reduce vehicle exhaust emissions associated with the proposals. It is considered these are appropriate for a development of this scale and nature and will further control impacts during the operational phase.

Based on the assessment results, air quality factors are not considered a constraint to the development.

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1.0 INTRODUCTION

1.1 Instruction

1.1.1 Redmore Environmental Ltd was commissioned by Homes by Honey Ltd to undertake an Air Quality Assessment in support of a residential development on land off Lee Lane, Royston.

1.2 Site Location and Context

1.2.1 The site is located on land off Lee Lane, Royston, at approximate National Grid Reference (NGR): 434915, 411126. The relevant Local Authority (LA) is Barnsley Metropolitan Borough Council (BMBC). Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 The proposals comprise construction of 247 residential dwellings and associated infrastructure.

1.3 Assessment Scope

1.3.1 The proposals have the potential to cause air quality impacts at sensitive locations. As such, an Air Quality Assessment was undertaken to:

- Assess potential impacts associated with fugitive dust emissions during the construction phase of the development;
- Assess potential impacts associated with road transport emissions during the operational phase of the development;
- Assess the potential for future resident exposure to any existing air quality issues; and,
- Identify any requirement for relevant mitigation measures.

1.3.2 This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO₂);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Particulate matter with an aerodynamic diameter of less than 2.5µm (PM_{2.5});
- Benzene; and,
- Carbon monoxide.

2.1.2 Air Quality Target Values were also provided for several additional pollutants. It should be noted that the AQLV for PM_{2.5} stated in the Air Quality Standards Regulations (2010) was amended in the Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020).

2.1.3 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published on 28th April 2023¹. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.1.4 The Environmental Improvement Plan 2025² was published in December 2025, providing long term and Interim Targets in order to reduce population exposure to PM_{2.5}. The Concentration Target for 2040 was adopted in the Environmental Targets (Fine Particulate Matter) (England) Regulations (2023).

¹ AQS: Framework for Local Authority Delivery, DEFRA, 2023.

² Environmental Improvement Plan 2025, DEFRA, 2025.

2.1.5 Table 1 presents the AQOs, Interim Target and Concentration Target for pollutants considered within this assessment.

Table 1 Air Quality Objectives/ Interim Target/ Concentration Target

Pollutant	Air Quality Objective/ Interim Target/ Concentration Target	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum
PM _{2.5}	10 ^(a)	Annual mean
	10 ^(b)	Annual mean

Note: (a) Interim Target to be achieved by 2030.

(b) Concentration Target to be achieved by 2040.

2.1.6 Table 2 summarises the advice provided in DEFRA guidance³ on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

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

³ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

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

2.2 Local Air Quality Management

2.2.1 LAs are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Dust

2.3.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments, such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance."

2.3.2 Enforcement of the Act, in regard to nuisance, is currently under the jurisdiction of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practicable means.

2.4 National Planning Policy

2.4.1 The revised National Planning Policy Framework⁴ (NPPF) was published in December 2024 and updated in February 2025. The document sets out the Government's planning policies for England and how these are expected to be applied.

2.4.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives including the following of relevance to air quality:

"c) an environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

2.4.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

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

[...]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of

⁴ NPPF, Ministry of Housing, Communities and Local Government, 2024.

soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality [...]."

2.4.4 The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

"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."

2.4.5 The implications of the NPPF have been considered throughout this assessment.

2.5 National Planning Practice Guidance

2.5.1 The National Planning Practice Guidance⁵ (NPPG) web-based resource was launched by the Department for Communities and Local Government to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?

⁵ <https://www.gov.uk/guidance/air-quality--3>.

7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

2.5.2 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

2.6 Local Planning Policy

2.6.1 The Barnsley Local Plan⁶ was adopted by BMBC on 3rd January 2019. A review of the document indicated the following of relevance to this assessment:

"Policy GD1 General Development

Proposals for development will be approved if:

[...]

Any adverse impact on the environment, natural resources, waste and pollution is minimised and mitigated;

[...]"

"Policy Poll 1 Pollution Control and Protection

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

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

⁶ Barnsley Local Plan, BMBC, 2019.

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

2.6.2 Policy AQ1 discusses development which may affect AQMAs:

"Development which may impact 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."

2.6.3 The implications of the above policies were taken into consideration throughout the undertaking of the assessment.

2.6.4 BMBC has produced Air Quality and Emissions Good Practice Planning Guidance⁷, adopted November 2021, which provides a template for integrating and air quality considerations into land-use planning and development management policies. This guidance was taken into consideration throughout the assessment.

⁷ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2021.

3.0 METHODOLOGY

3.1 Introduction

3.1.1 The proposed development has the potential to cause air quality impacts during the construction and operational phases. These were assessed in accordance with the following methodology.

3.2 Construction Phase Assessment

3.2.1 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction V2.2'⁸.

3.2.2 Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These are:

- Earthworks;
- Construction; and,
- Trackout.

3.2.3 The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

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

3.2.4 The assessment steps are detailed below.

Step 1 - Screen the Need for an Assessment

3.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors

⁸ Guidance on the Assessment of Dust from Demolition and Construction V2.2, IAQM, 2024.

be identified within 250m from the boundary or 50m from the construction vehicle route up to 250m from the site entrance, then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50m of the site or the construction vehicle route up to 250m from the site entrance, then the assessment also proceeds to Step 2.

3.2.6 Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

Step 2 - Assess the Risk of Dust Impacts

3.2.7 Step 2 assesses the risk of potential dust impacts. A site is allocated a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

3.2.8 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

3.2.9 Step 2A defines the potential magnitude of dust emission during the construction phase. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	<ul style="list-style-type: none"> • Total site area greater than 110,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 6m in height
	Construction	<ul style="list-style-type: none"> • Total building volume greater than 75,000m³ • On site concrete batching • Sandblasting

Magnitude	Activity	Criteria
	Trackout	<ul style="list-style-type: none"> • More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Earthworks	<ul style="list-style-type: none"> • Total site area 18,000m² to 110,000m² • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 3m to 6m in height
	Construction	<ul style="list-style-type: none"> • Total building volume 12,000m³ to 75,000m³ • Potentially dusty construction material (e.g. concrete) • On site concrete batching
	Trackout	<ul style="list-style-type: none"> • 20 to 50 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Earthworks	<ul style="list-style-type: none"> • Total site area less than 18,000m² • Soil type with large grain size (e.g. sand) • Less than 5 heavy earth moving vehicles active at any one time • Formation of bunds less than 3m in height
	Construction	<ul style="list-style-type: none"> • Total building volume less than 12,000m³ • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	<ul style="list-style-type: none"> • Less than 20 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

3.2.10 Step 2B defines the sensitivity of the area around the development to potential dust impacts. The sensitivities of specific receptors are shown in Table 4.

Table 4 Construction Dust - Sensitivities of Human and Ecological Receptors

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	<ul style="list-style-type: none"> • Users expect high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀. e.g. residential properties, hospitals, schools and residential care homes 	<ul style="list-style-type: none"> • Internationally or nationally designated site e.g. Special Area of Conservation
Medium	<ul style="list-style-type: none"> • Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work 	<ul style="list-style-type: none"> • Nationally designated site e.g. Sites of Special Scientific Interest
Low	<ul style="list-style-type: none"> • Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, farmland, short term car parks and roads 	<ul style="list-style-type: none"> • Locally designated site e.g. Local Nature Reserve

3.2.11 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 5.

Table 5 Construction Dust - Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 250
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 250
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

3.2.12 Table 6 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 6 Construction Dust - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Background Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			Less than 20	Less than 50	Less than 100	Less than 250
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium
		10 - 100	High	High	Medium	Low
		1 - 10	High	Medium	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Medium	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low
	28 - 32µg/m ³	More than 10	Medium	Low	Low	Low
		1 - 10	Low	Low	Low	Low

Receptor Sensitivity	Background Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			Less than 20	Less than 50	Less than 100	Less than 250
	24 - 28µg/m ³	More than 10	Low	Low	Low	Low
		1 -10	Low	Low	Low	Low
	Less than 24µg/m ³	More than 10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Low	-	1 or more	Low	Low	Low	Low

3.2.13 Table 7 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 7 Construction Dust - Sensitivity of the Area to Ecological Impacts

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

3.2.14 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

3.2.15 Table 8 outlines the risk category from earthworks, construction and trackout activities.

Table 8 Construction Dust - Dust Risk Category from Earthworks, Construction and Trackout Activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Step 3 - Site-specific Mitigation

3.2.16 Step 3 requires the identification of site-specific mitigation measures within the IAQM guidance⁹ to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4 - Determine Significance

3.2.17 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be **not significant**.

3.2.18 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. The IAQM guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

3.3 Operational Phase Assessment

3.3.1 The development has the potential to affect air quality as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site, as well as expose future occupants to any existing air quality issues. Potential impacts have therefore been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2024 - Verification.
- Opening year Do-Minimum (DM) (predicted traffic flows in 2027 should the proposals not proceed); and,
- Opening year Do-Something (DS) (predicted traffic flows in 2027 should the proposals be completed).

⁹ Guidance on the Assessment of Dust from Demolition and Construction V2.2, IAQM, 2024.

3.3.2 Reference should be made to Appendix 1 for assessment input data and details of the verification process.

Potential Development Impacts

3.3.3 Locations sensitive to potential changes in off-site pollutant concentrations were identified within 200m of the highway network in accordance with National Highways guidance¹⁰ on the likely limits of pollutant dispersion from road sources. The criteria provided within DEFRA guidance¹¹ on where the AQOs apply, as summarised in Table 2, was utilised to determine worst-case receptor positions in the vicinity of links likely to be affected by changes in traffic flows as a result of the development.

3.3.4 The significance of predicted air quality impacts was determined in accordance with the guidance provided within the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'¹². Using this methodology impacts were defined based on the interaction between the predicted pollutant concentration from the DS scenario and the magnitude of change between the DM and DS scenarios, as outlined in Table 9.

Table 9 Significance of Operational Phase Road Vehicle Exhaust Emission Impacts

Concentration at Receptor in Assessment Year	Predicted Concentration Change as Proportion of AQO/Concentration Target (%)			
	1	2 - 5	6 - 10	> 10
75% or less of AQO/Concentration Target	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO/Concentration Target	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO/Concentration Target	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO/Concentration Target	Moderate	Moderate	Substantial	Substantial
110% or more of AQO/Concentration Target	Moderate	Substantial	Substantial	Substantial

3.3.5 The matrix shown in Table 9 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell

¹⁰ LA 105: Air Quality, National Highways, 2024.

¹¹ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

¹² Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as **negligible**.

3.3.6 Following the prediction of impacts at discrete receptor locations, the IAQM document¹³ provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

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

3.3.7 The IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**, the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**.

3.3.8 The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. The IAQM guidance¹⁴ suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

Potential Future Exposure

3.3.9 The proposals have the potential to expose future residents to any existing air quality issues. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations across the development site, detailed dispersion modelling was undertaken. The results were subsequently compared with the relevant AQOs and Concentration Target to determine any potential areas of exceedence and associated constraints to the proposed land use.

3.3.10 Reference should be made to Appendix 1 for assessment input data and details of the verification process.

¹³ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹⁴ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

4.0 BASELINE

4.1 Introduction

4.1.1 Existing air quality conditions in the vicinity of the proposed development site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

4.2 Local Air Quality Management

4.2.1 As required by the Environment Act (1995), as amended by the Environment Act (2021), BMBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual and 1-hour mean concentrations of NO₂ are above the relevant AQOs within the borough. As such, five AQMAs have been declared. The closest of these to the site is described as follows:

"AQMA No.1 - An area encompassing residential properties one hundred metres either side of the central reservation of the M1 motorway in Barnsley."

4.2.2 The development is located approximately 4km east of the AQMA. It is considered unlikely that the development would cause air quality impacts over a distance of this magnitude. As such, the AQMA has not been considered further.

4.2.3 BMBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

4.3 Air Quality Monitoring

4.3.1 Monitoring of pollutant levels is undertaken by BMBC throughout its area of jurisdiction. Recent NO₂ concentrations recorded in the vicinity of the development, as provided in BMBC's '2025 Air Quality Annual Status Report (ASR)'¹⁵ are shown in Table 10.

¹⁵ 2025 Air Quality ASR, BMBC, 2025.

