

Air Quality Assessment
Keresforth Road, Dodworth

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Executive Summary

Redmore Environmental Ltd was commissioned by Persimmon Homes West Yorkshire to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Keresforth Road, Dodworth.

The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions associated with vehicles travelling to and from the site during operation, as well as expose future occupants to elevated pollution levels. As such, an Air Quality Assessment was required in order to determine baseline conditions, consider site suitability for the proposed end-use and assess potential effects as a result of the scheme.

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 good practice control measures would provide suitable mitigation for a development of this size and nature and reduce potential impacts to an acceptable level.

Potential operational phase impacts from vehicle exhaust emissions were assessed by predicting air quality conditions at sensitive locations using dispersion modelling both with and without the development in place. Results were subsequently verified using local monitoring data.

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

The results of the assessment also demonstrated that predicted pollution levels were below the relevant air quality standards at all proposed residential unit locations. As such, the site is considered suitable for the proposed end use from an air quality perspective.

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

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 Redmore Environmental Ltd was commissioned by Persimmon Homes West Yorkshire to provide an Air Quality Assessment (ref:1943r1) in support of a residential scheme on land off Keresforth Road, Dodworth. The results of this assessment were submitted to Barnsley Metropolitan Borough Council (BMBC) as part of a pre-application enquiry for the development (ref:2017/ENQ//00629).
- 1.1.2 Following submission of the pre-application documentation, comments were received from the Environmental Health Department at BMBC regarding the assessment methodology. These were addressed within a Technical Note produced by Redmore Environmental (1943c1). However, BMBC raised residual concerns that the Bias-Adjustment Factor (BAF) used to correct the short-term on-site monitoring data was too dissimilar to the value obtained by BMBC at their own monitoring sites over the same period. To address this disagreement, the survey data has been adjusted using the BMBC BAF and the results provided within the following updated assessment.

1.2 Site Location and Context

- 1.2.1 The site is located on land off Keresforth Road, Dodworth, at approximate National Grid Reference (NGR): 432298, 405464. Reference should be made to Figure 1 for a map of the site and surrounding area.
- 1.2.2 The proposals comprise a residential development of circa 146 units and associated infrastructure.
- 1.2.3 The development has the potential to cause impacts at sensitive locations. These may include fugitive dust emissions associated with construction works and road traffic exhaust emissions from vehicles travelling to and from the site during the operational phase. Further to this, there are concerns that the proposals may introduce future users to exceedences of the relevant Air Quality Objectives (AQOs) due to the proximity of the development to the M1 motorway. An Air Quality Assessment was therefore undertaken in order to determine baseline conditions, consider site suitability for the proposed end-

use and consider potential effects as a result of the proposals. This is detailed in the following report.

2.0 LEGISLATION AND POLICY

2.1 European Directives

2.1.1 European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new Air Quality Limit Values (AQLVs) for particulate matter with an aerodynamic diameter of less than 2.5µm. The consolidated Directives include:

- Directive 1999/30/EC - the First Air Quality "Daughter" Directive - sets ambient AQLVs for nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

2.1.2 The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

2.2.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 5 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for

Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out AQOs that 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.

2.2.3 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m ³)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum

2.2.4 Table 2 summarises the advice provided in DEFRA guidance² 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

¹ The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management (TG16), DEFRA, 2016.

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

2.3 Local Air Quality Management

- 2.3.1 Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (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.

2.4 Dust

- 2.4.1 The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2016), 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."

2.4.2 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). Enforcement can insist that there be no dust beyond the boundary of the works. 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 practice measures.

2.5 National Planning Policy

2.5.1 The National Planning Policy Framework³ (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to the proposed development:

"The planning system should contribute to and enhance the natural and local environment by: [...]

Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"

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

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

³ NPPF, Department for Communities and Local Government, 2012.

2.6 National Planning Practice Guidance

2.6.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans 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 be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

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

2.7 Local Planning Policy

2.7.1 The Barnsley Metropolitan Borough Council (BMBC) Local Development Plan consists of the Core Strategy, the Barnsley Education Sites Development Plan Document, the Joint Waste Plan and saved policies from the Unitary Development Plan (UDP). The Core Strategy⁵ was adopted in September 2011 and sets out the key elements of the planning framework for Barnsley. Review of the Core Strategy revealed the following policies of relevance to this report:

"CSP 40 Pollution Control and Protection

⁴ <http://planningguidance.planningportal.gov.uk>.

⁵ Core Strategy, Local Development Framework, BMBC, 2011.

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

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

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

"CSP 41 Development in Air Quality Management Areas

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

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

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

2.7.2 The Core Strategy supersedes the majority of the Volume 1: Strategy, Policy and Justification UDP⁶. However, some policies from the UDP have been saved until the adoption of the new Local Plan. Review of the UDP saved policies document revealed the following policy of relevance to this report:

"Economic Development and Residential Amenity

⁶ Volume 1: Strategy, Policy and Justification, Barnsley UDP, BMBC, 2000.

Policy ED4

Proposals for economic development adjoining or close to housing will be assessed with particular regard to the likely impact on residential amenity in terms of:

- a) Air Pollution including smell, fumes, smoke, soot, ash, dust or grit.

[...]"

- 2.7.3 The above policies were taken into consideration throughout the undertaking of the assessment.

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, as well as expose future occupants to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

3.1.2 BMBC have produced 'Air Quality and Emissions Good Practice Planning Guidance'⁷ which includes direction on when an air quality assessment will be required and the associated scope of works. The recommendations outlined in the document were applied as necessary throughout the assessment.

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 V1.1'⁸.

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,

⁷ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

⁸ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

- 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

3.2.5 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the boundary or 50m from the construction vehicle route up to 500m 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 500m 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

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 through the construction phase. The relevant criteria are summarised in Table 3.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	- Total site area greater than 10,000m² - 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 8m in height - More than 100,000 tonnes of material moved
	Construction	- Total building volume greater than 100,000m³ - On site concrete batching - Sandblasting
	Trackout	- 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	- Total site area 2,500m² to 10,000m² - Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time - Formation of bunds 4m to 8m in height - Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	- Total building volume 25,000m³ to 100,000m³ - Potentially dusty construction material (e.g. concrete) - On site concrete batching
	Trackout	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
Small	Earthworks	- Total site area less than 2,500m² - 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 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	Construction	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)

Magnitude	Activity	Criteria
	Trackout	• Less than 10 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 influencing factors are shown in Table 4.

Table 4 Construction Dust - Examples of Factors Defining Sensitivity of an Area

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	• 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	• Internationally or nationally designated site e.g. Special Area of Conservation
Medium	• 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	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• 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	• Locally designated site e.g. Local Nature Reserve

3.2.11 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

3.2.12 These factors were considered in the undertaking of this assessment.

3.2.13 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 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

3.2.14 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	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m ³	More than 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m ³	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32µg/m ³	More than 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	Less than 24µg/m ³	More than 10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
Low	-	1 or more	Low	Low	Low	Low	Low

3.2.15 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

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

3.2.17 Table 8 outlines the risk category from earthworks and construction activities.

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

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

3.2.18 Table 9 outlines the risk category from trackout activities.

Table 9 Construction Dust - Dust Risk Category from Trackout Activities

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

Step 3

3.2.19 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

3.2.20 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**.

3.2.21 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.

⁹ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

3.3 Operational Phase Assessment

3.3.1 The development has the potential to affect existing 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 poor air quality. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling for the following scenarios:

- 2016 - Verification;
- Opening year Do-Minimum (DM) (predicted traffic flows in 2023 should the proposals not proceed); and,
- Opening year Do-Something (DS) (predicted traffic flows in 2023 should the proposals be completed).

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 pollutant concentrations were identified within 200m of the highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB)¹⁰ 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 appropriate receptor positions.

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 10.

¹⁰ DMRB Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.

¹¹ Local Air Quality Management (TG16), DEFRA, 2016.

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

Table 10 Significance of Impact

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

3.3.5 The matrix shown in Table 10 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell 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. 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 should be provided as far as practicable. This has been considered throughout the assessment

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

when defining predicted impacts. The IAQM guidance¹⁴ suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix 2.

Future Exposure

- 3.3.9 The proposed development has the potential to expose future residents to poor air quality. Pollutant concentrations were therefore quantified across the site using dispersion modelling. The results were subsequently compared with the relevant AQOs to determine the potential for any exceedence.

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), BMBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO₂ are above the AQO within the borough. Six AQMAs are currently declared, with the closest to the development described as:

"An area along the M1 between Junction 35a and Junction 38, including Haigh, Darton, Cawthorne Dike, Higham, Dodworth, Gilroyd, Rockley, Birdwell, and Tankersley. The area extends 100m either side of the central reservation."

- 4.2.2 The development is partially located within the AQMA. As such, there is the potential for the exposure of future occupants to poor air quality and vehicles travelling to and from the site to increase pollution levels in this sensitive area. These issues have been considered throughout the assessment.

- 4.2.3 One further AQMA is located 300m north-west of the site. This is described as:

"An area encompassing the A628 from junction 37 of the M1 to Town End roundabout, including part of Summer Lane from Town End roundabout to Wharncliffe Street."

- 4.2.4 As traffic generated by the development is likely to travel through this AQMA it has also been taken into consideration throughout the assessment.

- 4.2.5 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

BMBC Monitoring Results

4.3.1 Monitoring of pollutant concentrations is undertaken by BMBC throughout their area of jurisdiction. Recent NO₂ results from the sites nearest to the development are shown in Table 11.

Table 11 BMBC Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)	
		2015	2016
CM2	Barnsley A628 Roadside	39	36
CM3	Barnsley Gawber	19	19
DT14	Dodworth Road	49.8	49.2
DT18	Dodworth Road, West of Crossroads	44.4	36.9
DT19	Crown Hill Road	30.9	28.1
DT20	Dodworth Road, Pogmoor	44.7	43.4
DT21	Dodworth Road, Pogmoor	58.1	51.1
DT22	Dodworth Road, Pogmoor	53.2	52.7
DT23	Dodworth Road, Pogmoor	49.8	50.0
DT11	Dodworth Road	43.9	43.2
DT12	Dodworth Road	48.5	45.5
DT13	Traffic Lights Dodworth Rd	48.1	45.1
DT33	Westway	30.8	31.8

4.3.2 As shown in Table 11, annual mean NO₂ concentrations were above the AQO at several monitors in recent years. As the sites are positioned at roadside locations within an AQMA, exceedences would be anticipated.

4.3.3 BMBC do not undertake PM₁₀ monitoring within the vicinity of the development.

Site Specific Monitoring Results

- 4.3.4 Monitoring of NO₂ concentrations was undertaken within the vicinity of the M1 slip road by Wardell Armstrong during 2016. The results are summarised in Table 12.

Table 12 Site Specific Monitoring Results

Monitoring Site		2016 Monitored NO ₂ Concentration (µg/m ³)
DTML1	Positioned to the north of the site, approximately 30m west of the M1 slip road	29.73
DTML2	Positioned on the eastern boundary of the site, approximately 18m west of the M1 slip road	43.12
DTML3	Positioned to the south of the site, approximately 32m west of the M1 slip road	32.10
DTML4	Positioned within the eastern part of the site, approximately 34m west of the M1 slip road	36.23

Note: Monitoring undertaken between 27/05/2016 and 30/08/2016 and 03/10/2017 and 31/10/2016. Results have been annualised in accordance with DEFRA guidance¹⁵. The BMBC BAF of 0.87 was applied to the results. Further details are provided in Appendix 1.

- 4.3.5 As shown in Table 12, annual mean NO₂ concentrations were above the AQO for NO₂ at DTML2. This is positioned at the eastern development boundary, in close proximity to the M1 slip road. Elevated levels would therefore be anticipated. All other locations recorded NO₂ concentrations below the relevant AQO. Reference should be made to Figure 2 for a map of the survey sites.

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: 432500, 405500. Data for this location was downloaded from the DEFRA website¹⁶ for the purpose of the assessment and is summarised in Table 13.

¹⁵ Local Air Quality Management (TG16), DEFRA, 2016.

¹⁶ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>.

Table 13 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (µg/m³)		
	2016	2017	2023
NO ₂	17.93	17.29	12.70
PM ₁₀	14.10	13.99	13.57

4.4.2 As shown in Table 13, predicted background NO₂ and PM₁₀ concentrations are below the relevant AQOs at the development site.

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 350m 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	10 - 100	0
Up to 50	More than 100	0
Up to 100	More than 100	-
Up to 350	More than 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 500m of the site access. These are summarised in Table 15. For the purpose of the assessment it was assumed construction phase traffic would access the site from Keresforth Road.

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	More than 100	0
Up to 50	More than 100	0

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

4.5.5 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 16.

Table 16 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The desk top study did not indicate any dust generating activities in the local area
The likelihood of concurrent dust generating activity on nearby sites	A review of the planning portal indicated a number of applications have been granted planning permission within the vicinity of the site. These include the following: • Planning reference: 2017/1002 - 15 industrial units, approximately 370m north-west of the site • Planning reference: 2016/0713 - Industrial development, approximately 450m to the north-west of the site • Planning reference: 2016/0259 - 36 dwellings, approximately 775m south-west of the site • Planning reference: 2016/0268 - 51 dwellings, approximately 680m south-west of the site • Planning reference: 2014/0429 - 163 dwellings, approximately 600m east of the site It is therefore possible that there will be concurrent dust generation in the area should the construction phases of the development and the consented schemes overlap
Pre-existing screening between the source and the receptors	There is no significant screening around the site boundary

Guidance	Comment
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	As shown in Figure 3, the predominant wind bearing at the site is from the south-west. As such, receptors to the north-east of the site are most likely to be affected by dust releases
Conclusions drawn from local topography	There are no significant topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	The construction phase is likely to last approximately 5 years
Any known specific receptor sensitivities which go beyond the classifications given in the document	No specific receptor sensitivities identified during the baseline assessment

4.5.6 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. As such, users would expect to enjoy a reasonable level of amenity, aesthetics or the value of their property could be diminished by soiling and people would be expected to be present for extended periods of time.