Table 10 Monitoring Results - NO₂

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2022	2023	2024
BAR3	Barnsley Gawber	13	12	11.1
32	12 High Street, Royston	-(a)	-(a)	17.2
33	Cherry Cakes, Midland Road, Royston	-(b)	-(b)	30.1
34	Wakefield Road / Carlton Road	23.8	24.0	24.2
35	Wakefield Road - South of Carlton Road	26.6	25.9	26.4
36	Wakefield Road /Smithies Lane (North)	31.3	29.4	29.7
37	Wakefield Road - app. Burton Rd Junc	23.0	21.8	22.7
50	Carlton Road (Watford Road junction)	27.9	26.3	23.1
52	Wakefield Road / Bar Lane junction	26.3	25.5	24.7

Note: (a) Monitor relocated for 2024. No data available prior to this at the installed location.

(b) Monitor commissioned in 2024.

4.3.2 As shown in Table 10, annual mean NO₂ concentrations were below the AQO of 40µg/m³ at all monitors in recent years. Reference should be made to Figure 2 for a map of the survey positions.

4.3.3 Recent PM₁₀ concentrations recorded in the vicinity of the development are shown in Table 11.

Table 11 Monitoring Results - PM₁₀

Monitoring Site		Monitored PM ₁₀ Concentration (µg/m ³)		
		2022	2023	2024
BAR3	Barnsley Gawber ^(a)	-	12	11.4

Note: (a) Monitor upgraded to analyse PM₁₀ during 2023. No data available prior to this year.

4.3.4 As shown in Table 11, annual mean PM₁₀ concentrations were below the AQO of 40µg/m³ at the BAR3 - Barnsley Gawber monitor in recent years.

4.3.5 Recent PM_{2.5} concentrations recorded in the vicinity of the development are shown in Table 12.

Table 12 Monitoring Results - PM_{2.5}

Monitoring Site		Monitored PM _{2.5} Concentration (µg/m ³)		
		2022	2023	2024
BAR3	Barnsley Gawber ^(a)	-	7	7.1

Note: (a) Monitor upgraded to analyse PM_{2.5} during 2023. No data available prior to this year.

4.3.6 As shown in Table 12, annual mean PM_{2.5} concentrations were below the Concentration Target of 10µg/m³ at the BAR3 - Barnsley Gawber monitor in recent years.

4.4 Background Pollutant Concentrations

4.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development site is located in grid square NGR: 434500, 411500. Data for this location was downloaded from the DEFRA website¹⁶ for the purpose of the assessment and is summarised in Table 13.

Table 13 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m ³)		
	2024	2026	2027
NO ₂	7.46	7.02	6.79
PM ₁₀	11.76	11.62	11.56
PM _{2.5}	6.12	6.00	5.94

4.4.2 As shown in Table 13, predicted background concentrations are below the relevant AQOs and Concentration Target at the development site.

¹⁶ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>.

4.5 Sensitive Receptors

4.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

Construction Phase Sensitive Receptors

4.5.2 Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 250m from the development boundary. These are summarised in Table 14.

Table 14 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	0	0
Up to 50	1 - 10	0
Up to 100	10 - 100	-
Up to 250	10 - 100	-

4.5.3 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 250m of the site access. These are summarised in Table 15.

Table 15 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Up to 20	10 - 100	0
Up to 50	More than 100	0

4.5.4 There are no ecological receptors within 50m of the development boundary or the access route within 250m of the site entrance. As such, ecological impacts have not been assessed further within this report.

4.5.5 Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was determined as **high**. This was because the identified receptors included residential properties.

Operational Phase Sensitive Receptors

4.5.6 Locations sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study. These are summarised in Table 16. Receptor heights were included in order to account for less sensitive land uses at ground floor level, such as retail units.

Table 16 Operational Phase Road Vehicle Exhaust Emission Sensitive Receptor Locations

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - Lee Lane	434733.3	411299.0	1.5
R2	Residential - Lee Lane	435362.6	411491.1	1.5
R3	Residential - Lee Lane	436165.3	411409.0	4.0
R4	Residential - Midland Road	436193.2	411454.6	4.0
R5	Residential - Station Road	436161.0	411467.8	1.5
R6	Residential - Station Road	436046.1	411646.2	1.5
R7	Parkside Primary School	436310.9	411438.1	1.5
R8	Residential - Midland Road	436442.1	411605.8	1.5
R9	Residential - Church Street	436455.3	411180.9	1.5
R10	Outwood Academy Carlton	436623.1	410360.0	1.5
R11	Residential - Church Street	436334.3	409826.1	1.5
R12	Residential - Wakefield Road	433380.8	410910.7	1.5
R13	Residential - Wakefield Road	433490.3	410535.4	1.5
R14	Residential - Shaw Lane	433234.5	410423.1	1.5
R15	Mapplewell Primary School	433246.2	410173.8	1.5
R16	Residential - Shaw Lane	433017.7	410092.1	1.5

Receptor		NGR (m)		Height (m)
		X	Y	
R17	Residential - Shaw Lane	432987.0	410037.4	1.5
R18	Residential - Wakefield Road	433664.6	410302.1	1.5
R19	Residential - Wakefield Road	433883.2	410013.3	1.5
R20	Residential - Wakefield Road	433902.8	409916.6	1.5
R21	Residential - Wakefield Road	434104.7	409636.4	1.5
R22	Residential - Bar Lane	433381.5	409858.1	1.5
R23	Residential - Wakefield Road	435023.0	408239.5	1.5
R24	Residential - Carlton Road	435429.4	408422.1	1.5
R25	Residential - Wakefield Road	434869.5	408900.6	1.5
R26	Residential - Wakefield Road	435023.5	408085.1	1.5
R27	Residential - Midland Road	436225.0	411474.1	1.5

4.5.7 Reference should be made to Figure 3 for a map of the road vehicle exhaust emission sensitive receptor locations.

5.0 CONSTRUCTION PHASE ASSESSMENT

5.1 Introduction

5.1.1 There is the potential for air quality impacts as a result of the construction of the proposed development. These are assessed in the following Sections.

5.2 Step 1 - Screen the Need for an Assessment

5.2.1 The undertaking of activities such as excavation, groundworks, cutting, concrete batching, construction and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul roads and highway surfaces.

5.2.2 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

5.2.3 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 250m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

5.3 Step 2a - Define the Potential Dust Emission Magnitude

Earthworks

5.3.1 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The area of the proposed development site is between 18,000m² and 110,000m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **medium**.

Construction

5.3.2 Due to the size of the development, the total building volume is estimated to be greater than 75,000m³. In accordance with the criteria outlined in Table 3, the magnitude of

potential dust emissions from construction is therefore **large**.

Trackout

5.3.3 Based on the site area, it is anticipated that the unpaved road length will be greater than 100m during certain stages of construction. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

5.4 Step 2b - Define the Sensitivity of the Area

Dust Soiling

5.4.1 Table 14 shows that there are between 1 and 10 **high** sensitivity receptors within 50m of the site boundary. The sensitivity of the area with respect to dust soiling from earthworks and construction, as defined using the criteria summarised in Table 5, is therefore considered to be **low**.

5.4.2 Table 15 shows that there are between 10 and 100 **high** sensitivity receptors within 20m of the road network within 250m of the site access. The sensitivity of the area with respect to dust soiling from trackout, as defined using the criteria summarised in Table 5, is therefore considered **high**.

Human Health

5.4.3 Table 13 shows the annual mean PM₁₀ background concentration at the site is 11.62µg/m³. As shown in Table 6, where the background annual mean PM₁₀ concentration is below 24µg/m³ and there are between 1 and 10 **high** sensitivity receptors within 50m of the site boundary, the sensitivity of the area with respect to human health from earthworks and construction is considered to be **low**.

5.4.4 There are between 10 and 100 **high** sensitivity receptors within 20m of the road network within 250m of the site access. The sensitivity of the area with respect to human health from trackout, as defined using the criteria summarised in Table 6, is therefore considered to be **low**.

5.5 Step 2c - Define the Risk of Dust Impacts

5.5.1 The derived dust emission magnitude for each activity was combined with the sensitivity of the area to determine the risk of unmitigated impacts in line with the methodology set out in Table 8. A summary of the risk from each dust generating activity is provided in Table 17.

Table 17 Summary of Potential Unmitigated Dust Risks

Potential Impact	Activity	Step 2A - Dust Emission Magnitude	Step 2B - Sensitivity of the Area	Step 2C - Risk
Dust Soiling	Earthworks	Medium	Low	Low
	Construction	Large	Low	Low
	Trackout	Large	High	High
Human Health	Earthworks	Medium	Low	Low
	Construction	Large	Low	Low
	Trackout	Large	Low	Low

5.5.2 As indicated in Table 17, the potential risk of dust soiling is **high** from trackout and **low** from earthworks and construction. The potential risk of human health impacts is **low** from all activities.

5.5.3 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

5.6 Step 3 - Site-specific Mitigation

5.6.1 The IAQM guidance¹⁷ provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the development site as summarised in Table 18. These may be reviewed prior to the

¹⁷ Guidance on the Assessment of Dust from Demolition and Construction V2.2, IAQM, 2024.

commencement of construction works and incorporated into a Construction Environmental Management Plan or similar if required by the LA.

Table 18 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	<ul style="list-style-type: none"> • 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 • Display the head or regional office contact information • Develop and implement a Dust Management Plan, which may include measures to control other emissions, approved by the LA
Site management	<ul style="list-style-type: none"> • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken • Make the complaints log available to the LA upon request • 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
Monitoring	<ul style="list-style-type: none"> • Carry out regular site inspections, record inspection results, and make an inspection log available to the LA upon request • Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions
Site preparation	<ul style="list-style-type: none"> • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Erect solid screens or barriers around dusty activities or the site • Fully enclose site or specific operations where there is a high potential for dust production and they are active for an extensive period • Avoid site runoff of water or mud • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used • Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	<ul style="list-style-type: none"> • Ensure all vehicles switch off engines when stationary - no idling vehicles • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable

Issue	Control Measure
Operations	<ul style="list-style-type: none"> • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques • Ensure an adequate water supply on the site for effective dust suppression, using non-potable water where possible and appropriate • Use enclosed chutes and conveyors and covered skips • Minimise drop heights and use fine water sprays wherever appropriate • Ensure equipment is available to clean any dry spillages, and clean up spillages as soon as reasonably practicable using wet cleaning methods
Waste management	<ul style="list-style-type: none"> • Avoid bonfires or burning of waste materials
Trackout	<ul style="list-style-type: none"> • Use water-assisted dust sweeper on access and local roads, if required • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving site are covered to prevent escape of materials • Implement a wheel washing system, if required • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit • Access gates to be located at least 10m from receptors where possible

5.7 **Step 4 - Determine Significance**

5.7.1 Assuming the relevant mitigation measures outlined in Table 18 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with the IAQM guidance¹⁸.

¹⁸ Guidance on the Assessment of Dust from Demolition and Construction V2.2, IAQM, 2024.

6.0 OPERATIONAL PHASE ASSESSMENT

6.1 Introduction

6.1.1 The development has the potential to increase concentrations of NO₂, PM₁₀ and PM_{2.5} as a result of road traffic exhaust emissions associated with vehicles travelling to and from the site during the operational phase, as well as expose future residents to any existing air quality issues. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

6.1.2 The assessment considered the following scenarios:

- 2024 - Verification;
- 2027 - DM; and,
- 2027 - DS.

6.1.3 The DM scenario (i.e. without development) included baseline traffic data, inclusive of anticipated growth, for the relevant assessment year. The DS scenario (i.e. with development) included baseline traffic data, inclusive of anticipated growth, in addition to predicted vehicle trips associated with the operation of the proposals.

6.1.4 For the purpose of the assessment traffic data for 2027 was utilised as the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors and background concentrations for 2024 were utilised within the dispersion model. The use of 2027 traffic data and 2024 emission factors is considered to provide a robust scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

6.1.5 Reference should be made to Appendix 1 for full assessment input details.

6.2 Potential Development Impacts

Predicted Concentrations

6.2.1 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 19.