4.5.7 The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.2, is shown in Table 17.

Table 17 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Medium

Operational Phase Sensitive Receptors

4.5.8 Locations sensitive to potential operational phase road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 18. Receptor heights were selected to take account for less sensitive land uses, such as ground floor retail units.

Table 18 Sensitive Receptor Locations

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - Barnsley Road	431464.1	405259.4	1.5
R2	Residential - Barnsley Road	431681.3	405641.3	1.5
R3	Residential - Barnsley Road	431957.1	405804.8	1.5
R4	Residential - Barnsley Road	432061.5	405848.0	1.5
R5	Residential - Barnsley Road	432113.1	405832.5	1.5
R6	Residential - Dodworth Road	432286.7	405925.1	1.5
R7	Residential - Dodworth Road	432340.3	405993.1	1.5
R8	Residential - Dodworth Road	432427.2	406001.9	1.5
R9	Residential - Dodworth Road	432584.2	406122.9	1.5
R10	Residential - Dodworth Road	432652.2	406162.8	1.5
R11	Residential - Dodworth Road	432704.1	406146.6	1.5
R12	Residential - Dodworth Road	432927.3	406272.3	1.5
R13	Residential - Dodworth Road	433032.8	406300.8	1.5
R14	Residential - Dodworth Road	433513.0	406290.0	1.5
R15	Residential - Dodworth Road	433999.6	406293.3	4.0
R16	Residential - Dodworth Road	433929.0	406278.1	1.5
R17	Residential - Racecommon Road	433919.1	406055.6	1.5
R18	Residential - Racecommon Road	433680.4	405442.8	1.5
R19	Residential - Park Road	433746.0	405384.3	1.5
R20	Residential - Keresforth Hill Road	433423.1	405343.6	1.5
R21	Greenacre School	433117.2	405266.7	1.5
R22	Residential - Keresforth Hill Road	432581.5	404824.8	1.5
R23	Residential - Water Royd Drive	432304.4	404989.7	1.5
R24	Residential - Water Royd Drive	432097.3	405306.0	1.5
R25	Residential - Rose Hill Drive	431862.1	405203.1	1.5

Receptor		NGR (m)		Height (m)
		X	Y	
R26	Residential - High Street	431837.0	405058.9	1.5
R27	Residential - Keresforth Road	432169.1	404903.6	1.5
R28	Residential - Keresforth Road	431959.8	404821.8	1.5
R29	Residential - High Street	431539.4	405208.7	1.5
R30	Residential - Broadway	432885.1	405884.5	1.5

- 4.5.9 The sensitive receptors identified in Table 18 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposals that have not been individually identified above. Reference should be made to Figure 4 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

5.0 ASSESSMENT

5.1 Introduction

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

5.2 Construction Phase Assessment

Step 1

- 5.2.1 The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching 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 road 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 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

Step 2

Earthworks

- 5.2.4 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The proposed development site is estimated to cover an area greater than 10,000m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.

5.2.5 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 8, the development is considered to be a **high** risk site for dust soiling as a result of earthworks activities.

5.2.6 Table 17 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health impacts as a result of earthworks activities.

Construction

5.2.7 Due to the size of the development the total building volume is likely to be greater than 100,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **large**.

5.2.8 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 8, the development is considered to be a **high** risk site for dust soiling as a result of construction activities.

5.2.9 Table 17 indicates the sensitivity of the area to human health impacts is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health impacts as a result of construction activities.

Trackout

5.2.10 Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. However, based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

5.2.11 Table 17 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 9, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

5.2.12 Table 17 indicates the sensitivity of the area to human health impacts is **medium**. In accordance within the criteria outlined in Table 9, the development is considered to be a **medium** risk site for human health impacts as a result of trackout activities.

Summary of the Risk of Dust Effects

5.2.13 A summary of the risk from each dust generating activity is provided in Table 19.

Table 19 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Medium

5.2.14 As indicated in Table 19, the potential risk of dust soiling is **high** from earthworks, construction and trackout. The potential risk of human health impacts is **medium** from trackout and **low** from earthworks and construction.

5.2.15 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.

Step 3

5.2.16 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 20. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the LA.

¹⁷ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

Table 20 Fugitive Dust Emission Mitigation Measures

Issue	Control Measure
Communications	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site management	• 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	• Undertake daily on-site and off-site inspection to monitor dust, record inspection results, and make the log available to the LA upon request • Carry out regular site inspections to monitor compliance with the DMP, 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	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site • Fully enclose 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	• 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	• 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	• Avoid bonfires and burning of waste materials
Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable • Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
Construction	• Avoid scabbling (roughening of concrete surfaces) if possible • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos
Trackout	• 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 • Record all inspections of haul routes and any subsequent action in a site log book • Implement a wheel washing system, if required • Access gates to be located at least 10m from receptors where possible

Step 4

5.2.17 Assuming the relevant mitigation measures outlined in Table 20 are implemented, the residual impacts from all dust generating activities is predicted to be **not significant**, in accordance with IAQM guidance¹⁸.

¹⁸ Guidance on the Assessment of Dust from Demolition and Construction V1.1, IAQM, 2016.

5.3 Operational Phase Assessment

5.3.1 Vehicle movements associated with the operation of the proposal will generate exhaust emissions on the local and regional road networks. 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, as well as consider potential exposure of future occupants to AQO exceedences.

5.3.2 The assessment considered the following scenarios:

- 2016 - Verification;
- 2023 - DM; and,
- 2023 - DS.

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

5.3.4 For the purpose of the assessment traffic data for 2023 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 2016 were utilised within the dispersion model. The use of 2023 traffic data and 2016 emission factors and background concentrations is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

Potential Development Impacts

Predicted Concentrations

5.3.6 Annual mean NO₂ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 21. Exceedences of the relevant AQO are shown in **bold**.

Table 21 Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Barnsley Road	30.18	30.50	0.32
R2	Residential - Barnsley Road	28.45	28.65	0.20
R3	Residential - Barnsley Road	36.63	36.89	0.26
R4	Residential - Barnsley Road	38.85	38.96	0.11
R5	Residential - Barnsley Road	41.82	41.93	0.11
R6	Residential - Dodworth Road	51.78	51.89	0.11
R7	Residential - Dodworth Road	45.27	45.35	0.08
R8	Residential - Dodworth Road	41.60	41.68	0.08
R9	Residential - Dodworth Road	41.80	41.88	0.08
R10	Residential - Dodworth Road	41.57	41.65	0.08
R11	Residential - Dodworth Road	38.93	38.98	0.05
R12	Residential - Dodworth Road	30.60	30.64	0.04
R13	Residential - Dodworth Road	30.46	30.50	0.04
R14	Residential - Dodworth Road	42.86	42.95	0.09
R15	Residential - Dodworth Road	41.73	41.82	0.09
R16	Residential - Dodworth Road	57.16	57.29	0.13
R17	Residential - Racecommon Road	26.20	26.29	0.09
R18	Residential - Racecommon Road	29.94	30.07	0.13
R19	Residential - Park Road	30.07	30.16	0.09

Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R20	Residential - Keresforth Hill Road	28.84	28.98	0.14
R21	Greenacre School	25.27	25.40	0.13
R22	Residential - Keresforth Hill Road	31.82	32.09	0.27
R23	Residential - Water Royd Drive	23.89	24.21	0.32
R24	Residential - Water Royd Drive	23.17	23.56	0.39
R25	Residential - Rose Hill Drive	22.02	22.53	0.51
R26	Residential - High Street	26.27	26.72	0.45
R27	Residential - Keresforth Road	23.42	23.52	0.10
R28	Residential - Keresforth Road	24.24	24.39	0.15
R29	Residential - High Street	26.58	26.98	0.40
R30	Residential - Broadway	27.55	27.57	0.02

5.3.7 As indicated in Table 21, predicted annual mean NO₂ concentrations were above the AQO at nine receptors and below at 21 positions in the DS scenario.

5.3.8 Reference should be made to Figure 5 and 6 for graphical representations of annual mean NO₂ concentrations across the assessment area for the DM and DS scenarios, respectively.

5.3.9 Annual mean PM₁₀ concentrations were predicted at the sensitive receptor locations for the DM and DS scenarios. These are summarised in Table 22.

Table 22 Predicted Annual Mean PM₁₀ Concentrations

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	Residential - Barnsley Road	15.80	15.86	0.06
R2	Residential - Barnsley Road	15.56	15.60	0.04
R3	Residential - Barnsley Road	16.50	16.56	0.05

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R4	Residential - Barnsley Road	16.50	16.52	0.02
R5	Residential - Barnsley Road	16.91	16.93	0.02
R6	Residential - Dodworth Road	18.50	18.52	0.02
R7	Residential - Dodworth Road	17.47	17.48	0.02
R8	Residential - Dodworth Road	16.95	16.97	0.01
R9	Residential - Dodworth Road	17.03	17.05	0.01
R10	Residential - Dodworth Road	17.08	17.10	0.01
R11	Residential - Dodworth Road	16.74	16.75	0.01
R12	Residential - Dodworth Road	15.69	15.70	0.01
R13	Residential - Dodworth Road	15.68	15.69	0.01
R14	Residential - Dodworth Road	17.68	17.70	0.02
R15	Residential - Dodworth Road	17.08	17.10	0.02
R16	Residential - Dodworth Road	20.26	20.29	0.03
R17	Residential - Racecommon Road	15.17	15.18	0.02
R18	Residential - Racecommon Road	15.44	15.47	0.02
R19	Residential - Park Road	15.52	15.54	0.02
R20	Residential - Keresforth Hill Road	15.26	15.29	0.02
R21	Greenacre School	14.99	15.02	0.03
R22	Residential - Keresforth Hill Road	15.74	15.79	0.05
R23	Residential - Water Royd Drive	14.68	14.73	0.06
R24	Residential - Water Royd Drive	14.58	14.65	0.07
R25	Residential - Rose Hill Drive	14.48	14.57	0.09
R26	Residential - High Street	15.23	15.32	0.09
R27	Residential - Keresforth Road	14.69	14.71	0.02
R28	Residential - Keresforth Road	14.89	14.92	0.03
R29	Residential - High Street	15.28	15.36	0.08

Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R30	Residential - Broadway	15.42	15.43	0.00

5.3.10 As indicated in Table 22, predicted annual mean PM₁₀ concentrations were below the relevant AQO at all sensitive receptors in both scenarios.

5.3.11 Reference should be made to Figure 7 and 8 for graphical representations of annual mean PM₁₀ concentrations across the assessment area for the DM and DS scenarios, respectively.

Predicted Impacts

5.3.12 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 23.

Table 23 Predicted Impacts - NO₂

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Barnsley Road	76 - 94% of AQO	1	Negligible
R2	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R3	Residential - Barnsley Road	76 - 94% of AQO	1	Negligible
R4	Residential - Barnsley Road	95 - 102% of AQO	0	Negligible
R5	Residential - Barnsley Road	103 - 109% of AQO	0	Negligible
R6	Residential - Dodworth Road	110% or more of AQO	0	Negligible
R7	Residential - Dodworth Road	110% or more of AQO	0	Negligible
R8	Residential - Dodworth Road	103 - 109% of AQO	0	Negligible
R9	Residential - Dodworth Road	103 - 109% of AQO	0	Negligible
R10	Residential - Dodworth Road	103 - 109% of AQO	0	Negligible
R11	Residential - Dodworth Road	95 - 102% of AQO	0	Negligible

Receptor		Predicted Annual Mean NO ₂ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R12	Residential - Dodworth Road	76 - 94% of AQO	0	Negligible
R13	Residential - Dodworth Road	76 - 94% of AQO	0	Negligible
R14	Residential - Dodworth Road	103 - 109% of AQO	0	Negligible
R15	Residential - Dodworth Road	103 - 109% of AQO	0	Negligible
R16	Residential - Dodworth Road	110% or more of AQO	0	Negligible
R17	Residential - Racecommon Road	Below 75% of AQO	0	Negligible
R18	Residential - Racecommon Road	76 - 94% of AQO	0	Negligible
R19	Residential - Park Road	76 - 94% of AQO	0	Negligible
R20	Residential - Keresforth Hill Road	Below 75% of AQO	0	Negligible
R21	Greenacre School	Below 75% of AQO	0	Negligible
R22	Residential - Keresforth Hill Road	76 - 94% of AQO	1	Negligible
R23	Residential - Water Royd Drive	Below 75% of AQO	1	Negligible
R24	Residential - Water Royd Drive	Below 75% of AQO	1	Negligible
R25	Residential - Rose Hill Drive	Below 75% of AQO	1	Negligible
R26	Residential - High Street	Below 75% of AQO	1	Negligible
R27	Residential - Keresforth Road	Below 75% of AQO	0	Negligible
R28	Residential - Keresforth Road	Below 75% of AQO	0	Negligible
R29	Residential - High Street	Below 75% of AQO	1	Negligible
R30	Residential - Broadway	Below 75% of AQO	0	Negligible

5.3.13 As indicated in Table 23, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

5.3.14 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 24.

Table 24 Predicted Impacts - PM₁₀

Receptor		Predicted Annual Mean PM ₁₀ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R1	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R2	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R3	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R4	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R5	Residential - Barnsley Road	Below 75% of AQO	0	Negligible
R6	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R7	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R8	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R9	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R10	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R11	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R12	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R13	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R14	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R15	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R16	Residential - Dodworth Road	Below 75% of AQO	0	Negligible
R17	Residential - Racecommon Road	Below 75% of AQO	0	Negligible
R18	Residential - Racecommon Road	Below 75% of AQO	0	Negligible
R19	Residential - Park Road	Below 75% of AQO	0	Negligible
R20	Residential - Keresforth Hill Road	Below 75% of AQO	0	Negligible
R21	Greenacre School	Below 75% of AQO	0	Negligible
R22	Residential - Keresforth Hill Road	Below 75% of AQO	0	Negligible
R23	Residential - Water Royd Drive	Below 75% of AQO	0	Negligible
R24	Residential - Water Royd Drive	Below 75% of AQO	0	Negligible

Receptor		Predicted Annual Mean PM ₁₀ Concentration	Predicted Concentration Change as Proportion of AQO (%)	Impact Significance
R25	Residential - Rose Hill Drive	Below 75% of AQO	0	Negligible
R26	Residential - High Street	Below 75% of AQO	0	Negligible
R27	Residential - Keresforth Road	Below 75% of AQO	0	Negligible
R28	Residential - Keresforth Road	Below 75% of AQO	0	Negligible
R29	Residential - High Street	Below 75% of AQO	0	Negligible
R30	Residential - Broadway	Below 75% of AQO	0	Negligible

5.3.15 As indicated in Table 24, impacts on annual mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all receptors.

Potential Future Exposure

Dispersion Modelling Results

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

5.3.17 Modelling was undertaken at discrete receptors within the site. Locations were selected to represent areas most likely to experience elevated pollutant concentrations. Eight points were positioned within the eastern part of the development, closest to the M1 slip road. These correspond to the location of the proposed residential properties. A graphical representation of the receptor locations is shown in Figure 9.

5.3.18 A summary of predicted annual mean NO₂ and PM₁₀ concentrations at the Proposed Receptor (PR) locations is shown in Table 25.

Table 25 Annual Mean NO₂ and PM₁₀ Concentrations at Proposed Receptor Locations

Receptor	NGR (m)		Predicted Annual Mean NO ₂ Concentration (µg/m ³)	Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)
	X	Y		
PR1	432257.0	405599.1	35.94	16.13
PR2	432277.7	405562.4	36.22	16.17
PR3	432294.9	405527.5	35.95	16.12
PR4	432315.5	405496.8	36.95	16.26
PR5	432331.0	405462.0	36.33	16.16
PR6	432359.0	405411.7	36.75	16.21
PR7	432372.8	405376.5	35.79	16.07
PR8	432388.1	405349.6	36.10	16.11

5.3.19 As shown Table 25, predicted annual mean NO₂ and PM₁₀ concentrations are below the relevant AQOs at the proposed receptor locations. It should be noted that the modelling results are similar to those provided within the original Air Quality Assessment and the utilisation of the BMBC BAF has not affected the assessment conclusions.

5.3.20 Graphical representations of pollutant levels across the site are shown in Figure 10 and 11. These indicate predicted concentrations of NO₂ and PM₁₀ are below the relevant AQO at all residential unit locations.

Comparison of Dispersion Modelling Results with Site Specific Monitoring

5.3.21 Monitored NO₂ concentrations indicate levels to be above the AQO of 40µg/m³ at the eastern development boundary. The maximum concentration was 43.12µg/m³, recorded at DTML2. The results of the dispersion modelling also indicate an exceedence of the AQO at the eastern extents of the site. However, both the monitored and modelled NO₂ concentrations indicate maximum levels to be approximately 36µg/m³, which is below the relevant AQO, at proposed residential unit locations. This is due to the fall off in NO₂ concentrations with increased distance from the M1 motorway, the main source of road traffic emissions.

5.3.22 It should be noted the assessment assumes vehicle exhaust emission rates and background pollutant levels will not reduce in future years. As such, the predicted concentrations are considered to provide worst case assumptions of future air quality conditions at the development location.

Summary

5.3.23 Taking the modelling and monitoring results into account, it is considered unlikely that future occupants will be exposed to pollutant concentrations above the AQOs. As such, the site is considered suitable for residential use from an air quality perspective.

Mitigation

5.3.24 A number of mitigation measures have been proposed following the methodology provided within the BMBC 'Air Quality and Emissions Good Practice Planning Guidance'¹⁹ document. Review of the relevant criteria identified the development to be a **major** scale proposal under the following conditions:

- Development provides greater than 50 dwellings;
- Development generates greater than 100 two-way vehicle movements per day; and,
- Development is located within an AQMA.

5.3.25 The following mitigation measures have been proposed in response to the assessment:

- Provision of electric vehicle (EV) charging points throughout the development site; and,
- Production of a full Travel Plan to encourage the use of non-transport modes and assist with the reduction of development transport related emissions.

5.3.26 In accordance with the requirements of BMBC guidance²⁰ an emissions assessment has also been undertaken. The results are provided within the following Section.

¹⁹ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

²⁰ Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

Emissions Assessment

5.3.27 Where the emission impact of a development can not be fully mitigated by measures in close proximity to a development, a financial contribution may be requested towards wide compensatory measures. As such, a damage cost calculation has been undertaken to identify the monetary value of predicted emissions from the proposals and detail the mitigation measures to control air quality impacts associated with the scheme.

5.3.28 The calculation uses the Emissions Factor Toolkit (EFT) to calculate the amount of transport related pollutant emissions the development is likely to produce. The output is then multiplied by the Interdepartmental Group on Costs and Benefits damage costs for the key pollutants NO_x and PM₁₀, and finally multiplied by 5 to provide a five-year exposure cost value. This is the value of mitigation that is expected to be spent on measures to reduce the impact of the proposed development. This has been summarised in the following equation:

$$5 \text{ Year Exposure Cost Value} = \text{EFT Output} \times \text{Damage Costs} \times 5$$

5.3.29 The input data values used in the assessment are shown in Table 26.

Table 26 Emissions Assessment - Inputs

Data	Value
Daily vehicle movements produced by development	1,253
Average Speed (km/h)	50
Average Trip Length (km)	10
NO _x Output (kg/year)	1,016.42
PM ₁₀ Output (kg/year)	141.60
NO _x Output (tonnes/year)	1.02
PM ₁₀ Output (tonnes/year)	0.14
NO _x Damage Costs (£/tonne)	25,252
PM ₁₀ Damage Costs (£/tonne)	58,125

5.3.30 The calculation is shown in Table 27.

Table 27 Emissions Assessment - Calculation

Data	Value
Annual Cost of NO _x Emissions (£)	25,667
Annual Cost of PM ₁₀ Emissions (£)	8,230
Total Annual Exposure Cost Value (£)	33,897
Total Five Year Exposure Cost Value (£)	169,484

5.3.31 As shown in Table 27, the calculation determined the development should include mitigation measures to reduce the air quality impacts of road traffic emissions equal to £169,484.

Overall Impact Significance

5.3.32 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 28.

Table 28 Overall Impact Significance

Guidance	Comment
The existing and future air quality in the absence of the development	Predicted annual mean NO₂ concentrations were above the relevant AQO at nine receptors and below at 21 locations in the DM scenario Predicted annual mean PM₁₀ concentrations were below the relevant AQOs at all locations in the DM scenario The predicted concentrations are considered unlikely to change significantly in the absence of the proposals given the relatively established nature of the area
The extent of current and future population exposure to the impacts	The proposed development is not predicted to expose new occupants to exceedences of the relevant AQOs

Guidance	Comment
The influence and validity of any assumptions adopted when undertaking the prediction of impacts	The assessment assumed that vehicle exhaust emission rates and background pollutant levels will not reduce in future years. This provides worst-case results when compared with DEFRA and Highways Agency methodologies Due to the adopted assumptions it is considered the presented results are sufficiently robust for an assessment of this nature

5.3.33 The IAQM guidance²¹ 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.

²¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

6.0 CONCLUSION

- 6.1.1 Redmore Environmental Ltd was commissioned by Persimmon Homes West Yorkshire to undertake an Air Quality Assessment in support of a planning application for a residential development on land off Keresforth Road, Dodworth.
- 6.1.2 The proposals have the potential to cause air quality impacts as a result of fugitive dust emissions during construction and road traffic exhaust emissions associated with vehicles travelling to and from the site during operation, as well as expose future residents to any existing air quality issues. As such, an Air Quality Assessment was required in order to determine baseline conditions and assess potential effects as a result of the scheme.
- 6.1.3 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. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **not significant**.
- 6.1.4 The proposed development has the potential to expose future users to elevated pollution levels and impact existing air quality in the vicinity of the site during operation. Dispersion modelling was therefore undertaken using ADMS-Roads in order to predict pollutant concentrations as a result of emissions from the local highway network. Results were subsequently verified using local monitoring data.
- 6.1.5 Impacts on NO₂ and PM₁₀ concentrations as a result of operational phase road vehicle exhaust emissions were predicted to be **negligible** at all sensitive receptor locations.
- 6.1.6 The results of the dispersion modelling assessment indicated that NO₂ and PM₁₀ concentrations were below the relevant AQOs at all residential positions across the site. Site specific monitoring also demonstrate levels of NO₂ to be below the relevant AQO at sensitive locations. The development is therefore considered suitable for the proposed end-use from an air quality perspective.

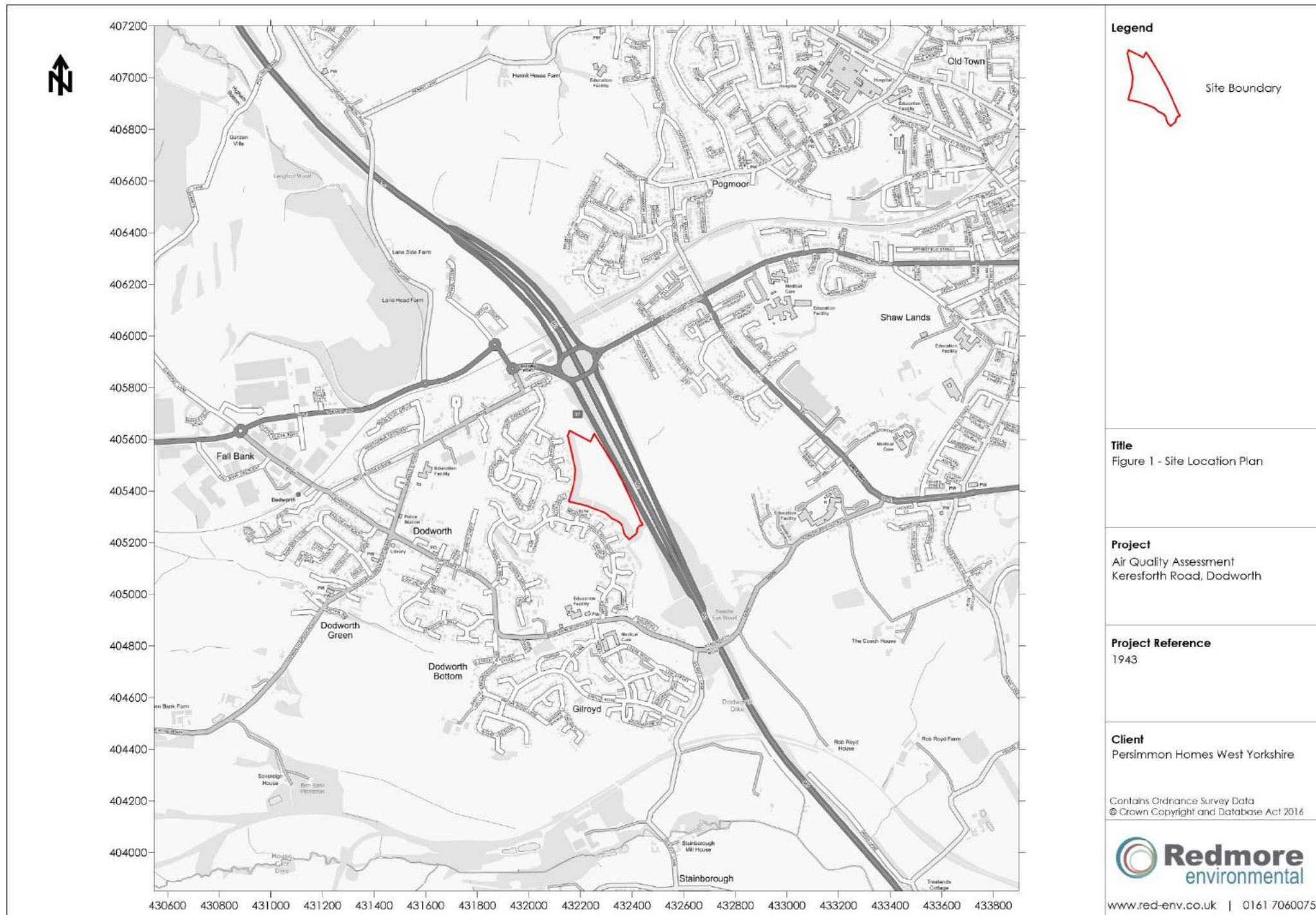
6.1.7 Following consideration of the relevant issues, air quality impacts as a result of the operation of the proposals were considered to be **not significant**, in accordance with the IAQM guidance.