Table 19 Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Lee Lane	12.29	12.38	0.09
R2	Residential - Lee Lane	17.58	17.82	0.24
R3	Residential - Lee Lane	18.08	18.30	0.22
R4	Residential - Midland Road	27.12	27.37	0.25
R5	Residential - Station Road	17.52	17.63	0.11
R6	Residential - Station Road	14.91	14.95	0.04
R7	Parkside Primary School	13.40	13.45	0.05
R8	Residential - Midland Road	16.42	16.50	0.08
R9	Residential - Church Street	17.84	17.99	0.15
R10	Outwood Academy Carlton	12.71	12.75	0.04
R11	Residential - Church Street	15.32	15.42	0.10
R12	Residential - Wakefield Road	13.75	13.86	0.11
R13	Residential - Wakefield Road	21.72	22.30	0.58
R14	Residential - Shaw Lane	18.92	19.17	0.25
R15	Mapplewell Primary School	12.66	12.70	0.04
R16	Residential - Shaw Lane	19.55	19.74	0.19
R17	Residential - Shaw Lane	21.20	21.43	0.23
R18	Residential - Wakefield Road	15.44	15.51	0.07
R19	Residential - Wakefield Road	19.97	20.06	0.09
R20	Residential - Wakefield Road	16.83	16.90	0.07

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R21	Residential - Wakefield Road	25.83	25.95	0.12
R22	Residential - Bar Lane	15.32	15.34	0.02
R23	Residential - Wakefield Road	29.07	29.11	0.04
R24	Residential - Carlton Road	25.09	25.24	0.15
R25	Residential - Wakefield Road	21.25	21.31	0.06
R26	Residential - Wakefield Road	24.71	24.74	0.03
R27	Residential - Midland Road	21.32	21.48	0.16

6.2.2 As indicated in Table 19, predicted annual mean NO₂ concentrations were below the AQO of 40µg/m³ at all sensitive receptors in both scenarios. Reference should be made to Figure 4 and Figure 5 for a graphical representation of the results.

6.2.3 Annual mean PM₁₀ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 20.

Table 20 Predicted Annual Mean PM₁₀ Concentrations

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Lee Lane	11.73	11.76	0.02
R2	Residential - Lee Lane	13.62	13.71	0.09
R3	Residential - Lee Lane	13.36	13.43	0.06
R4	Residential - Midland Road	16.20	16.28	0.09
R5	Residential - Station Road	13.29	13.33	0.03
R6	Residential - Station Road	12.73	12.74	0.01
R7	Parkside Primary School	12.13	12.14	0.02
R8	Residential - Midland Road	13.26	13.29	0.03
R9	Residential - Church Street	13.81	13.86	0.06
R10	Outwood Academy Carlton	11.95	11.96	0.01

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R11	Residential - Church Street	12.88	12.91	0.03
R12	Residential - Wakefield Road	12.22	12.25	0.03
R13	Residential - Wakefield Road	14.64	14.83	0.19
R14	Residential - Shaw Lane	14.16	14.26	0.09
R15	Mapplewell Primary School	11.90	11.92	0.01
R16	Residential - Shaw Lane	13.98	14.03	0.06
R17	Residential - Shaw Lane	14.56	14.63	0.07
R18	Residential - Wakefield Road	12.77	12.80	0.02
R19	Residential - Wakefield Road	14.32	14.35	0.03
R20	Residential - Wakefield Road	13.24	13.26	0.02
R21	Residential - Wakefield Road	15.21	15.25	0.04
R22	Residential - Bar Lane	12.87	12.88	0.01
R23	Residential - Wakefield Road	16.91	16.93	0.02
R24	Residential - Carlton Road	15.72	15.77	0.05
R25	Residential - Wakefield Road	14.69	14.71	0.02
R26	Residential - Wakefield Road	15.50	15.52	0.01
R27	Residential - Midland Road	14.87	14.92	0.06

6.2.4 As indicated in Table 20, predicted annual mean PM₁₀ concentrations were below the AQO of 40µg/m³ at all sensitive receptors in both scenarios. Reference should be made to Figure 6 and Figure 7 for a graphical representation of the results.

6.2.5 Annual mean PM_{2.5} concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. The Concentration Target for PM_{2.5} is required to be met by the end of 2030. As such, concentrations of this species have been predicted for 2030, using traffic flows, background concentrations and emission factors for this year. These are summarised in Table 21.

Table 21 Predicted Annual Mean PM_{2.5} Concentrations

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Lee Lane	6.88	6.89	0.23
R2	Residential - Lee Lane	7.89	7.94	0.60
R3	Residential - Lee Lane	7.75	7.79	0.55
R4	Residential - Midland Road	9.28	9.32	0.63
R5	Residential - Station Road	7.71	7.73	0.27
R6	Residential - Station Road	7.40	7.41	0.10
R7	Parkside Primary School	7.08	7.09	0.12
R8	Residential - Midland Road	7.69	7.70	0.20
R9	Residential - Church Street	7.98	8.01	0.37
R10	Outwood Academy Carlton	6.98	6.99	0.10
R11	Residential - Church Street	7.48	7.50	0.25
R12	Residential - Wakefield Road	7.14	7.16	0.27
R13	Residential - Wakefield Road	8.47	8.57	1.45
R14	Residential - Shaw Lane	8.17	8.22	0.63
R15	Mapplewell Primary School	6.96	6.97	0.10
R16	Residential - Shaw Lane	8.08	8.11	0.47
R17	Residential - Shaw Lane	8.39	8.43	0.58
R18	Residential - Wakefield Road	7.45	7.46	0.18
R19	Residential - Wakefield Road	8.31	8.33	0.23
R20	Residential - Wakefield Road	7.71	7.72	0.18
R21	Residential - Wakefield Road	8.78	8.80	0.30
R22	Residential - Bar Lane	7.48	7.48	0.05
R23	Residential - Wakefield Road	9.66	9.66	0.10
R24	Residential - Carlton Road	9.01	9.03	0.37
R25	Residential - Wakefield Road	8.45	8.46	0.15

Receptor		Predicted Annual Mean PM _{2.5} Concentration (µg/m ³)		
		DM	DS	Change
R26	Residential - Wakefield Road	8.90	8.90	0.07
R27	Residential - Midland Road	8.54	8.57	0.40

6.2.6 As indicated in Table 21, predicted annual mean PM_{2.5} concentrations were below the Concentration Target of 10µg/m³ at all sensitive receptors in both scenarios during 2030. Reference should be made to Figure 8 and Figure 9 for a graphical representation of the results.

Predicted Impacts

6.2.7 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 22.

Table 22 Predicted Impacts - NO₂

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Lee Lane	Below 75% of AQO	0	Negligible
R2	Residential - Lee Lane	Below 75% of AQO	1	Negligible
R3	Residential - Lee Lane	Below 75% of AQO	1	Negligible
R4	Residential - Midland Road	Below 75% of AQO	1	Negligible
R5	Residential - Station Road	Below 75% of AQO	0	Negligible
R6	Residential - Station Road	Below 75% of AQO	0	Negligible
R7	Parkside Primary School	Below 75% of AQO	0	Negligible
R8	Residential - Midland Road	Below 75% of AQO	0	Negligible
R9	Residential - Church Street	Below 75% of AQO	0	Negligible
R10	Outwood Academy Carlton	Below 75% of AQO	0	Negligible
R11	Residential - Church Street	Below 75% of AQO	0	Negligible
R12	Residential - Wakefield Road	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R13	Residential - Wakefield Road	Below 75% of AQO	1	Negligible
R14	Residential - Shaw Lane	Below 75% of AQO	1	Negligible
R15	Mapplewell Primary School	Below 75% of AQO	0	Negligible
R16	Residential - Shaw Lane	Below 75% of AQO	0	Negligible
R17	Residential - Shaw Lane	Below 75% of AQO	1	Negligible
R18	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R19	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R20	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R21	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R22	Residential - Bar Lane	Below 75% of AQO	0	Negligible
R23	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R24	Residential - Carlton Road	Below 75% of AQO	0	Negligible
R25	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R26	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R27	Residential - Midland Road	Below 75% of AQO	0	Negligible

6.2.8 As indicated in Table 22, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

6.2.9 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 23.

Table 23 Predicted Impacts - PM₁₀

Receptor		Predicted Annual Mean PM ₁₀ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Lee Lane	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean PM ₁₀ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R2	Residential - Lee Lane	Below 75% of AQO	0	Negligible
R3	Residential - Lee Lane	Below 75% of AQO	0	Negligible
R4	Residential - Midland Road	Below 75% of AQO	0	Negligible
R5	Residential - Station Road	Below 75% of AQO	0	Negligible
R6	Residential - Station Road	Below 75% of AQO	0	Negligible
R7	Parkside Primary School	Below 75% of AQO	0	Negligible
R8	Residential - Midland Road	Below 75% of AQO	0	Negligible
R9	Residential - Church Street	Below 75% of AQO	0	Negligible
R10	Outwood Academy Carlton	Below 75% of AQO	0	Negligible
R11	Residential - Church Street	Below 75% of AQO	0	Negligible
R12	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R13	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R14	Residential - Shaw Lane	Below 75% of AQO	0	Negligible
R15	Mapplewell Primary School	Below 75% of AQO	0	Negligible
R16	Residential - Shaw Lane	Below 75% of AQO	0	Negligible
R17	Residential - Shaw Lane	Below 75% of AQO	0	Negligible
R18	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R19	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R20	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R21	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R22	Residential - Bar Lane	Below 75% of AQO	0	Negligible
R23	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R24	Residential - Carlton Road	Below 75% of AQO	0	Negligible
R25	Residential - Wakefield Road	Below 75% of AQO	0	Negligible
R26	Residential - Wakefield Road	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean PM ₁₀ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R27	Residential - Midland Road	Below 75% of AQO	0	Negligible

6.2.10 As indicated in Table 23, impacts on annual mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

6.2.11 Predicted impacts on annual mean PM_{2.5} concentrations at the sensitive receptor locations are summarised in Table 24.

Table 24 Predicted Impacts - PM_{2.5}

Receptor		Predicted Annual Mean PM _{2.5} Concentration	Predicted Conc. Change as Proportion of Concentration Target (%)	Impact Significance
R1	Residential - Lee Lane	Below 75% of Concentration Target	0	Negligible
R2	Residential - Lee Lane	76 - 94% of Concentration Target	0	Negligible
R3	Residential - Lee Lane	76 - 94% of Concentration Target	0	Negligible
R4	Residential - Midland Road	76 - 94% of Concentration Target	0	Negligible
R5	Residential - Station Road	76 - 94% of Concentration Target	0	Negligible
R6	Residential - Station Road	Below 75% of Concentration Target	0	Negligible
R7	Parkside Primary School	Below 75% of Concentration Target	0	Negligible
R8	Residential - Midland Road	76 - 94% of Concentration Target	0	Negligible
R9	Residential - Church Street	76 - 94% of Concentration Target	0	Negligible
R10	Outwood Academy Carlton	Below 75% of Concentration Target	0	Negligible

Receptor		Predicted Annual Mean PM _{2.5} Concentration	Predicted Conc. Change as Proportion of Concentration Target (%)	Impact Significance
R11	Residential - Church Street	Below 75% of Concentration Target	0	Negligible
R12	Residential - Wakefield Road	Below 75% of Concentration Target	0	Negligible
R13	Residential - Wakefield Road	76 - 94% of Concentration Target	1	Negligible
R14	Residential - Shaw Lane	76 - 94% of Concentration Target	1	Negligible
R15	Mapplewell Primary School	Below 75% of Concentration Target	0	Negligible
R16	Residential - Shaw Lane	76 - 94% of Concentration Target	0	Negligible
R17	Residential - Shaw Lane	76 - 94% of Concentration Target	0	Negligible
R18	Residential - Wakefield Road	Below 75% of Concentration Target	0	Negligible
R19	Residential - Wakefield Road	76 - 94% of Concentration Target	0	Negligible
R20	Residential - Wakefield Road	76 - 94% of Concentration Target	0	Negligible
R21	Residential - Wakefield Road	76 - 94% of Concentration Target	0	Negligible
R22	Residential - Bar Lane	Below 75% of Concentration Target	0	Negligible
R23	Residential - Wakefield Road	95 - 102% of Concentration Target	0	Negligible
R24	Residential - Carlton Road	76 - 94% of Concentration Target	0	Negligible
R25	Residential - Wakefield Road	76 - 94% of Concentration Target	0	Negligible
R26	Residential - Wakefield Road	76 - 94% of Concentration Target	0	Negligible
R27	Residential - Midland Road	76 - 94% of Concentration Target	0	Negligible

6.2.12 As indicated in Table 24, impacts on annual mean PM_{2.5} concentrations as a result of the proposed development were predicted to be **negligible** at all receptor locations.

6.3 Potential Future Exposure

6.3.1 The proposed development has the potential to cause exposure of future residents to elevated pollution levels. Dispersion modelling was therefore undertaken with the inputs described in Appendix 1 to quantify air quality conditions at the site.