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

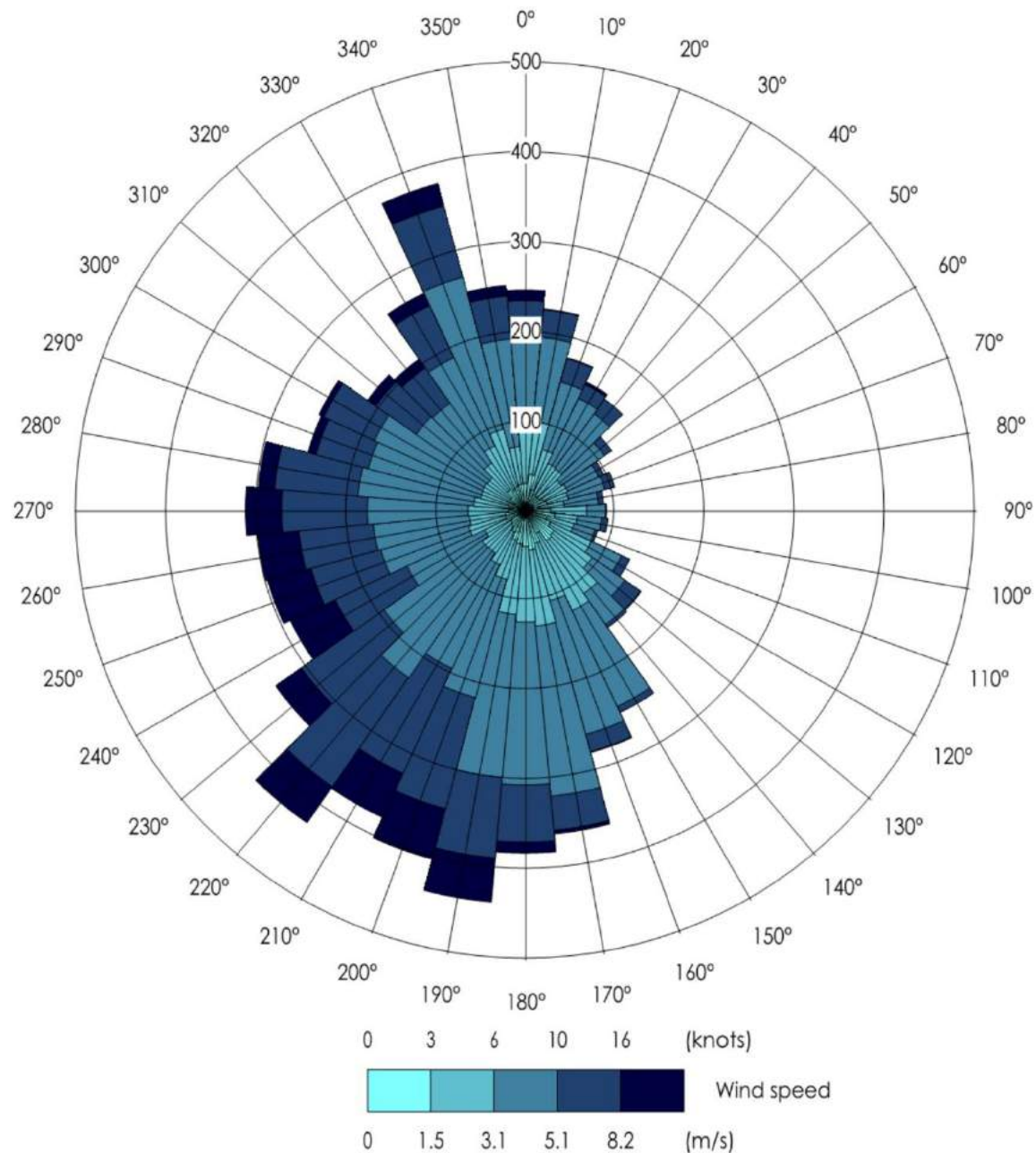
7.0 **ABBREVIATIONS**

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
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
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
EB	Eastbound
EU	European Union
EV	Electric Vehicle
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NB	Northbound
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM ₁₀	Particulate Matter with an aerodynamic diameter of less than 10µm
UDP	Unitary Development Plan
SB	Southbound
SP	Slow Phase
Z ₀	Roughness length

Figures







Legend

Title
Figure 3 - Wind Rose of 2016
Robin Hood Airport
Meteorological Data

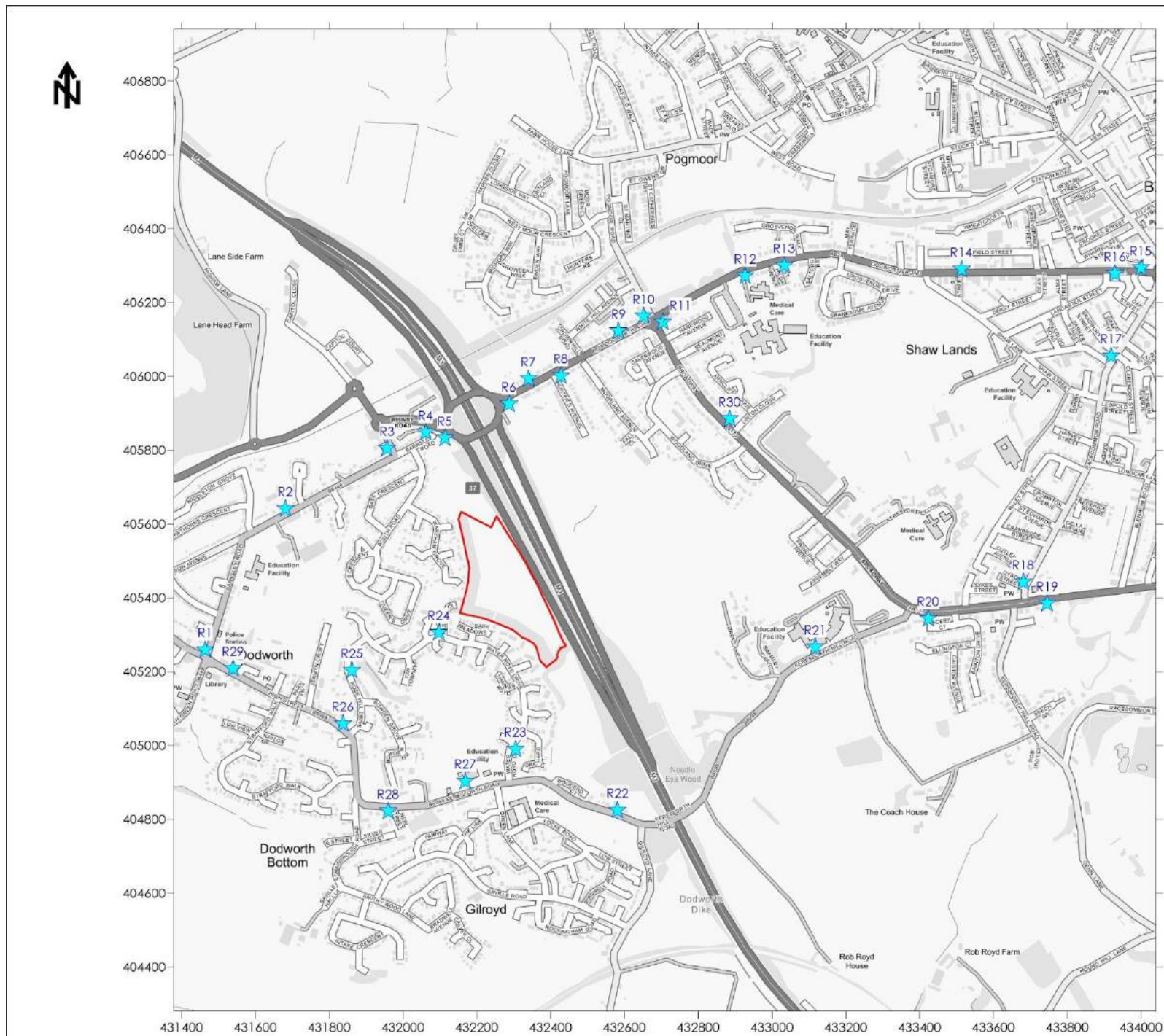
Project
Air Quality Assessment
Keresforth Road, Dodworth

Project Reference
1943

Client
Persimmon Homes West Yorkshire



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Legend

-  Site Boundary
-  Receptor

Title

Figure 4 - Sensitive Receptor Locations

Project

Air Quality Assessment
Keresforth Road, Dodworth

Project Reference

1943

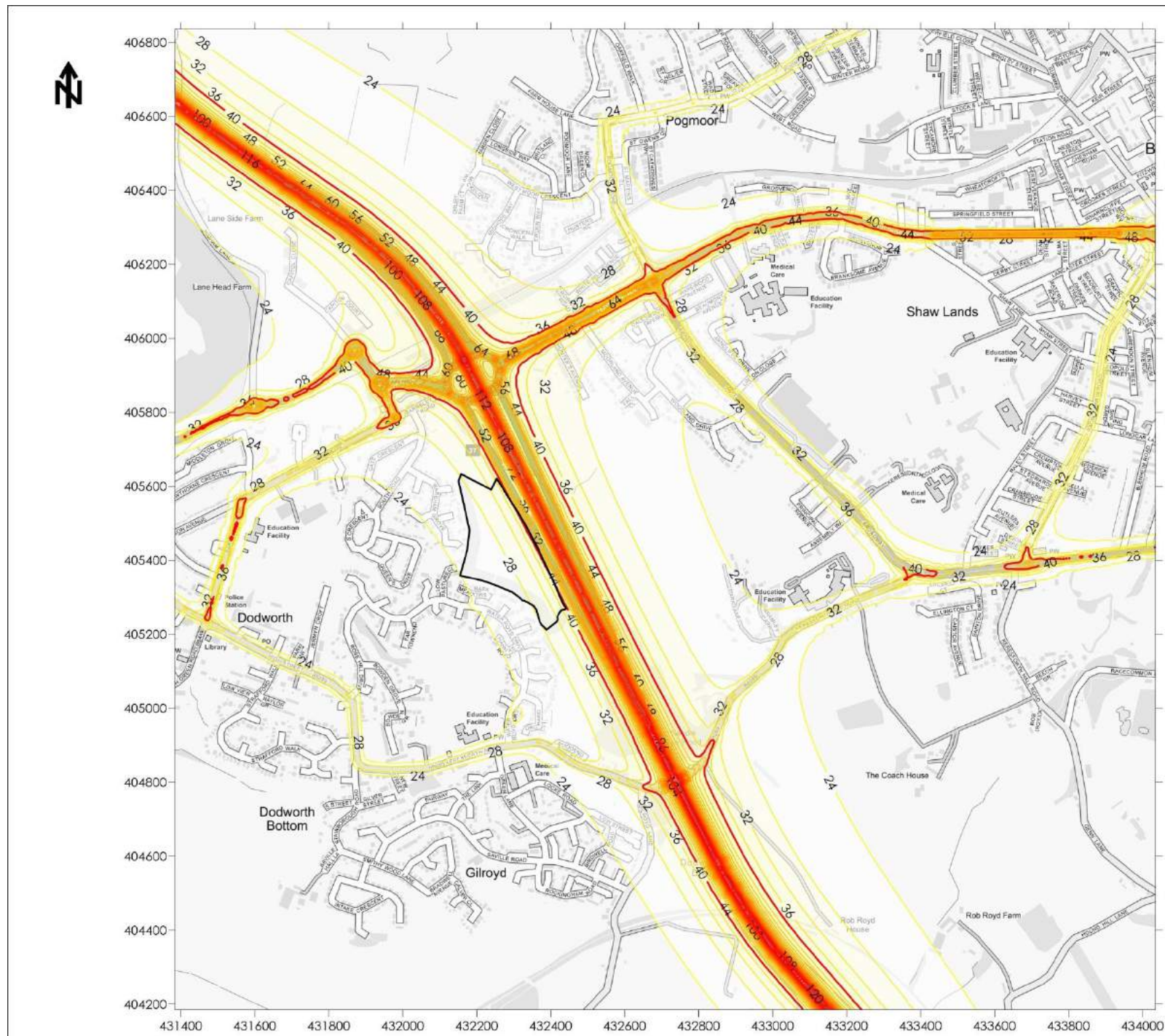
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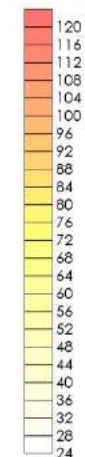
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Legend



Site Boundary



Predicted Annual Mean NO₂ Concentrations (µg/m³)

Title

Figure 5 - Predicted Annual Mean NO₂ Concentrations (µg/m³) Do-Minimum

Project

Air Quality Assessment
Keresforth Road, Dodworth

Project Reference

1943

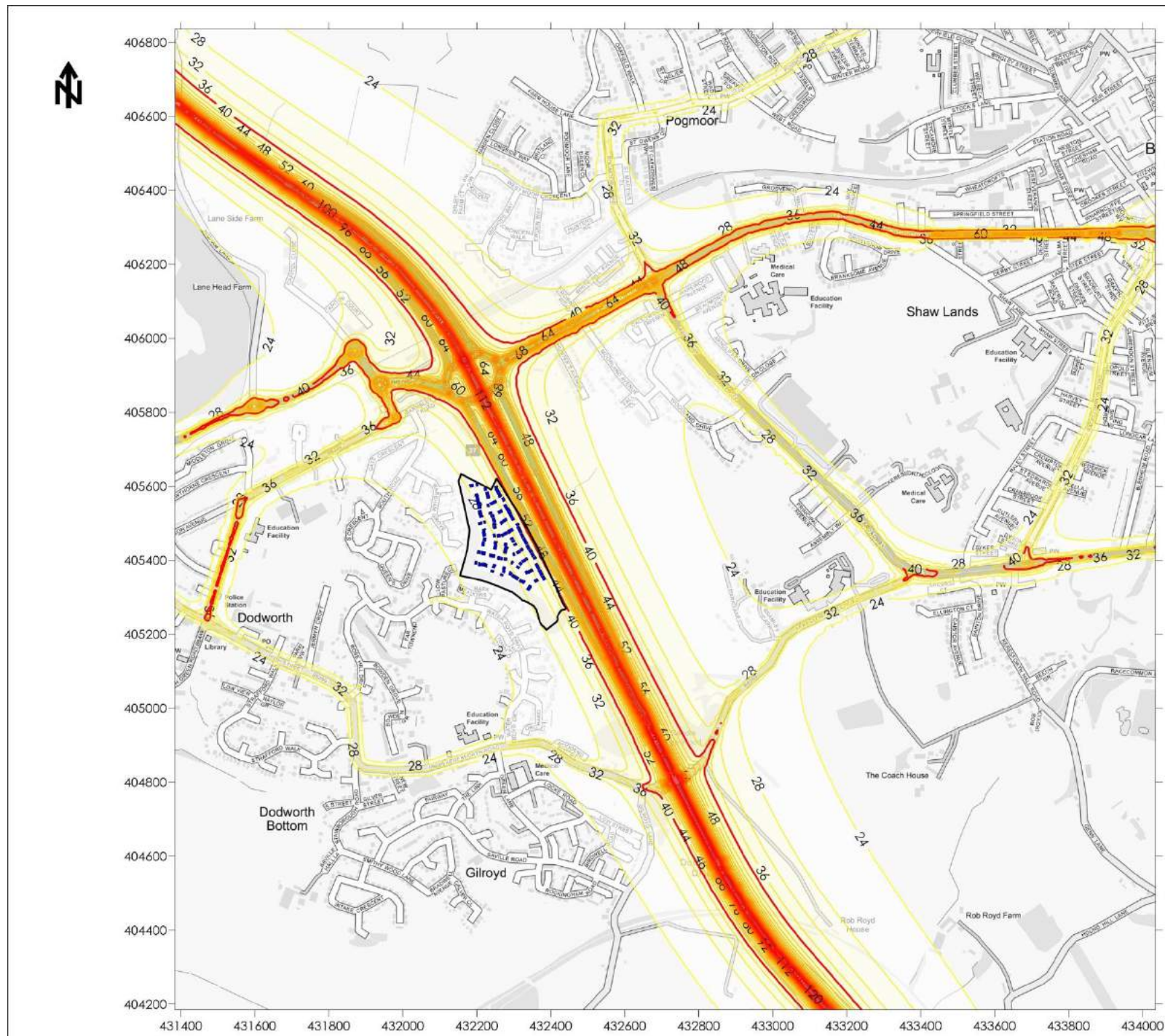
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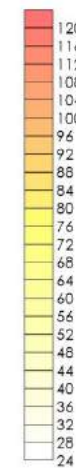
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Legend



Site Boundary



Predicted Annual
Mean NO₂
Concentrations
(µg/m³)



Residential Unit

Title

Figure 6 - Predicted Annual
Mean NO₂ Concentrations
(µg/m³)
Do-Something

Project

Air Quality Assessment
Keresforth Road, Dodworth

Project Reference

1943

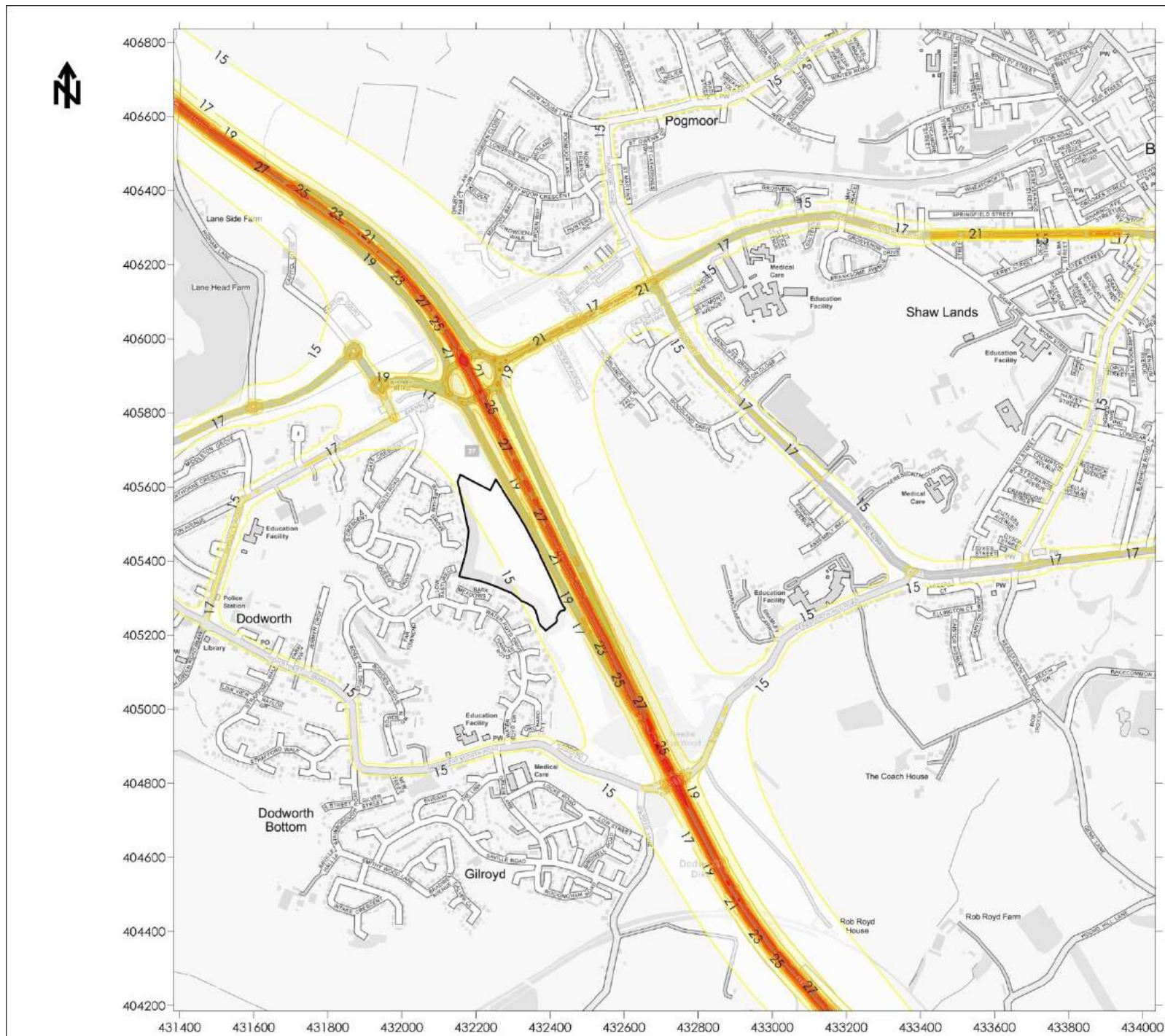
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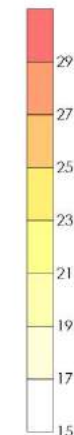
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Legend



Site Boundary



Predicted Annual
Mean PM₁₀
Concentrations
(µg/m³)

Title

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

Project

Air Quality Assessment
Keresforth Road, Dodworth

Project Reference

1943

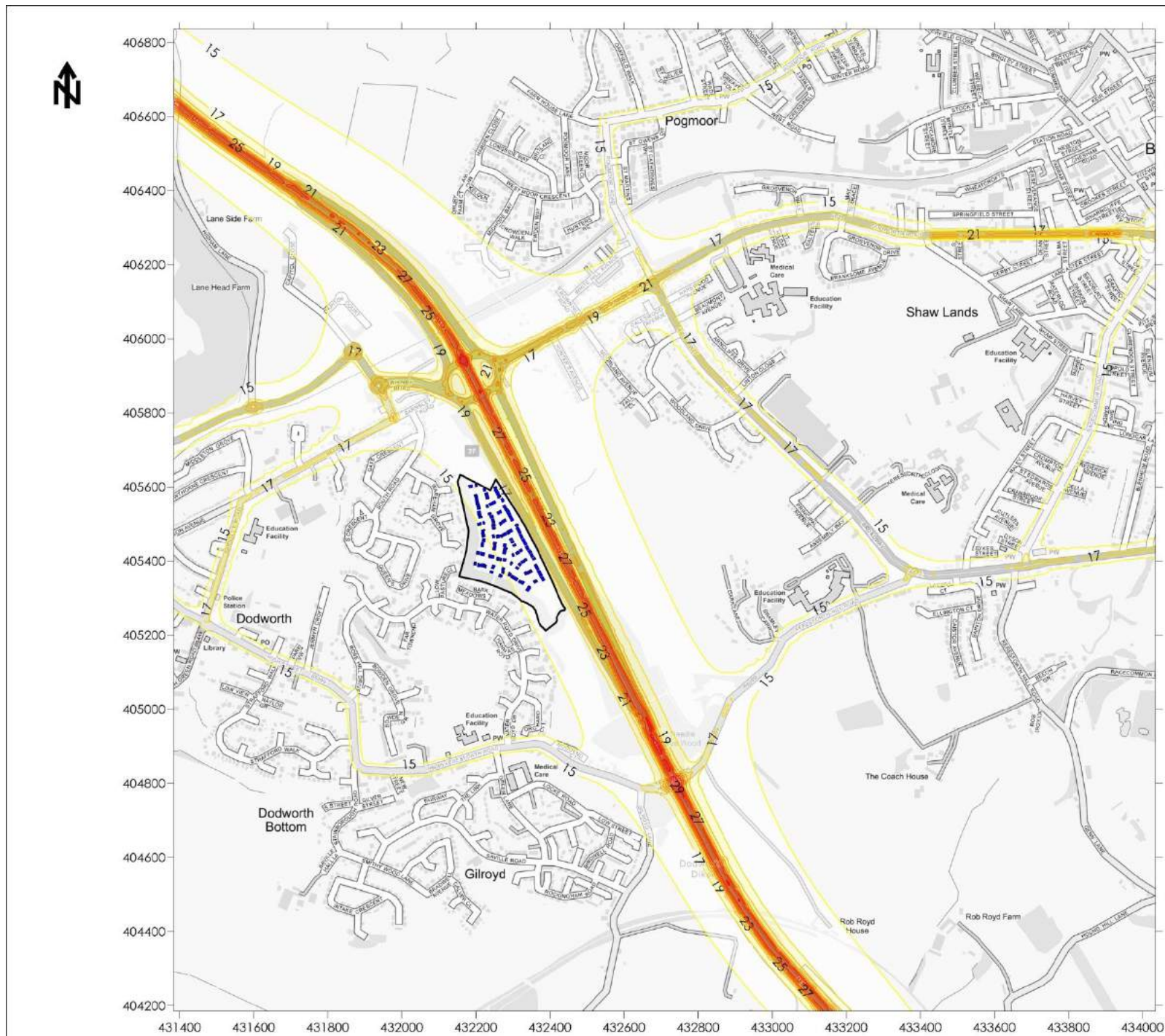
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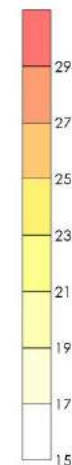
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Site Boundary



Predicted Annual
Mean PM₁₀
Concentrations
(µg/m³)