6.3.2 Modelling was undertaken at a number of discrete receptors to represent conditions at the site. These were positioned along Lee Lane. Reference should be made to Figure 3 for a graphical representation of the receptor locations.

6.3.3 A summary of the receptor locations and predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations is provided in Table 25. The Concentration Target for PM_{2.5} is required to be met by the end of 2030. As such, concentrations of this species have been predicted for 2030, using traffic flows, background concentrations and emission factors for this year.

Table 25 Annual Mean NO₂, PM₁₀ and PM_{2.5} Concentrations at Discrete Receptors

Receptor	NGR (m)		Predicted Annual Mean Concentration (µg/m ³)		
	X	Y	NO ₂	PM ₁₀	PM _{2.5}
PR1	434652.8	411163.2	19.58	13.80	8.07
PR2	434708.3	411195.6	19.21	13.69	8.00
PR3	434764.2	411230.0	19.29	13.72	8.02
PR4	434826.5	411266.1	18.47	13.48	7.88

6.3.4 As shown in Table 25, predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were below the relevant AQOs and Concentration Target at all proposed receptor locations.

6.3.5 Reference should be made to Figures 5, 7 and 9 for predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations across the site. These indicate that the relevant AQOs and Concentration Target are not predicted to be exceeded at any location across the development.

6.3.6 Based on the assessment results, the site is considered suitable for the proposed end-use from an air quality perspective.

6.4 **Interim Planning Guidance for PM_{2.5}**

6.4.1 Interim Planning Guidance¹⁹ on the consideration of the PM_{2.5} targets identified in the Environment Act (2021) in planning decisions has been produced by DEFRA. This requires evidence that the key sources of air pollution within a development have been identified and appropriate action to minimise emissions of PM_{2.5} and its precursors as far as is reasonably practicable be provided in support of planning applications. To assist the process, two questions and associated considerations are provided. These are summarised in Table 26, along with the development response.

Table 26 Interim Planning Guidance Questions

Question	Response
<p>How has exposure to PM_{2.5} been considered when selecting the development site?</p> <p>Factors to consider include:</p> <ul style="list-style-type: none"> • Site proximity to people (particularly large populations and/or vulnerable groups, e.g. schools, hospitals, care homes, areas of deprivation) and the impact of the development on these • Site proximity to pollution sources and the impact of these on users of the development • Exposure and emissions during both construction and in-use 	<p>The site is located to the west of Royston town centre, bordered by agricultural fields to all aspects. Receptors along the wider road network have the potential to be affected by exhaust emissions associated with vehicles travelling to and from the site. However, the assessment results summarised in Section 5.7 and 6.2 demonstrate that the impact of the development on local air quality is predicted to be not significant</p> <p>The site is bordered to the north by Lee Lane and associated road vehicle exhaust emissions. As outlined in Table 25, PM_{2.5} concentrations are below the Concentration Target across the site</p> <p>As outlined in Table 18, a number of mitigation measures will be used throughout the construction phase in order to reduce fugitive dust emissions as far as practicable. This will control potential exposure at off-site locations</p>

¹⁹ <https://uk-air.defra.gov.uk/pm25targets/planning>.

Question	Response
<p>What actions and/or mitigations have been considered to reduce PM_{2.5} exposure for development users and nearby receptors and to reduce emissions of PM_{2.5} and its precursors?</p> <p>Factors to consider include:</p> <ul style="list-style-type: none"> • Site layout • The development's design • Technology used in the construction or installed for use in the development • Construction and future use of the development 	<p>The site is bordered to the north by Lee Lane and associated vehicle exhaust emissions. However, as demonstrated in Table 25, PM_{2.5} concentrations are below the Concentration Target across the site</p> <p>In order to reduce emissions of PM_{2.5} with associated impacts at nearby receptors, secure cycle storage will be provided within the scheme to encourage the use of sustainable transport modes. Electric Vehicle (EV) charging will also be provided</p> <p>Further to the above, in order to reduce emissions during the construction phase, a number of mitigation measures will be used to minimise dust generation from associated activities</p>

6.4.2 Based on the responses provided in Table 26 and the results of the assessment, as outlined in Sections 5.5, 6.2 and 6.3, it is considered that the development has identified key sources of air pollution and taken appropriate action to minimise emissions of PM_{2.5}.

6.5 Overall Impact Significance

6.5.1 The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the overall predicted impacts at discrete receptor locations and the considerations outlined previously. Further justification is provided in Table 27.

Table 27 Overall Impact Significance of Road Vehicle Exhaust Emission Impacts

Guidance	Comment
The existing and future air quality in the absence of the development	<p>Predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were below the relevant AQOs and Concentration Target at all sensitive locations in the DM and DS scenarios</p> <p>It is considered unlikely that future air quality conditions will change significantly in the absence of the development given the relatively established nature of the area</p>
The extent of current and future population exposure to the impacts	The development is not predicted to affect the population exposed to exceedences of the AQOs or Concentration Target

Guidance	Comment
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	<p>For the assessment of NO₂ and PM₁₀ concentrations, it was assumed that vehicle exhaust emission rates and background concentrations will not reduce in future years</p> <p>As the compliance date for the PM_{2.5} Concentration Target is 2030, vehicle exhaust emission rates and background concentrations for this species were predicted for this year, and accounted for predicted emission reductions in line with DEFRA and National Highways methodologies</p> <p>Due to the adopted assumptions, it is considered the presented results are sufficiently robust for an assessment of this nature</p>

6.5.2 The IAQM guidance²⁰ states that only if the impact is greater than **slight**, the effect is considered **significant**. As impacts were predicted to be **negligible**, overall effects are considered **not significant**, in accordance with the stated methodology.

6.6 Barnsley Air Quality and Emissions Good Practice Planning Guidance

6.6.1 BMBC has produced Air Quality and Emissions Good Practice Planning Guidance²¹ which includes direction on when an air quality assessment will be required and the associated scope of works. The guidance provides a methodology for determining the scale of a development as minor, medium or major and the required air quality mitigation for the relevant banding. Review of the relevant criteria indicated the proposals were classified as **medium** under the following category:

- Dwelling Houses (C3) more than 50 units.

6.6.2 The guidance provides a number of mitigation options that should be considered for inclusion with **medium** developments. Those to be incorporated into the scheme include:

- Provision of 1 EV charging point per dwelling;
- Secure cycle storage; and,

²⁰ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

²¹ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2021.

- 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.

6.6.3 It is recommended that the above measures are adopted in order to minimise air quality effects as a result of vehicle exhaust emissions as far as practicable. This can be secured through planning condition if required by BMBC.

7.0 CONCLUSION

7.1.1 Redmore Environmental Ltd was commissioned by Homes by Honey Ltd to undertake an Air Quality Assessment in support of a proposed residential development on land off Lee Lane, Royston.

7.1.2 The proposals have the potential to cause air quality impacts at sensitive locations during the construction and operational phases, as well as exposure of future residents to any existing air quality issues. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions, assess potential effects as a result of the scheme and identify any mitigation measures.

7.1.3 During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Site-specific dust control measures were subsequently determined based on the identified risk ratings. Subject to implementation, potential air quality impacts from dust generated by earthworks, construction and trackout activities are predicted to be **not significant**.

7.1.4 Potential impacts during the operational phase of the proposals may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the development. There is also the potential for exposure of future residents to any existing air quality issues. Dispersion modelling was therefore undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the highway network both with and without the development in place. Results were subsequently verified using local monitoring data.

7.1.5 Review of the dispersion modelling results indicated that impacts on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations as a result of traffic generated by the development were predicted to be **negligible** at all receptor locations. Following consideration of the relevant issues, residual impacts as a result of the operation of the development were considered to be **not significant**, in accordance with the IAQM guidance.

7.1.6 The results of the dispersion modelling also indicated that predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were below the relevant AQOs and Concentration Target

at all locations across the development. As such, the site is considered suitable for the proposed end use from an air quality perspective.

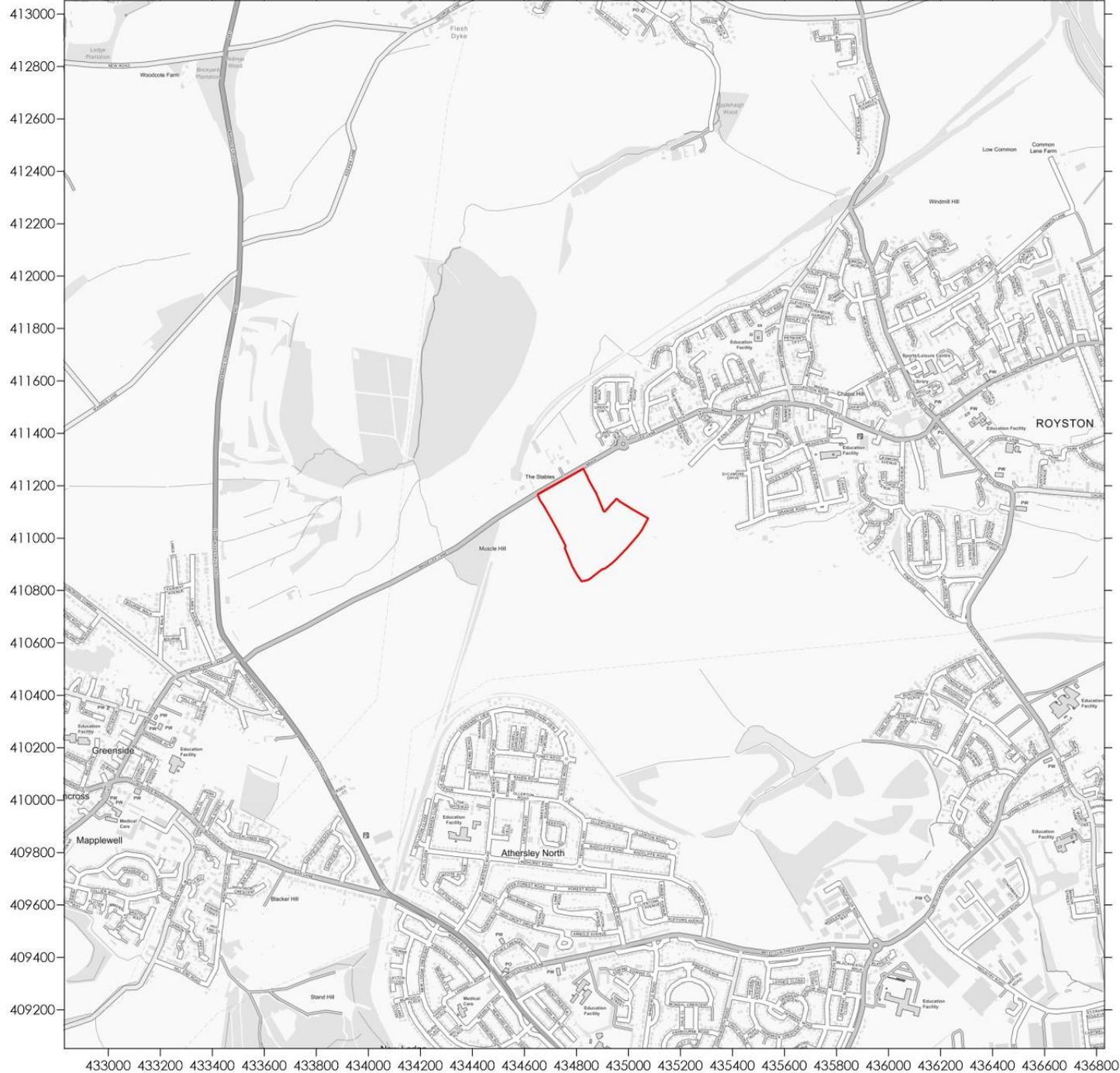
7.1.7 A number of mitigation measures were identified in line with the requirements of the Barnsley Air Quality and Emissions Good Practice Planning Guidance in order to reduce vehicle exhaust emissions associated with the proposals. It is considered these are appropriate for a development of this scale and nature and will further control impacts during the operational phase.

7.1.8 Based on the assessment results, air quality factors are not considered a constraint to the development.

8.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
ASR	Annual Status Report
BMBC	Barnsley Metropolitan Borough Council
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do-Minimum
DS	Do-Something
EFT	Emissions Factor Toolkit
EV	Electric Vehicle
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5µm
SB	Southbound
SP	Slow Phase
Z ₀	Roughness length

Figures



433000 433200 433400 433600 433800 434000 434200 434400 434600 434800 435000 435200 435400 435600 435800 436000 436200 436400 436600 436800

Legend



Site Boundary

Title

Figure 1 - Site Location Plan

Project

Air Quality Assessment
Lee Lane, Royston

Project Reference

5345-2

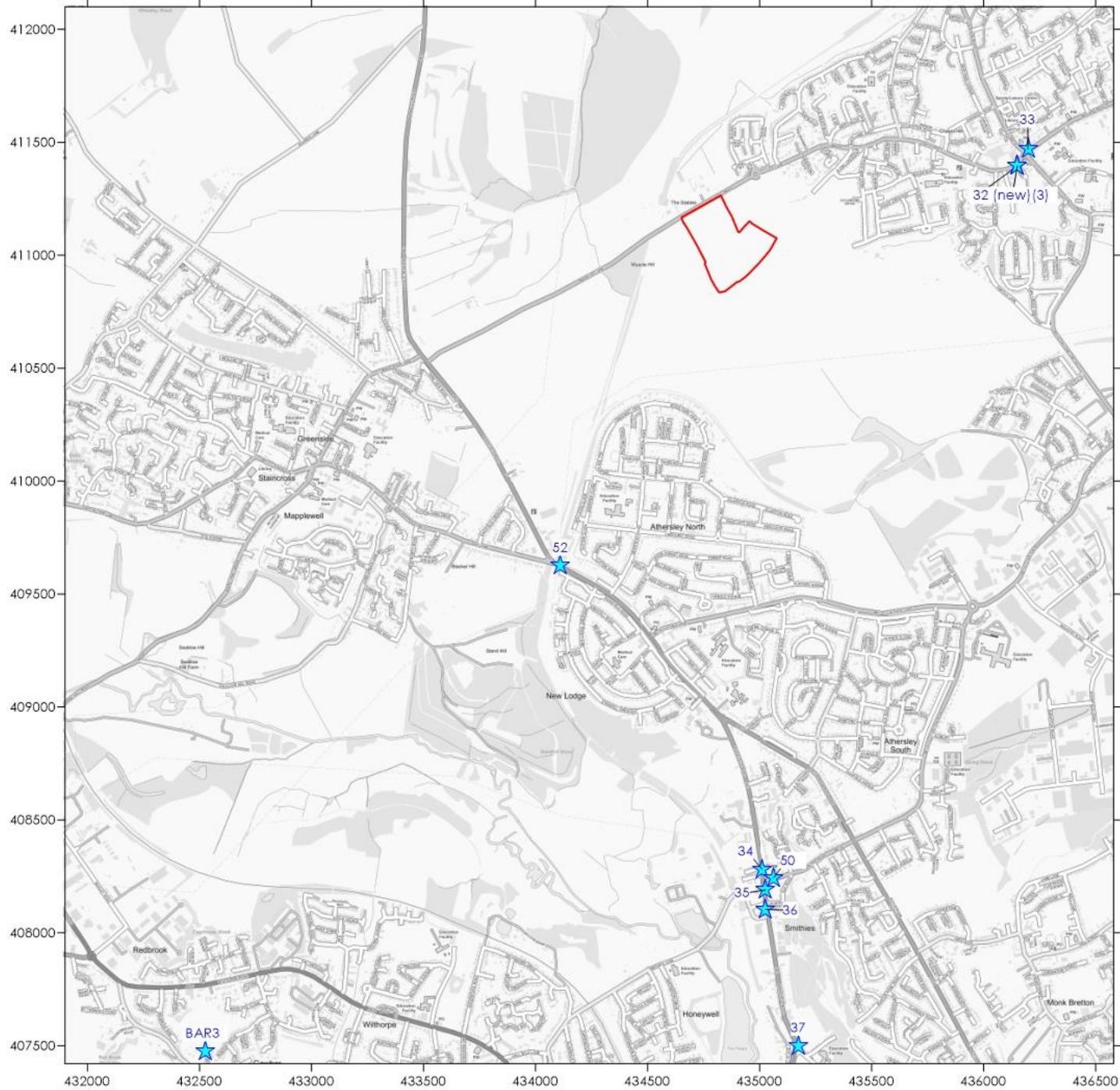
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Legend

-  Site Boundary
-  Monitor

Title

Figure 2 - Monitoring Locations

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Air Quality Assessment
Lee Lane, Royston

Project Reference

5345-2

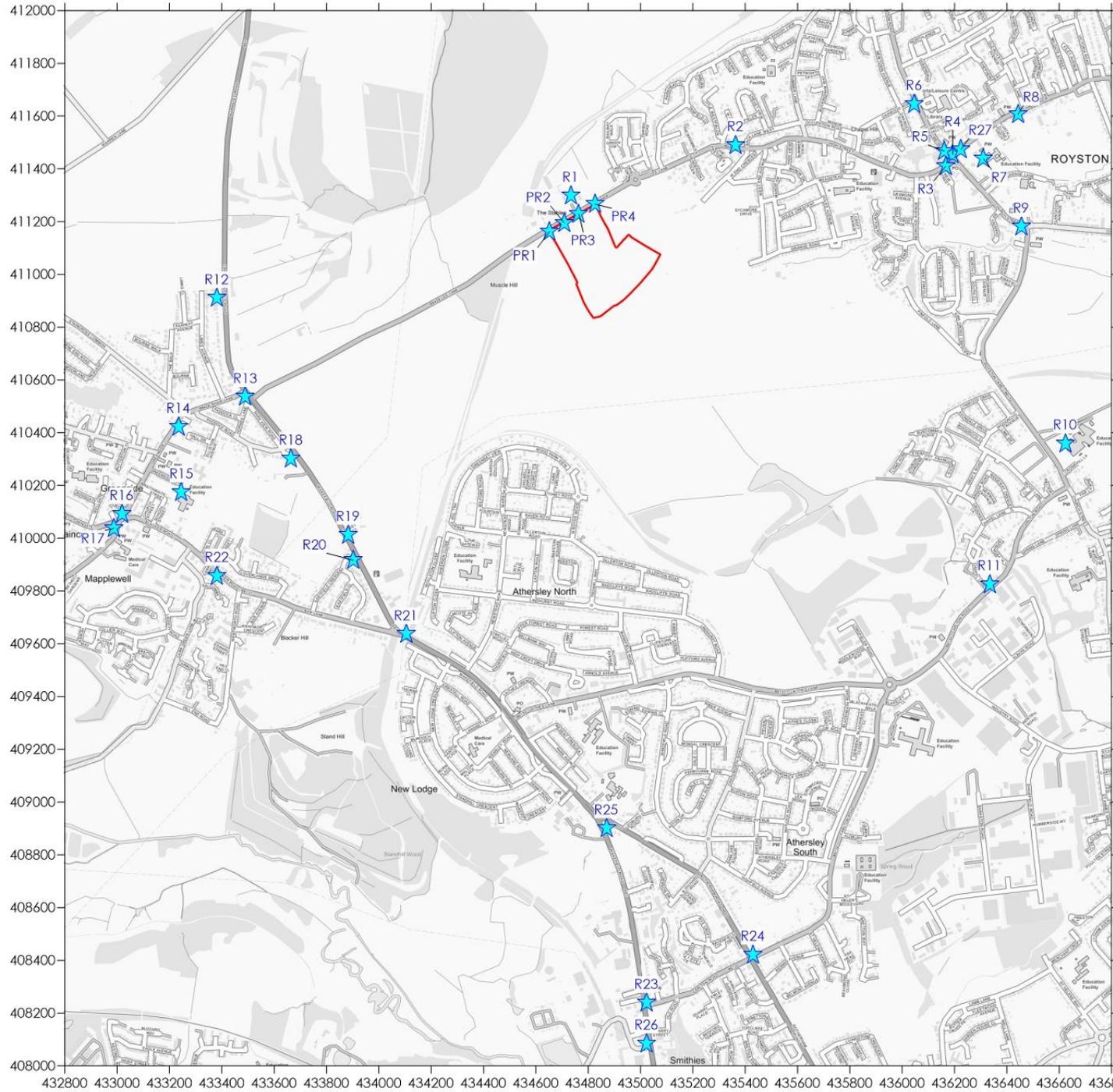
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Legend

-  Site Boundary
-  Receptor

Title
Figure 3 - Operational Phase
Road Vehicle Exhaust Emission
Sensitive Receptor Locations

Project
Air Quality Assessment
Lee Lane, Royston

Project Reference
5345-2

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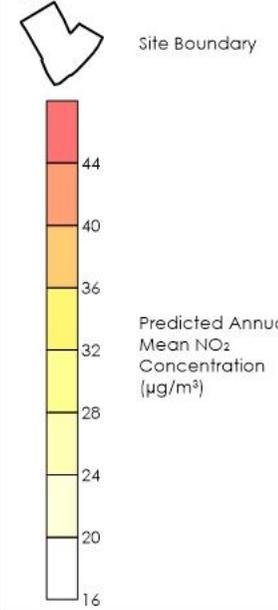
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Title

Figure 4 - Predicted Annual Mean NO₂ Concentration (µg/m³) Do-Minimum

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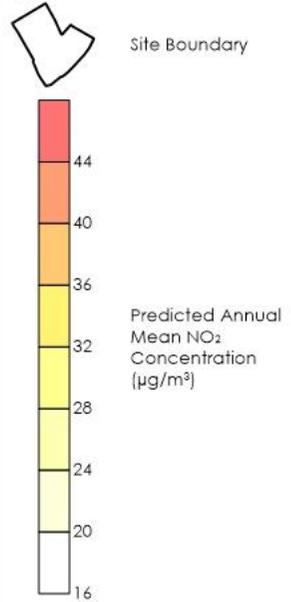
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Title
Figure 5 - Predicted Annual Mean NO₂ Concentration (µg/m³)
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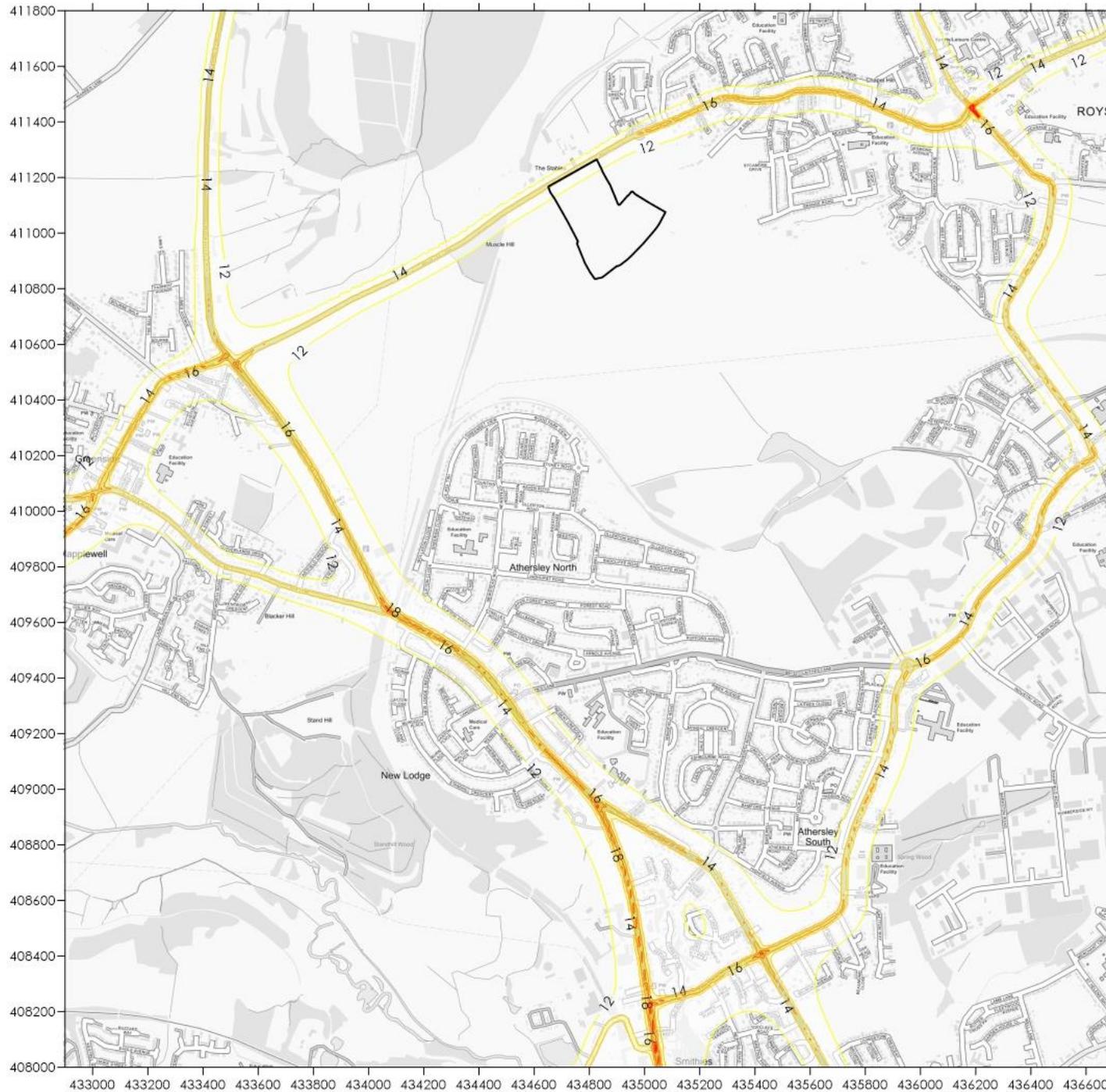
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Air Quality Assessment
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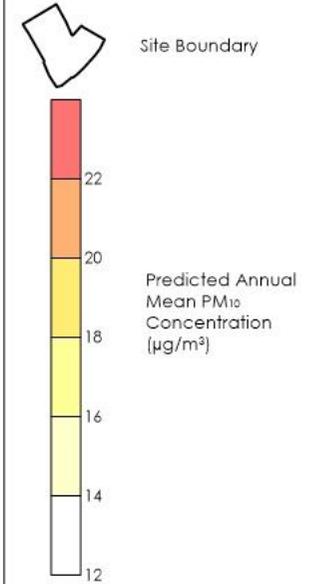
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Title
Figure 6 - Predicted Annual Mean PM₁₀ Concentration (µg/m³) Do-Minimum