Residential Unit

Title

Figure 8 - Predicted Annual
Mean PM₁₀ Concentrations
(µg/m³)
Do-Something

Project

Air Quality Assessment
Keresforth Road, Dodworth

Project Reference

1943

Client

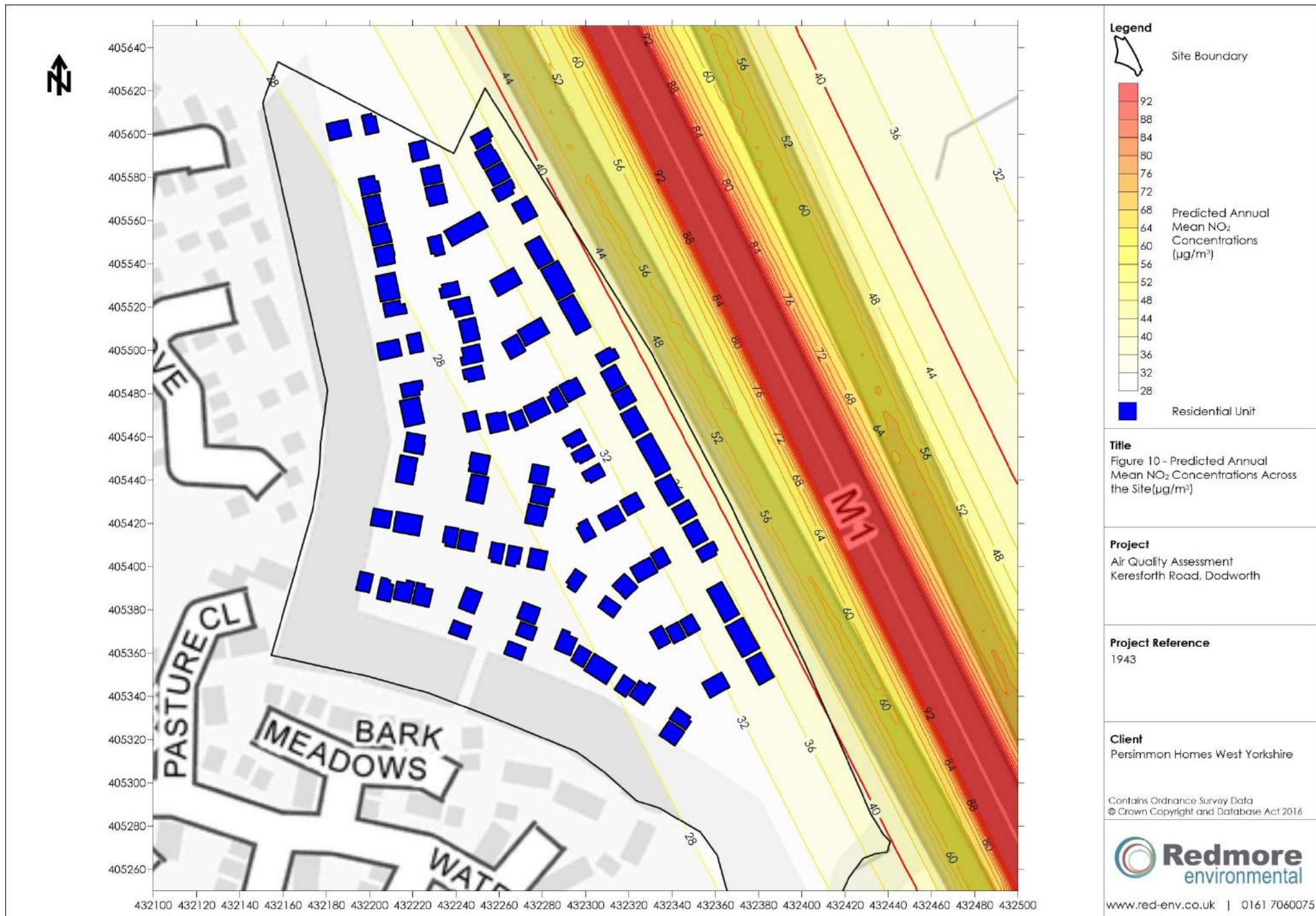
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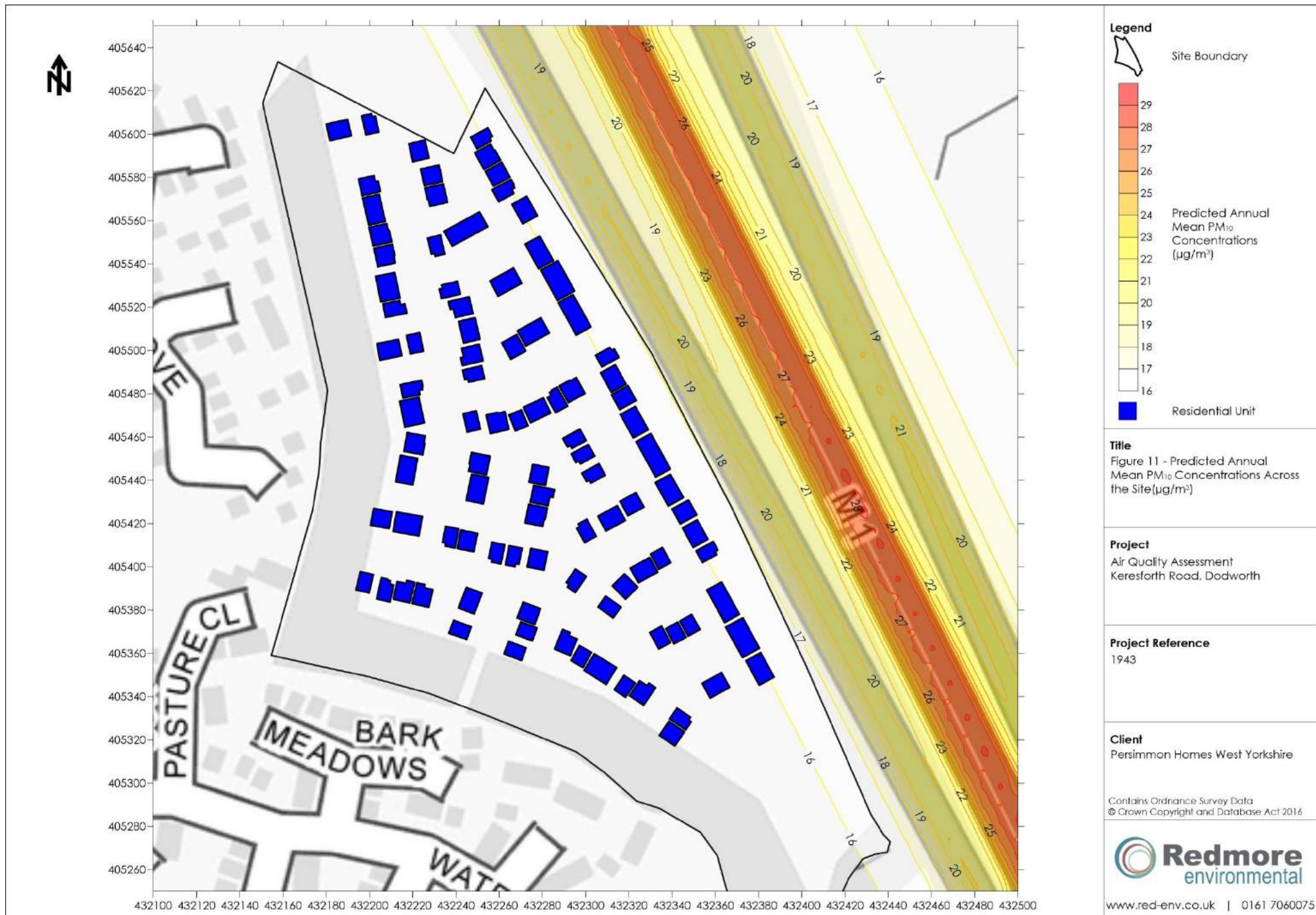
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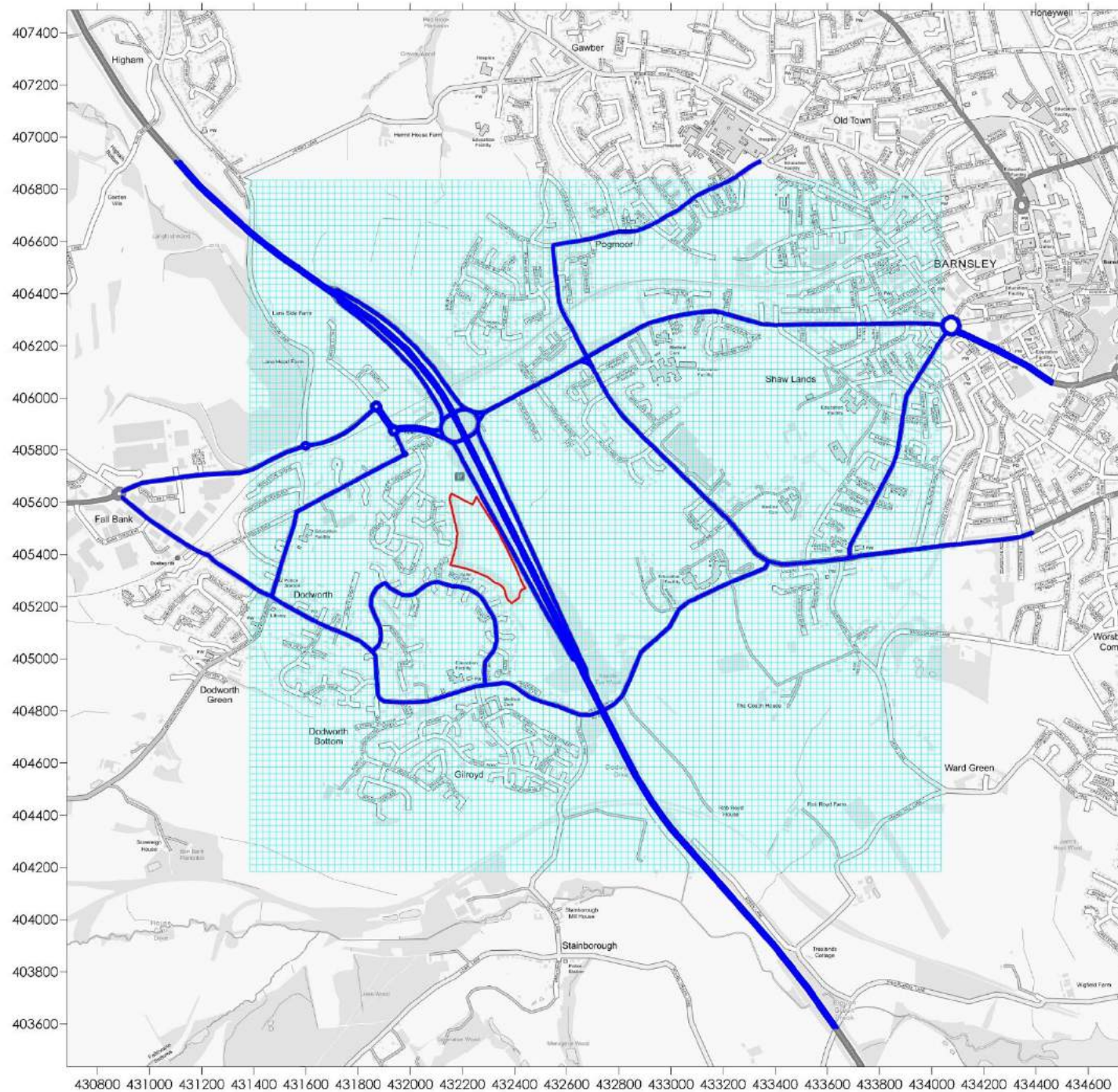


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Legend



Site Boundary



Output Grid



Road Link

Title

Figure 12 - ADMS-Roads Inputs

Project

Air Quality Assessment
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Project Reference

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Appendix 1 - Assessment Input Data

Introduction

The proposed development has the potential to cause air quality impacts as a result of vehicles travelling to and from the site, as well as expose future occupants to elevated pollution levels. In order to assess NO₂ and PM₁₀ 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 4.1.1.0). 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 interface to take account of site specific characteristics that may affect model output, such as canyons.

The following Sections detail the relevant inputs utilised in the assessment.

Assessment Area

The assessment area was defined based on the site location and anticipated vehicle trip distribution from the development. Ambient concentrations were predicted over the area NGR:

431380, 404180 to 434040, 406840. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 12 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment was provided by Fore Consulting, the Transport Consultants for the project.

Traffic data for several links within the model was not provided by the Transport Consultants and 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 some minor roads, in Great Britain for the years 1999 to 2016. 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 following committed developments have been incorporated into the baseline traffic data:

- Residential development for 163 units on Land off Broadway, Barnsley, approximately 600m east of the site;
- Industrial development consisting of B1, B2 and B8 land uses, approximately 450m north-west of the site; and,
- Development consisting of 15 industrial units, approximately 370m north-west of the site.

Traffic generation associated with the proposals was applied to the relevant road links based on the predicted traffic distribution patterns from the site to establish the DS scenario.

A summary of the traffic flows is provided in Table A1.1. Road widths and vehicle speeds were estimated from aerial photography and UK highway design standards.

²² <http://www.dft.gov.uk/traffic-counts/>.

²³ Local Air Quality Management (TG16), DEFRA, 2016.

Table A1.1 Traffic Flows

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)		Road Width (m)	Average Vehicle Speed (km/h)
		Verif.	2023 DM	2023 DS	Verif. DM	DS		
L1	A628 Whinby Road, West of Higham Lane	13,278	15,151	15,225	5.36	5.34	6.9	60
L2	A628 Whinby Road, West of Higham Lane, Slow Phase (SP)	13,278	15,151	15,225	5.36	5.34	9.7	20
L3	A628 Whinby Road, East of Higham Lane, SP	13,278	15,197	15,197	5.36	5.36	9.7	20
L4	A628 Whinby Road, East of Higham Lane	13,278	15,197	15,197	5.36	5.36	7.3	60
L5	A628 Whinby Road, West of Capitol Close, SP	13,278	15,197	15,197	5.36	5.36	9.7	20
L6	A628 Whinby Road, South of Capitol Close Roundabout, Southbound (SB)	6,639	7,819	7,819	5.36	5.36	7.4	45
L7	A628 Whinby Road, South of Capitol Close Roundabout, Northbound (NB)	6,639	7,819	7,819	5.36	5.36	6.8	45
L8	B6449 Barnsley Road, Between Roundabouts	9,300	10,501	10,981	8.90	8.51	7.8	45
L9	B6449 Barnsley Road, West of Roundabout, SP	9,300	10,501	10,981	8.90	8.51	8.8	20
L10	B6449 Barnsley Road	9,300	10,501	10,981	8.90	8.51	9.3	60
L11	A628 Whinby Road, Eastbound (EB)	11,086	12,812	12,978	7.52	7.42	7.6	60
L12	A628 Whinby Road, EB, SP	11,086	12,812	12,978	7.52	7.42	9.9	20
L13	A628 Whinby Road, Westbound (WB)	11,086	12,812	12,978	7.52	7.42	6.9	60
L14	A628 Whinby Road, WB, SP	11,086	12,812	12,978	7.52	7.42	6.9	20
L15	M1 NB Slip Road, North of Roundabout	5,052	5,702	5,808	4.60	4.52	6.3	80
L16	M1 NB, North of Roundabout	41,551	46,897	47,003	11.28	11.25	12.3	110
L17	M1 SB, North of Roundabout	43,784	49,410	49,486	12.96	12.94	11.4	110