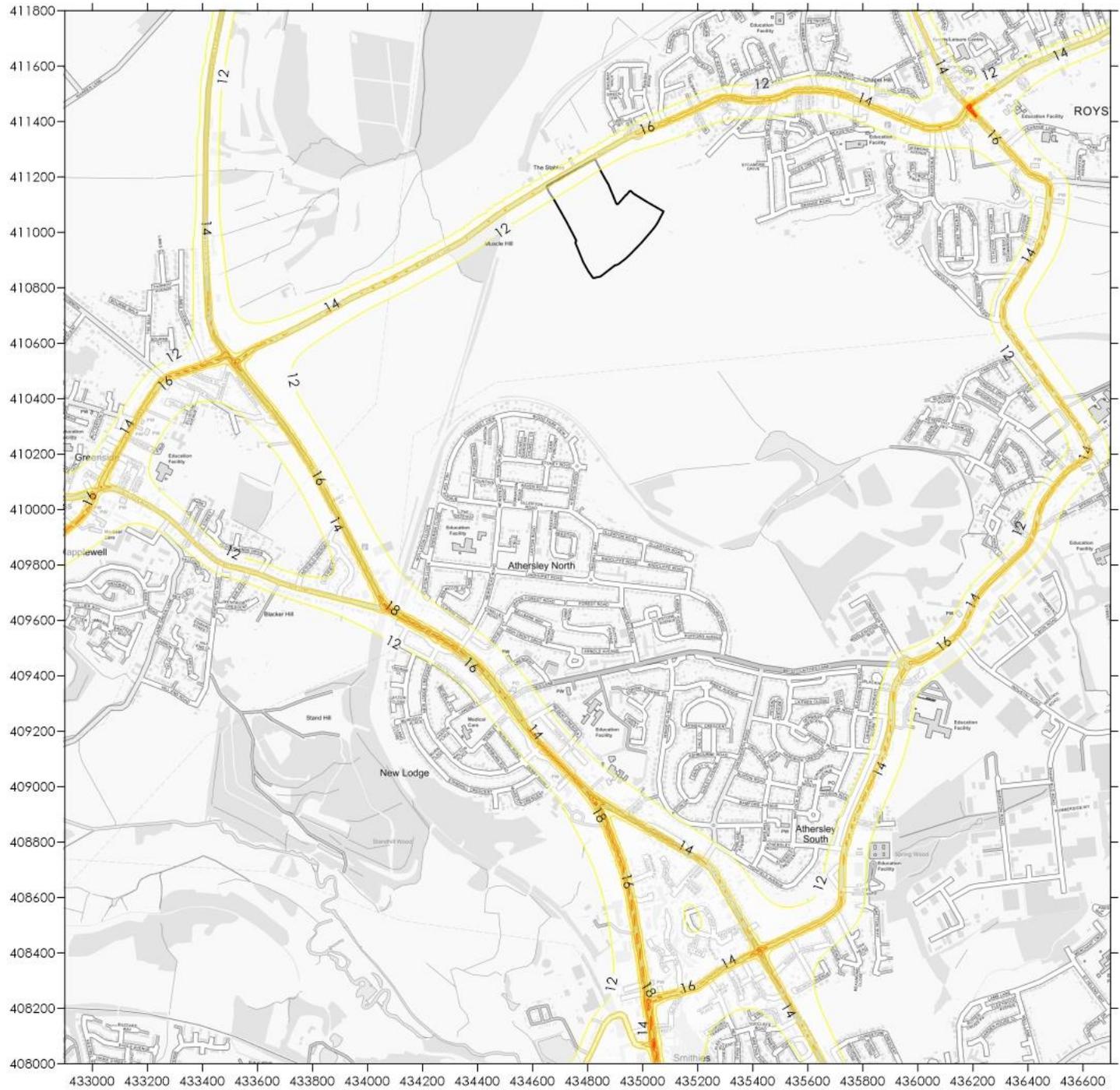
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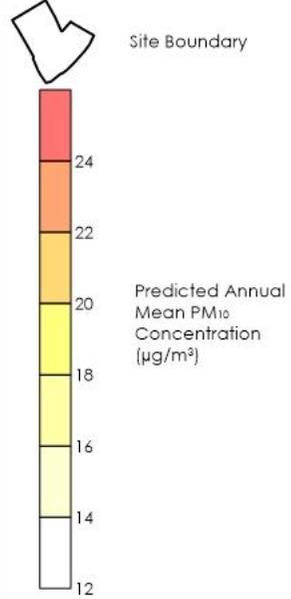
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Title
Figure 7 - Predicted Annual Mean PM₁₀ Concentration (µg/m³)
Do-Minimum

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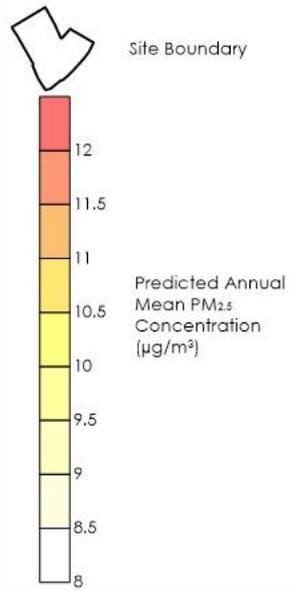
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Title
Figure 8 - Predicted Annual Mean PM_{2.5} Concentration (µg/m³) Do-Minimum

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Lee Lane, Royston

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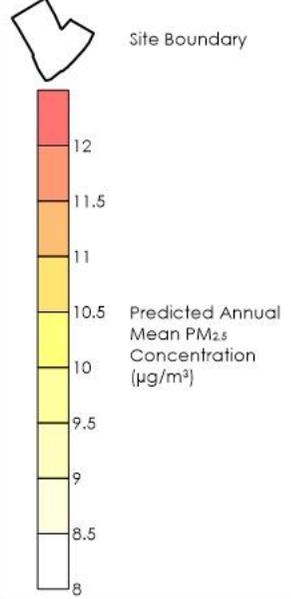
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Title
Figure 9 - Predicted Annual Mean PM_{2.5} Concentration (µg/m³)
Do-Something

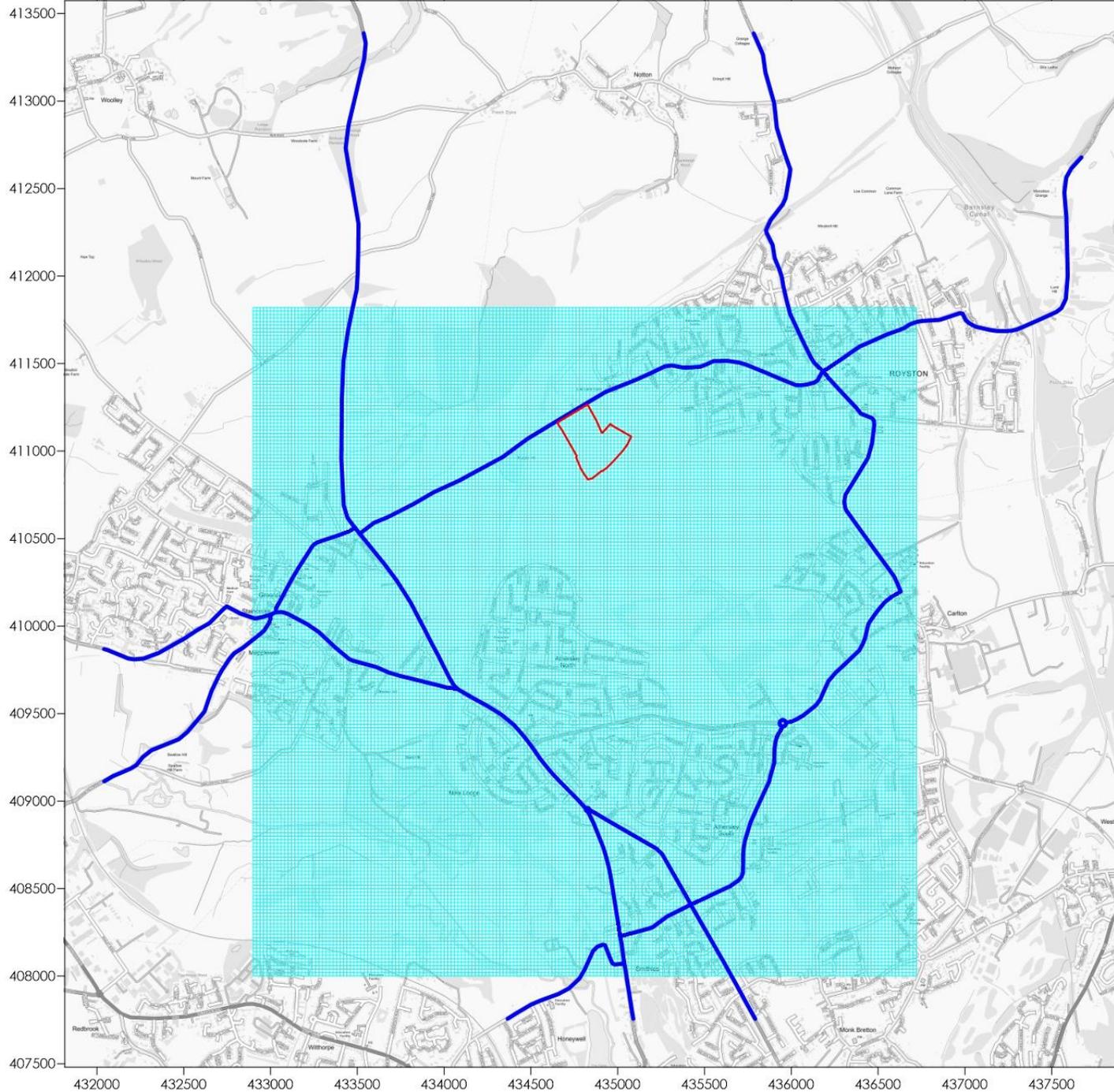
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Legend

-  Site Boundary
-  Road Link
-  Output Grid

Title

Figure 10 - ADMS-Roads Inputs

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Air Quality Assessment
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Appendix 1 - Assessment Input Data

Introduction

The proposals have the potential to cause air quality impacts as a result of exhaust emissions associated with vehicles travelling to and from the development, as well as exposure of future residents to any existing air quality issues. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.1.0.2). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

Additional options can also be selected within the ADMS-Roads user interface in order to take account of site-specific characteristics that may affect model output, such as canyons.

The relevant inputs are detailed in the following Sections.