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)		Road Width (m)	Average Vehicle Speed (km/h)
		Verif.	2023 DM	2023 DS	Verif. DM	DS		
L18	M1 SB Slip Road, North of Roundabout	6,251	7,030	7,106	6.70	6.63	6.6	80
L19	M1 SB Slip Road, North of Roundabout, SP	6,251	7,030	7,106	6.70	6.63	5.5	35
L20	M1 NB, Between Slip Roads	35,939	40,643	40,643	10.11	10.11	10.4	110
L21	M1 NB, South of Roundabout	45,458	51,360	51,412	9.67	9.66	11.3	110
L22	M1 SB, Between Slip Roads	37,533	42,385	42,385	14.00	14.00	10.2	110
L23	M1 SB, South of Roundabout	45,385	51,283	51,357	12.65	12.63	11.2	110
L24	M1 NB Slip Road, South of Roundabout	9,519	10,722	10,775	8.00	7.96	6.4	80
L25	M1 NB Slip Road, South of Roundabout, SP	9,519	10,722	10,775	8.00	7.96	6.2	35
L26	M1 SB Slip Road, South of Roundabout	8,843	9,978	10,051	8.00	7.94	6.9	80
L27	A628 Dodworth Road, EB	12,851	14,540	14,641	4.23	4.20	6.9	25
L28	A628 Dodworth Road, WB, SP	12,851	14,540	14,612	4.23	4.20	10.1	20
L29	A628 Dodworth Road	25,702	29,081	29,253	4.23	4.20	9.2	20
L30	A628 Dodworth Road, West of Broadway	25,702	29,081	29,253	4.23	4.20	9.3	20
L31	A628 Dodworth Road, West of Broadway, SP	25,702	29,081	29,253	4.23	4.20	9.2	20
L32	Pogmoor Road, SP	7,286	8,696	8,771	0.01	0.01	9.3	20
L33	Pogmoor Road	7,286	8,696	8,771	0.01	0.01	6.8	40
L34	A628 Dodworth Road, East of Broadway, SP	15,753	18,090	18,188	4.29	4.27	9	20
L35	A628 Dodworth Road, East of Broadway	15,753	18,090	18,188	4.29	4.27	9.9	30
L36	A6133 Broadway, SP	10,039	11,442	11,442	3.40	3.40	7.4	20
L37	A6133 Broadway	10,039	11,741	11,741	3.40	3.40	10.1	40
L38	A6133 Broadway Slip Road	2,008	2,528	2,528	3.40	3.40	4.2	20

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)		Road Width (m)	Average Vehicle Speed (km/h)
		Verif.	2023 DM	2023 DS	Verif. DM	DS		
L39	B6099 Station Road, North of Barnsley Road	7,347	8,292	8,451	1.50	1.48	6.6	60
L40	B6099 Station Road	7,347	8,292	8,518	1.50	1.46	6.5	40
L41	B6449 Barnsley Road, North of Station Road	9,300	10,501	10,981	8.90	8.51	7.3	45
L42	B6449 Barnsley Road, North of Station Road, SP	9,300	10,501	10,981	8.90	8.51	8.2	20
L43	B6099 High Street, SP	7,385	8,334	9,060	2.60	2.39	11.8	20
L44	B6099 High Street	7,385	8,334	9,060	2.60	2.39	9.6	45
L45	B6099 Keresforth Road, Between Water Royd and Rose Hill	6,629	7,495	7,802	1.79	1.72	9.3	45
L46	B6099 Keresforth Road, Between Woodend Court and Water Royd Drive	6,410	7,252	7,779	1.78	1.66	7.2	45
L47	B6099 Keresforth Road, Between Gilroyd Lane and Woodend Court	6,410	7,252	7,779	1.78	1.66	10.1	45
L48	B6099 Keresforth Road, East of Gilroyd Lane	7,912	8,919	9,377	2.73	2.60	7.2	65
L49	B6099 Keresforth Road, East of Gilroyd Lane, SP	7,912	8,919	9,377	2.73	2.60	7.2	20
L50	A6133, East of Keresforth Road, SP	11,015	12,524	12,886	7.64	7.42	21.5	20
L51	A6133, East of Keresforth Road	11,015	12,524	12,886	7.64	7.42	18	45
L52	A6133, West of Racecommon Road, SP	11,015	12,524	12,886	7.64	7.42	18	20
L53	A6133 Par, East of Racecommon Road, SP	11,015	12,375	12,549	7.64	7.53	14.9	20
L54	A6133, East of Racecommon Road	11,015	12,375	12,549	7.64	7.53	7.5	45
L55	Racecommon Road, North of Park Road, SP	6,515	7,380	7,569	6.36	6.20	9	20

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)		Road Width (m)	Average Vehicle Speed (km/h)
		Verif.	2023 DM	2023 DS	Verif. DM	DS		
L56	Racecommon Road, North of Park Road	6,515	7,380	7,569	6.36	6.20	8.4	45
L57	Racecommon Road, Approach to A628 Roundabout, SP	6,515	7,380	7,569	6.36	6.20	16.1	20
L58	A6133 Broadway, North of Assembly Road	10,039	11,741	11,741	3.40	3.40	16.8	60
L59	A6133 Broadway, North of Assembly Road SP	10,039	11,741	11,741	3.40	3.40	16.8	20
L60	A6133 Broadway, South of Assembly Road	10,039	11,577	11,577	3.40	3.40	17.2	60
L61	A6133 Broadway, West of Keresforth Road, SP	10,039	11,577	11,577	3.40	3.40	22.2	20
L62	A628 Dodworth Road, East of Grosvenor Drive	15,753	18,090	18,188	4.29	4.27	9.2	30
L63	A628 Dodworth Road, West of Racecommon Road, SP	15,753	18,090	18,188	4.29	4.27	18.9	20
L64	Rosehill Drive, West of Bark Meadows	303	308	1,034	0.00	0.00	6.4	35
L65	Rosehill Drive, East of Bark Meadows	280	311	838	1.67	0.62	6.3	35
L66	A6133 Broadway	10,039	11,741	11,741	3.40	3.40	9.7	60
L67	A628 Westway EB	14,404	16,365	16,508	2.69	2.67	6.8	40
L68	A628 Westway EB, SP	14,404	16,365	16,508	2.69	2.67	7.3	20
L69	A628 Westway WB	14,404	16,365	16,508	2.69	2.67	7.3	40
L70	A628 Westway WB, SP	14,404	16,365	16,508	2.69	2.67	7.7	20
L71	A6133 Broadway, South of Assembly Road, SP	10,039	11,577	11,577	3.40	3.40	16.8	20
L72	A628 Dodworth, East of Shaw Lane, Canyon 1	15,753	18,090	18,188	4.29	4.27	7.2	30
L73	A628 Dodworth, East of Shaw Lane, Canyon 2	15,753	18,090	18,188	4.29	4.27	7.2	30

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)		Road Width (m)	Average Vehicle Speed (km/h)
		Verif.	2023 DM	2023 DS	Verif. DM	DS		
L74	A628 Dodworth, West of Racecommon Road, Canyon 3	15,753	18,090	18,188	4.29	4.27	13.4	20
R1	A628 Whinby Road/Higham Lane Roundabout	13,278	14,968	15,005	5.36	5.35	9.2	30
R2	A628 Whinby Road/Capitol Close Roundabout	13,278	15,469	15,469	5.36	5.36	9.3	30
R3	B6449 Roundabout	9,300	10,412	10,652	8.90	8.70	5.9	30
R4	A628 Whinby Road/B6449 Roundabout Roundabout	14,917	17,091	17,332	7.52	7.41	10.2	30
R5	M1 Roundabout	12,923	14,861	15,101	8.00	7.87	8.7	35
R6	A628 Roundabout	17,025	19,275	19,418	6.36	6.32	9.2	30

Reference should be made to Figure 12 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 4.1.1.0. 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 principle 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 canyon parameters used in the assessment are outlined in Table A1.2. It should be noted that for one link the parameters were included at 0m in order to represent the one-sided nature of this canyon.

Table A1.2 Canyon Parameters

Link	Parameter (m)							
	Canyon Width to Left	Average Height of Buildings to Left	Canyon Length Left	Building Length Left	Canyon Width to Right	Average Height of Buildings to Right	Canyon Length Right	Building Length Right
L72	9.8	9.0	424.1	334.1	8.8	9.8	424.1	309.1
L73	5.4	6.0	84.7	84.7	8.5	7.5	84.7	75.7
L74	9.8	6.5	71.9	71.9	0.0	0.0	0.0	0.0

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 canyon 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 best for detailed local analysis and as such was the mode selected for use in the model.

Emission Factors

The emission factors were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 8.0). This has been produced by DEFRA and incorporates COPERT5 vehicle emission factors and fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2016 emission factors were utilised in preference to the development opening year in order to provide robust model outputs. As predictions for 2016 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

Meteorological Data

Meteorological data used in the assessment was taken from Robin Hood Airport meteorological station over the period 1st January 2016 to 31st December 2016 (inclusive). Robin Hood Airport is located at NGR: 465930, 398920 which is approximately 34.3km east of the development. 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 3 for a wind rose of 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 of z_0 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 0.2m was used to describe the meteorological site. This value of z_0 is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (min)'.

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 the modelling extents. This value is

considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

Background Concentrations

A review of DEFRA data and local monitoring results was undertaken in order to identify an appropriate background value for use in the assessment. This indicated the annual mean NO₂ concentration recorded at the CM3 - Barnsley Gawber automatic station during 2016 was 19.00µg/m³, higher than the DEFRA background of 17.93µg/m³. As such, the monitoring result was used in order to provide worst-case predictions.

A PM₁₀ concentration of 14.10µg/m³ was obtained from the grid square containing the site, as shown in Table 13.

Similarly to emission factors, the background concentrations from 2016 were utilised in preference to the future year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the proposal.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations were converted to NO₂ concentrations using the spreadsheet (version 6.1) provided by DEFRA, which is the method detailed within DEFRA guidance²⁴.

Verification

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

- Estimates of background concentrations;

²⁴ Local Air Quality Management (TG16), DEFRA, 2016.

- Uncertainties in source activity data such as traffic flows and emission factors;
- 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 2016 using traffic data, meteorological data and monitoring results from this year.

NO₂ Concentrations

Monitoring of NO₂ concentrations was undertaken at 16 locations within the modelling extents during 2016. Results from the survey sites were obtained and the road contributions to total NO_x concentrations calculated following the methodology contained within DEFRA guidance²⁵. The monitored annual mean NO₂ concentrations and calculated road NO_x concentrations are summarised in Table A1.3.

Table A1.3 Verification - Monitoring Results

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
CM2	Barnsley A628 Roadside	36.0	35.14
DT14	Dodworth Road	49.2	67.01
DT18	Dodworth Road, West of Crossroads	36.9	37.18
DT19	Crown Hill Road	28.1	18.08
DT20	Dodworth Road, Pogmoor	43.4	52.46
DT21	Dodworth Road, Pogmoor	51.1	71.96
DT22	Dodworth Road, Pogmoor	52.7	76.21
DT23	Dodworth Road, Pogmoor	50.0	69.08

²⁵ Local Air Quality Management (TG16), DEFRA, 2016.

Monitoring Location		Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
DT11	Dodworth Road	43.2	51.97
DT12	Dodworth Road	45.5	57.62
DT13	Traffic Lights Dodworth Rd	45.1	56.63
DT33	Westway	31.8	25.90
DTML1	Diffusion Tube Monitor Location 1	29.7	21.49
DTML2	Diffusion Tube Monitor Location 2	43.1	51.77
DTML3	Diffusion Tube Monitor Location 3	32.1	26.54
DTML4	Diffusion Tube Monitor Location 4	36.2	35.67

The annual mean road NO_x concentrations predicted from the dispersion model and the 2016 road NO_x concentrations calculated from the monitoring results are summarised in Table A1.4.

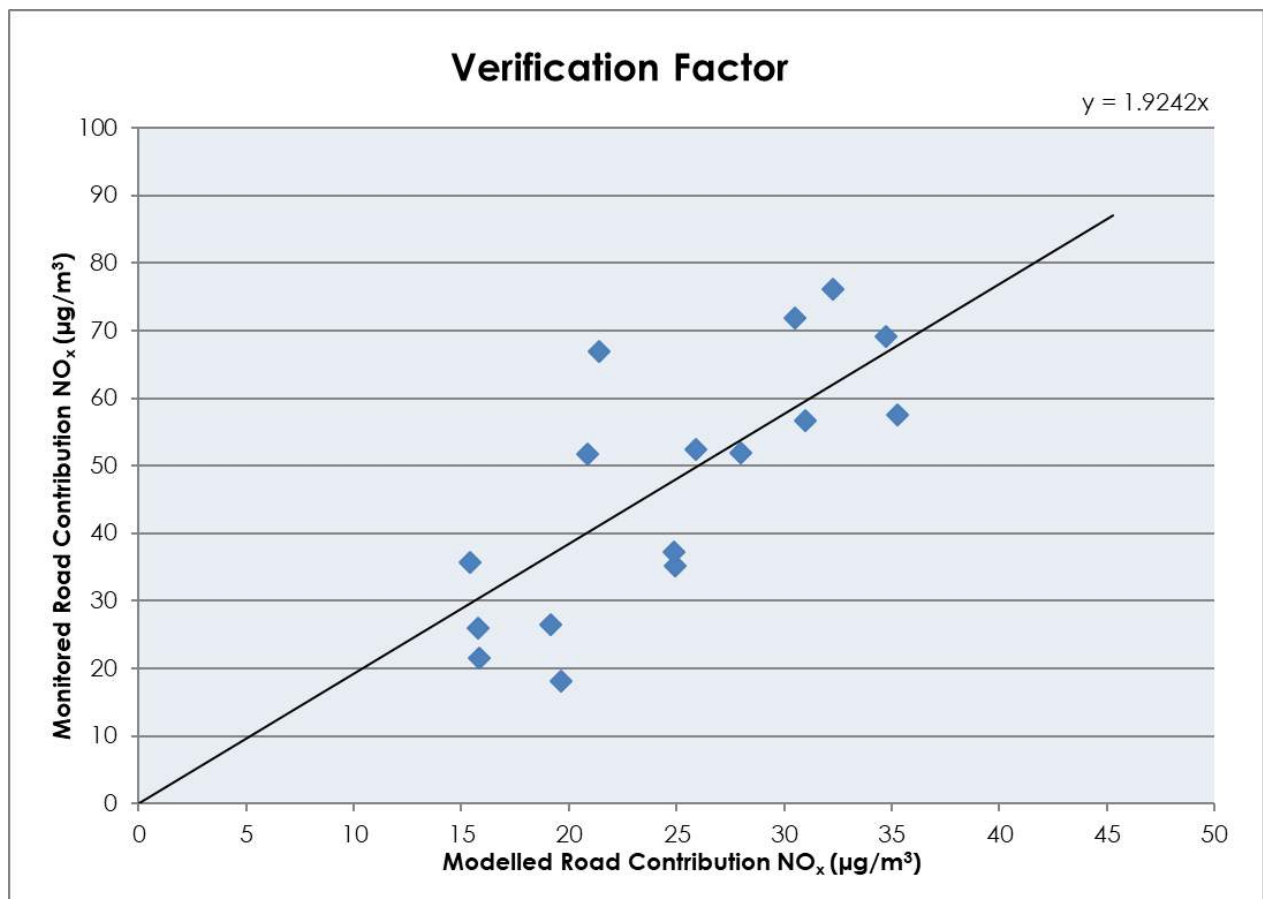
Table A1.4 Verification - Modelling Results

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
CM2	Barnsley A628 Roadside	35.14	24.93
DT14	Dodworth Road	67.01	21.42
DT18	Dodworth Road, West of Crossroads	37.18	24.88
DT19	Crown Hill Road	18.08	19.64
DT20	Dodworth Road, Pogmoor	52.46	25.89
DT21	Dodworth Road, Pogmoor	71.96	30.53
DT22	Dodworth Road, Pogmoor	76.21	32.26
DT23	Dodworth Road, Pogmoor	69.08	34.76
DT11	Dodworth Road	51.97	28.00
DT12	Dodworth Road	57.62	35.28
DT13	Traffic Lights Dodworth Rd	56.63	30.99
DT33	Westway	25.90	15.79
DTML1	Diffusion Tube Monitor Location 1	21.49	15.85

Monitoring Location		Calculated Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)
DTML2	Diffusion Tube Monitor Location 2	51.77	20.89
DTML3	Diffusion Tube Monitor Location 3	26.54	19.15
DTML4	Diffusion Tube Monitor Location 4	35.67	15.38

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 1.9242 was required to be applied to all road NO_x modelling results, as shown in Graph 1.

Graph 1 Verification Factor



Comparison Between Measured and Modelled NO₂ Concentrations

The difference between the measured and modelled NO₂ calculations at each survey location was calculated. This is summarised in A1.5.

Table A1.5 Comparison Between Measured and Modelled NO₂ Concentrations

Survey Location	Measured NO ₂ Concentration (µg/m ³)	Modelled NO ₂ Concentration (µg/m ³)	Difference between Measured and Modelled Values (%)
CM2	36.0	41.54	+15.39
DT14	49.2	38.66	-21.42
DT18	36.9	41.49	+12.44
DT19	28.1	37.17	+32.28
DT20	43.4	42.31	-2.51
DT21	51.1	45.95	-10.08
DT22	52.7	47.27	-10.30
DT23	50.0	49.15	-1.70
DT11	43.2	43.98	+1.81
DT12	45.5	49.54	+8.88
DT13	45.1	46.30	+2.66
DT33	31.8	33.86	+6.48
DTML1	29.7	33.92	+14.08
DTML2	43.1	38.22	-11.36
DTML3	32.1	36.76	+14.52
DTML4	36.2	33.50	-7.54

As shown in Table A1.5, further to model adjustment, 15 of the 16 survey locations are within 25% of the measured value.

The Root Mean Squared Error has been calculated to define the average error or uncertainty of the model. In accordance with DEFRA guidance²⁶, if the RMSE value is higher than +/- 25% of the AQO being assessed, it is recommended that the model inputs and verification is revisited in order to make improvements. The annual mean AQO of relevance to the assessment is 40µg/m³. As such, an RMSE value of +/-10µg/m³ is required in order to have confidence in the predicted values. The RMSE calculated for the study is 4.98µg/m³, the model is therefore considered to be performing to an acceptable standard.

PM₁₀ Concentrations

Monitoring of PM₁₀ concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust PM₁₀ model predictions in lieu of more accurate data in accordance with DEFRA guidance²⁷.

Adjustment of Site Specific Monitoring Data

Monitoring of NO₂ concentrations has been undertaken at the site by Wardell Armstrong using passive diffusion tube samplers. The results of the survey were provided by the applicant. Measurements were recorded at five locations within the vicinity of the M1 slip road. In addition, a triplicate co-location study was undertaken at the CM2 - Barnsley A628 Roadside automatic station to allow a local BAF to be derived. Monitoring was undertaken for four months between 27th May 2016 and 30th August 2016 and 3rd October 2016 and 31st October 2016.

Annualisation of Measurement Data

Annualisation of the monitoring results was undertaken in order to estimate annual mean NO₂ concentrations and facilitate direct comparison of the measurement data with the relevant AQO. This process was undertaken in accordance with DEFRA guidance²⁸.

Annual mean NO₂ concentrations for use in the annualisation process were obtained from two background monitoring sites. A summary of the survey positions selected for use in the assessment is provided in Table A1.6.

²⁶ Local Air Quality Management (TG16), DEFRA, 2016.

²⁷ Local Air Quality Management (TG16), DEFRA, 2016.

²⁸ Local Air Quality Management (TG16), DEFRA, 2016.

Table A1.6 Monitoring Sites Used for Annualisation

Site Name	NGR (m)		Station Type
	x	y	
Barnsley Gawber	432524	407478	Urban Background
Sheffield Tinsley	440238	390588	Urban Background

The period mean for each monitoring site was calculated for the corresponding monitoring intervals at the sampling locations. The ratio of the 2016 annual mean to the period mean was then calculated and an average derived as the adjustment factor. A summary of the data used to calculate the adjustment factor is provided in Table A1.7.

Table A1.7 Annualisation Data

Site Name	NO ₂ Concentration (µg/m ³)		Ratio (Am/Pm)
	Annual Mean (Am)	Period Mean (Pm)	
Barnsley Gawber	18.98	13.29	1.43
Sheffield Tinsley	26.36	18.86	1.40
Average Ratio			1.41

Local Bias Adjustment Factor

The Local Bias Adjustment Factor Tool²⁹ was used to calculate a local BAF. This was undertaken using the results of the co-location study. This indicated a BAF of 0.71 should be applied to the annualised results. However, following submission of the original Air Quality Assessment, the Environmental Health Officer at BMBC expressed concern that the project specific BAF was dissimilar to the BMBC BAF of 0.87. To alleviate this concern, the BMBC BAF of 0.87 was used to correct the monitored values. This is considered to provide worst-case predictions in NO₂ concentrations at the development location and therefore results in a robust assessment.

It should be noted that Redmore Environmental do not agree with the use of the BMBC BAF in this circumstance and consider that the site specific BAF should have been utilised. However, given

²⁹ http://laqm.defragov.uk/documents/AEA_DifTPAB_v04.xls.

the use of the higher value has not affected the assessment conclusions, this provides additional assurances that the AQO is unlikely to be exceeded at the proposed residential unit locations.

Adjusted Monitoring Data

A summary of the adjusted results is shown in Table A1.8.

Table A1.8 Adjusted Monitoring Data

Location	Period Mean NO ₂ Concentration	Annualised NO ₂ Concentration	Bias Adjusted NO ₂ Concentration (µg/m ³)
DTML1	24.19	34.18	29.73
DTML2	35.08	49.56	43.12
DTML3	26.11	36.90	32.10
DTML4	29.48	41.65	36.23
DTML5	21.27 ^(a)	-	-

Note: DTML5 removed from adjustment procedure as only three months of data available.

Date: 6th April 2018

Ref: 1943

Appendix 2 - Curricula Vitae

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist and Director of Redmore Environmental with specialist experience in the air quality and odour sectors. His key capabilities include:

- Production and management of Air Quality, Dust and Odour Assessments for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Production and co-ordination of Environmental Permit applications for a variety of industrial sectors.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads, ADMS-5, AERMOD-PRIME and BREEZE-ROADS. 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.
- Provision of expert witness services at Planning Inquiries.
- Design and project management of pollutant monitoring campaigns.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.

Provision of expert advice to local government and international environmental bodies, as well as involvement in production of industry guidance.

SELECT PROJECTS SUMMARY:

Industrial

Shanks Waste Management - Odour Assessments of two waste management facilities to support Environmental Permit Applications.

Tatweer Petroleum - dispersion modelling of Bahrain oil field.

Doha South Sewage Treatment Works - AQA for works extension in Qatar.

IRIS Environmental Appraisal Report Reviews, Isle of Man Government - odour assessment reviews.

Lankem, Greater Manchester - Environmental Permit Application for chemical manufacturing plant.

Newport Docks Bulk Drying, Pelleting and CHP Facility - air quality EIA for gas CHP.

Springshades, Leicester - Environmental Permit Variation Application for textile manufacturing plant.

Valspar, Chester - Odour Assessment and production of Odour Management Plan for a paint manufacturing plant in response to neighbour complaints.

Agrivert - dispersion modelling of odour and CHP emissions from numerous AD plants.

James Cropper Paper Mill, Cumbria - air quality EIA, Environmental Permit Variation and Human Health Risk Assessment for new biomass boiler adjacent to SSSI.

Rigg Approach, Leyton - Air Quality Assessment in support of waste transfer site.

Lynchford Lane Waste Transfer Station - biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - biomass facility adjacent to AQMA.

Residential

Wood St Mill, Bury - residential development adjacent to scrap metal yard.

Hyams Lane, Holbrook - Odour Assessment to support residential development adjacent to sewage works.

North Wharf Gardens, London - peer review of EIA undertaken for large residential development.

Loxford Road, Alford - Air Quality EIA for residential development, included consideration of impacts from associated package sewage works

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre.

Castleford Growth Delivery Plan - baseline air quality constraints assessment for town redevelopment.

York St, Bury - residential development adjacent to AQMA.

Temple Point Leeds - residential development adjacent to M1.

Commercial and Retail

Etihad Stadium - Air Quality EIA for the extension to the capacity of the Etihad Stadium, Manchester.

Wakefield College - redevelopment of city centre campus in AQMA.

Manchester Airport Cargo Shed - commercial development.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

National Youth Theatre, Islington - redevelopment to provide new arts space and accommodation.

KEY EXPERIENCE:

Pearl is an Environmental Consultant 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 exhaust emissions using ADMS-Roads. Studies have included assessment of road traffic exhaust emissions on sensitive receptors and exposure of new residents to poor air quality.
- Assessment of construction dust impacts from a range of development sizes.
- 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.
- Definition of baseline air quality and identification of sensitive areas across the UK.
- Odour surveys to assess amenity and suitability of sites for potential future development for residential use.
- Odour monitoring at industrial sites to quantify odour emission rates.

SELECT PROJECTS SUMMARY:

Maid Marian House, Nottingham

Air Quality Assessment for a change of use from office units to residential use. Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions from the A6008 Maid Marian Way. Dispersion modelling took place at several different heights reflective of residential units within the development. Predicted concentrations of NO₂ were found to exceed air quality criteria at numerous levels of the proposed building. Mechanical ventilation was specified in the appropriate units within the development as a form of mitigation.

Victoria Quarter, London

Air Quality Assessment in support of residential development in an AQMA. Dispersion modelling was undertaken to consider the potential impact of development generated vehicles and CHP/Boiler emissions on air quality at sensitive receptor locations within the vicinity of the site. Different heights within the development, reflective of the proposed residential units, were also considered. The assessment identified a range of impacts, as such, a range of mitigation was specified. Mechanical ventilation was also specified in the appropriate units predicted to be exposed to poor levels of air quality.

Monks Farm, Townsend Grove

Air Quality EIA in support of residential development comprising 456 dwellings and primary school. NO₂ and PM₁₀ concentrations were predicted to be below the air quality objectives at the sensitive receptors considered. Air quality effects as a result of the proposals was determined to be not significant.

Stanton Harcourt, West Oxford

Odour Assessment for the redevelopment of the former Stanton Harcourt Airfield to residential properties. Due to the location of the site, being adjacent to a recently capped landfill, odour surveys were required to assess the level of odour across the site. A risk assessment was also undertaken in accordance with appropriate odour guidance. Taking into account the results of the odour surveys, recent odour complaint history and odour risk assessment the potential for odour effects across the site was determined to be not significant.

Hunter Street, Chester

Air Quality Assessment in support of a development for student accommodation. Concerns were raised regarding the exposure of future occupants to poor air quality due to road traffic emissions from the A5268. Dispersion modelling took place at several different heights of the proposed building. Predicted concentrations of NO₂ were found to exceed air quality criteria at ground to first floor level for those apartments facing the A5268. Mechanical ventilation was specified in these units as a form of mitigation.

Botley Road, West End, Southampton

Co-ordination and management of a six month diffusion study in support of a proposed residential development. Concerns were raised regarding the exposure of future residents to poor air quality due to road traffic emissions from the M27. The results of the monitoring study identified NO₂ concentrations across the site to be below the air quality objective and therefore deemed suitable for residential use.