Assessment Area

Ambient concentrations were predicted over the area NGR: 432900, 408000 to 436720, 411820. One Cartesian grid was included within the model to produce data suitable for contour plotting

using the Surfer software package. The default intelligent grid spacing option was selected within ADMS-Roads in order to improve contour resolution within the vicinity of sources.

Receptors potentially sensitive to changes in pollutant concentrations were included in the assessment as outlined in the main report text.

Reference should be made to Figure 10 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion, was provided by Andrew Moseley Associates Ltd, the Transport Consultants for the scheme.

Baseline traffic data for a number of road links was not available from the Transport Consultants. Data was therefore supplemented with information from the Department for Transport (DfT)²². The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2024. It should be noted that the DfT web tool is referenced in DEFRA guidance²³ as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the site.

The baseline traffic data was converted to the site opening year utilising a factor obtained from TEMPro (Version 8.0). This software package has been developed by the Department for Transport (DfT) to calculate future traffic growth throughout the UK.

Road parameters for input into the model were based on the following:

- Road widths were estimated from aerial photography and UK highway design standards;
- Vehicle speeds were estimated as an average for the relevant road link over the course of a 24-hour period;

²² <https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints>.

²³ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

- Vehicle speeds were determined following review of speed limits within the study extents, as well as congestion data available from GoogleMaps;
- Vehicle speeds specific to slow phases were determined using the methodology outlined in the DEFRA guidance²⁴;
- Necessary adjustments to slow phase vehicle speeds were based upon congestion data available from GoogleMaps; and,
- The length for slow phases was derived using the approaching distance of 25m outlined in the DEFRA guidance²⁵, and adjusted accordingly based on aerial photography and congestion data available from GoogleMaps.

A summary of the traffic data used in the assessment is provided in Table A1.1.

Table A1.1 Traffic Data

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Avg. Vehicle Speed (km/h)	Road Width (m)
		2024	2027 DM	2027 DS			
L1	B6428 Midland Road	6,116	6,596	6,691	3.43	45	7.5
L1a	B6428 Midland Road, Canyon	6,116	6,596	6,691	3.43	35	6.5
L2	B6428 Midland Road, Slow Phase (SP)	6,116	6,596	6,691	3.43	20	7.1
L3	B6132 Station Road, SP	5,284	6,059	6,086	2.65	20	6.8
L4	B6132 Station Road	5,284	6,059	6,086	2.65	45	6.5
L5	B6132 Church Street, SP	8,273	9,236	9,452	2.90	20	6.1
L6	B6132 Church Street	8,273	9,236	9,452	2.90	45	8.2
L7	B6132 Church Street, Junction	8,273	9,236	9,452	2.90	20	11.8
L8	B6132 Church Street, West of Carleton Road	8,273	9,236	9,452	2.90	45	6.1
L9	B6132 Church Street, West of Carleton Road, SP	8,273	9,236	9,452	2.90	20	12.3
L10	B6132 Carleton Road, SP	8,273	9,236	9,452	2.90	20	11.5
L11	B6132 Carleton Road,	8,273	9,236	9,452	2.90	45	7.6

²⁴ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

²⁵ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Avg. Vehicle Speed (km/h)	Road Width (m)
		2024	2027 DM	2027 DS			
L12	B6132 Carleton Road, East of A633, SP	8,273	9,236	9,452	2.90	20	7.3
L13	B6428 High Street, SP	8,359	8,615	8,953	7.31	20	8.9
L14	B6428 High Street	8,359	8,615	8,953	7.31	45	6.9
L15	B6428 High Street, East of Site Access	8,359	8,615	8,953	7.31	75	7.0
L16	B6428 High Street, West of Site Access	8,359	8,615	9,965	7.31	75	7.1
L17	B6428 High Street, West of Site Access, SP	8,359	8,615	9,965	7.31	20	10.5
L18	B6428 Shaw Lane, SP	9,191	10,631	10,982	4.35	20	10.7
L19	B6428 Shaw Lane	9,191	10,631	10,982	4.35	45	7.2
L20	B6428 Shaw Lane, North of B6131, SP	9,191	10,631	10,982	4.35	20	11.5
L21	B6428 Spark Lane, SP	9,191	10,631	10,982	4.35	20	9.5
L22	B6428 Spark Lane	9,191	10,631	10,982	4.35	45	5.9
L23	B6131, West of Shaw Lane	7,307	7,513	7,513	2.96	45	6.9
L24	B6131, between Shaw Lane and Spark Lane	5,400	5,672	5,672	2.34	45	7.3
L25	B6131, East of Shaw Lane	5,400	5,672	5,672	2.34	45	6.6
L26	B6131, East of Shaw Lane, SP	5,400	5,672	5,672	2.34	20	15.1
L27	A61 Wakefield, North of Shaw Lane	8,272	9,275	9,626	9.67	80	7.5
L28	A61 Wakefield, North of Shaw Lane	8,272	9,275	9,626	9.67	60	8.4
L29	A61 Wakefield, North of Lee Lane	8,272	9,275	9,977	9.67	60	9.3
L30	A61 Wakefield, South of Lee Lane	9,297	11,320	11,428	10.86	60	9.4
L31	A61 Wakefield, Bar Lane Junction SP	9,297	11,320	11,428	10.86	20	8.1
L32	A61 Wakefield, North of B6132, SP	9,297	11,320	11,428	10.86	20	12.2
L33	A61 Wakefield, South of B6132, SP	9,297	11,320	11,428	10.86	20	15.2
L34	A61 Wakefield, South of B6132	9,297	11,320	11,428	10.86	45	8.9
L35	A61 Wakefield, North of A633, SP	9,297	11,320	11,428	10.86	20	12.9
L36	A633 Rotherham Road, SP	9,180	9,439	9,493	1.49	20	9.3

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Avg. Vehicle Speed (km/h)	Road Width (m)
		2024	2027 DM	2027 DS			
L37	A633 Rotherham Road	9,180	9,439	9,493	1.49	45	10.5
L38	A633 Rotherham Road, North of B6132, SP	9,180	9,439	9,493	1.49	20	11.1
L39	A633 Rotherham Road, South of B6132, SP	9,180	9,439	9,574	1.49	20	7.3
L40	A633 Rotherham Road, South of B6132	9,180	9,439	9,574	1.49	45	8.6
L41	A61 Wakefield, South of A633, SP	13,478	13,858	13,912	3.38	20	9.4
L42	A61 Wakefield, South of A633	13,478	13,858	13,912	3.38	35	9.2
L43	A61 Wakefield, North of B6132, SP	13,478	13,858	13,912	3.38	20	8.5
L44	A61 Wakefield, South of B6132, SP	16,287	16,746	16,800	3.51	20	8.5
L45	A61 Wakefield, South of B6132	16,287	16,746	16,800	3.51	45	7.8
L46	B6132, East of A61, SP	8,273	9,236	9,236	2.90	20	7.6
L47	B6132	8,273	9,236	9,236	2.90	35	7.2
L48	B6132, West of A633, SP	8,273	9,236	9,236	2.90	20	7.5
L49	Smithes Lane, SP, north	2,690	2,766	2,766	3.83	20	4.8
L50	Smithes Lane, SP, south	2,690	2,766	2,766	3.83	20	4.8
L51	Smithes Lane	5,380	5,532	5,532	3.83	40	6.7
R1	B6132 Roundabout	4,137	4,618	4,672	2.90	30	10.1
R2	A633/A61 Roundabout	5,326	5,769	5,877	10.86	30	8.7

Reference should be made to Figure 10 for a graphical representation of the road link locations.

Canyons

Where buildings or walls surround roads, pollutant dispersion patterns are altered which can lead to high pollutant concentrations. These street canyons can significantly influence air quality along a road and therefore it is important to take consideration of their effects when undertaking dispersion modelling.

The release of ADMS-Roads version 4.0.1.0 in December 2015 incorporated a number of new features including an advanced street canyon module, which have been retained in version 5.1.0.2. Advanced street canyon modelling allows a number of parameters to be included in the dispersion model in order to predict pollutant dispersion patterns which better reflect air flow within complex urban geometries.

Canyons have five principal effects on dispersion which can influence pollutant concentrations. These are:

- Pollutants are channelled along street canyons;
- Pollutants are dispersed across street canyons by circulating flow at road height;
- Pollutants are trapped in recirculation regions;
- Pollutants leave the canyon through gaps between buildings as if there was no canyon; and,
- Pollutants leave the canyon from the canyon top.

The combined modelling of these effects will result in concentration patterns unique to each canyon. The parameters used in the assessment are outlined in Table A1.2. It should be noted that where buildings are not present on one side of the road, canyon parameters were purposefully included at 0m.

Table A1.2 Canyon Parameters

Link	Parameter (m)					
	Canyon Width to Left	Average Height of Buildings to Left	Building Length Left	Canyon Width to Right	Average Height of Buildings to Right	Building Length Right
L1a	6.1	7.5	45.0	0.0	0.0	0.0
L2	6.4	6.0	50.0	4.4	6.5	20.0
L3	0.0	0.0	0.0	7.0	6.5	35.0
L5	4.4	8.0	40.0	7.5	10.0	35.0

A choice of two modes is provided for use in the advanced canyon module. Standard mode assumes that each road is part of a continuous network of roads with similar properties. Network mode analyses the road network to determine transport of pollutants between adjoining street canyons, allows for varying concentrations along the canyon and accounts for transport of

pollutants out of the end of a canyon. Network mode is considered most accurate for detailed local analysis and as such was selected for use in the model.

Emission Factors

The emission factors were calculated using the relevant traffic flows and the Emissions Factor Toolkit (EFT) (version 13.1). This has been produced by DEFRA and incorporates COPERT 5.8 vehicle emission factors.

Meteorological Data

Meteorological data used in the assessment was taken from Sheffield City meteorological station over the period 1st January 2024 to 31st December 2024 (inclusive). Sheffield City meteorological station is located at NGR: 440795, 388748, which is approximately 23.3km south-east of the scheme. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 11 for a wind rose of the utilised meteorological data.

Roughness Length

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents. This value is considered appropriate for the morphology of the area and is suggested within ADMS- Roads as being suitable for 'parkland, open suburbia'.

A z_0 of 0.3m was used to describe the meteorological site. This value is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe both the modelling extents and the

meteorological site. This is considered appropriate for the nature of both areas and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

Annual mean NO₂, PM₁₀ and PM_{2.5} background concentrations for use in this assessment were obtained from the BAR3 - Barnsley Gawber automatic station. These are shown in Table A1.3.

Table A1.3 Background Pollutant Concentrations - Modelling Extents

Pollutant	Recorded Background Pollutant Concentration (µg/m³)
NO ₂	11.1
PM ₁₀	11.4
PM _{2.5}	7.1

The annual mean NO₂ and PM_{2.5} concentrations were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as they were higher than the DEFRA backgrounds for the grid square containing the site, as shown in Table 13. The annual mean PM₁₀ concentrations was chosen to provide continuity within the assessment.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 9.1) provided by DEFRA, which is the method detailed within DEFRA guidance²⁶.

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;

²⁶ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of the assessment, model verification was undertaken for 2024 using traffic data, meteorological data and monitoring results from this year.

BMBC undertook monitoring of NO₂ concentrations at seven locations within the vicinity of roads included in the model during 2024. The results were obtained and the road contributions to total NO_x concentrations calculated following the methodology contained within DEFRA guidance²⁷. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table A1.4.

Table A1.4 NO_x Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
32	12 High Street, Royston	17.2	13.18
33	Cherry Cakes, Midland Road, Royston	30.1	45.92
34	Wakefield Road / Carlton Road	24.2	29.98
35	Wakefield Road - South of Carlton Road	26.4	35.71
36	Wakefield Road /Smithies Lane (North)	29.7	44.78
50	Carlton Road (Watford Road junction)	23.1	27.20
52	Wakefield Road / Bar Lane junction	24.7	31.26

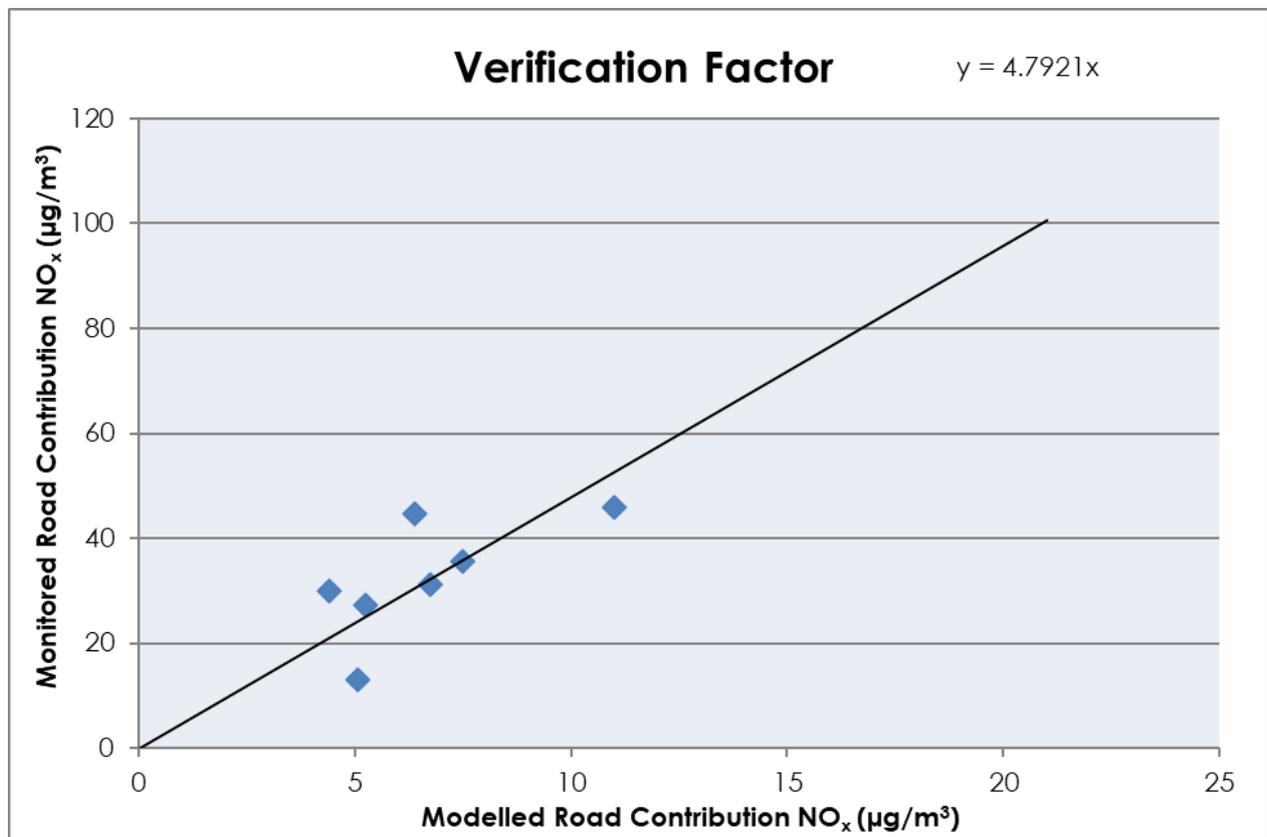
The annual mean road NO_x concentrations predicted from the dispersion model and the road NO_x concentrations calculated from the monitoring results are summarised in Table A1.5.

²⁷ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Table A1.5 NO_x Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
32	12 High Street, Royston	13.18	5.07
33	Cherry Cakes, Midland Road, Royston	45.92	11.01
34	Wakefield Road / Carlton Road	29.98	4.39
35	Wakefield Road - South of Carlton Road	35.71	7.50
36	Wakefield Road /Smithies Lane (North)	44.78	6.39
50	Carlton Road (Watford Road junction)	27.2	5.24
52	Wakefield Road / Bar Lane junction	31.26	6.74

The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 4.7921 was required to be applied to all road NO_x modelling results, as shown in Graph 1.



Monitoring of PM₁₀ and PM_{2.5} concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust model predictions of these species in lieu of more accurate data in accordance with DEFRA guidance²⁸.

²⁸ Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Appendix 2 - Curricula Vitae

KEY EXPERIENCE:

Emily is a Director with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads and ADMS-6. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Assessment of fugitive dust impacts from a range of mineral extraction developments.
- Assessment of petrol stations to address benzene concentrations and their impact on adjacent developments.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Assessment of potential effects associated with network realignment schemes and highway developments.

SELECT PROJECTS SUMMARY:

Broad Street, Birmingham

Air Quality Assessment in support of a residential-led development on land at Broad Street, Birmingham. The proposals were located adjacent to a section of the Midland Metro Westside which runs along Broad Street. Consideration was made to the potential for re-alignment of the local road network as a result of the Metro to effect pollution levels at the development. The assessment indicated NO₂ concentrations exceeded air quality criteria from ground to third floor level as a result of road vehicle exhaust emissions. Mitigation was therefore specified for the affected units.

Home Farm, Forest Road, Warfield

Ecological Air Quality Assessment in support of a residential development. Natural England held concerns regarding potential impacts at sensitive ecological designations as a result of traffic exhaust emissions associated with the development. The predicted change in NO_x and ammonia concentrations and nitrogen and acid deposition was below the relevant criteria at all locations within the ecological designations. Impacts were therefore not considered to be significant.

Saltcoats Road, Stevenston

Air Quality Assessment in support of an educational campus and associated energy centre. Impacts associated with emissions from the proposed gas and biomass boilers were assessed through detailed dispersion modelling. This indicated impacts on annual mean NO₂ and PM₁₀ concentrations were predicted to be not significant.

Blackthorn & Piddington

Environmental Impact Assessment in support of a railway embankment scheme on land at the Network Railway Embankment between Piddington and Blackthorn. Due to the extensive stabilisation works a Fugitive Dust Emissions Assessment was undertaken in addition to consideration of road vehicle exhaust emissions. Due to the location of the site in relation to nearby sensitive receptors, potential impacts associated with construction works were not considered to be significant.

Blackmoorfoot Road, Huddersfield

Air Quality in support of a residential-led development in close proximity to an operational minerals facility. Due to the presence of the Johnsons Wellfield Quarry to the south of the site a Fugitive Dust Emissions Assessment was undertaken to determine potential impacts. Dispersion modelling of road vehicle exhaust emissions was also undertaken in support of the scheme. Results indicated the overall significance of fugitive dust emissions from the quarry and air quality impacts associated with operation of the development itself were not significant.

Lockwood Bar, Huddersfield

Air Quality Assessment for the proposed highway realignment scheme along Lockwood Road, Huddersfield. Changes in pollution levels were considered at sensitive receptors as a result of variations to road geometry and associated redistribution of vehicle trips across the local area. Results of the dispersion modelling study indicated air quality impacts as a result of the scheme were not significant.

KEY EXPERIENCE:

Alec is a Senior Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments in accordance with Department for Environment, Food and Rural Affairs (DEFRA) methodologies for a range of residential, commercial and industrial sectors
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads and ADMS-6. Studies have included impact assessment of ground level pollutant concentrations and assessment of suitability of development sites for proposed end-use.
- Advanced Canyon Modelling to evaluate the impact of altered urban topography on air quality in built up areas
- Assessment of fugitive dust impacts from a range of industrial developments.
- Assessment of petrol stations to address benzene concentrations and their impact on adjacent developments.
- Periodic bioaerosol monitoring campaigns at a number of waste facilities in support of permit compliance.
- Assessment of potential effects associated with network realignment schemes and highway developments.
- Development of bespoke monitoring programmes to assess workplace exposure at commercial and industrial facilities and colleges.

SELECT PROJECTS SUMMARY:

1 Piccadilly Circus, London

Air Quality Assessment in support of a tourist hostel located within an Air Quality Management Area (AQMA). The development had the potential to expose future occupants to elevated pollution levels and cause impacts at sensitive locations. Potential emissions from the proposals were also assessed to determine compliance with the Air Quality Neutral requirements of the London Plan. Results of the assessment indicated that the site was Air Quality Neutral and air quality factors were not a constraint to the development.

Kingscroft Farm, Havant

Air Quality Assessment in support of a residential development located in close proximity to the A27 and a number of gas-fired generator sites. The development had the potential to expose future residents to elevated pollution concentrations and cause impacts at sensitive locations. Detailed dispersion modelling was undertaken using ADMS-roads to assess pollutant concentrations across the development and a comparison was made between overall concentrations with and without the development in place. Results indicated pollutant concentrations were below the relevant standards across the site and impacts associated with the development were not significant.

Trademark House, Petersfield

Odour Assessment in support of a mixed-use development at Trademark House, Petersfield. The site was located in close proximity to a petrol filling station (PFS) and associated retail unit, which may result in loss of amenity at the development site. A two stage

Odour Assessment was undertaken to assess baseline conditions across the site and consider the risk of reduced amenity. An Air Quality Benzene Assessment was also undertaken to determine potential exposure of future occupants to elevated benzene concentrations associated with the PFS. Results indicated odour effects at the site did not represent a constraint to planning consent and that exceedences of the Air Quality Objective (AQO) were not predicted at the development location

Granby Road, Buxton

Air Quality Assessment in support of a residential development on land off Granby Road, Buxton. Results of detailed dispersion modelling utilising advanced canyons indicated air quality impacts associated with the development were not significant. The scheme was also located in close proximity to Ashwood Dale Quarry. Potential impacts on future residential amenity were assessed using the Source-Pathway-Receptor approach, which indicated that existing emissions associated with the operation of the quarry were not considered significant.

Industrial Chemicals Ltd, West Thurrock

Air Quality Assessment in support of the relocation of an existing polyaluminium chloride process from Titan Works, Hogg Lane Grays, to West Thurrock Works, Stoneness Road, Grays. Results of the assessment indicated that potential emissions associated with construction and operation of the site were not significant.

KEY EXPERIENCE:

Lauren is an Associate with specialist experience in the air quality sector. Her key capabilities include:

- Undertaking and managing a variety of air quality projects in a range of sectors including residential, student accommodation, educational, commercial and industrial projects
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads and ADMS-6. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Project management and co-ordination of Environmental Impact Assessments and scoping reports for developments throughout the UK.
- Co-ordination and management of multi-disciplinary projects and submissions.
- Assessment of fugitive dust impacts from a range of mineral extraction developments.
- Production of air quality mitigation strategies specifically tailored to address issues at individual sites.
- Active STEM Ambassador role, working with local schools to educate about air quality.

SELECT PROJECTS SUMMARY:

Norton Lodge, Malton

An ES Chapter and technical appendix were supplied to support this EIA development. The development comprised a new link road and therefore required multiple assessment scenarios. The Chapter also looked at impacts at ecological designations, impacts with an AQMA, odour from neighbouring facilities and impacts on proposed receptors. The AQMA in Malton was a particular concern for the council. The overall impact was considered to be not significant.

Yorkshire Post Phase 2, Leeds

An Air Quality Assessments to support each of the three proposed towers which form part of the Yorkshire Post Phase 2. These high-rise buildings were proposed for student accommodation and commercial uses. In addition to following LAQM.TG(22) and EPUK&IAQM guidance, the West Yorkshire Low Emissions Strategy (WYLES) Air Quality & Emissions Technical Planning Guidance was followed. Due to the 'Major' development classification in line with the WYLES guidance, damage costs for each tower were calculated. Mitigation measures were suggested. The energy strategy for the development was for a connection to the Leeds PIPES local heating district network.. The scheme was approved.

Old Hall Street, Liverpool

An Air Quality Assessment to support a student accommodation development. The scheme is 'car free' and trips generated dispersed to below the threshold once off Old Hall Street. The Site was considered suitable for residential use.

Viadux Phase 2, Manchester

Environmental Impact Assessment to support a high-rise residential led scheme in the city centre. The assessment included both operational and construction phase impacts. Impacts with both phases were considered to be 'not significant'. Additionally, in line with Manchester City Council Air Quality Guidance a Damage Cost calculation was included to ensure that sufficient mitigation was included to reduce air quality impacts as much as possible.

Plot 9b, First Street, Manchester

An ES Chapter to support the EIA development on land off First Street. The assessment included operational and construction phase impacts, in addition to modelling to ensure site suitability. Additionally, in line with Manchester City Council Air Quality Guidance a Damage Cost calculation was included to ensure that sufficient mitigation was included to reduce air quality impacts as much as possible. This included improving footpaths so that the site linked to other Plots within the wider First Street development. The Chapter concluded that impacts were considered not significant.

Winwick Road, Warrington

Air Quality Assessment for the proposed B2/B8 development in Warrington. Changes in pollution levels were considered at sensitive receptors as a result of trips generated and their distribution across the local area. Results of the dispersion modelling study indicated air quality impacts as a result of the scheme were not significant.