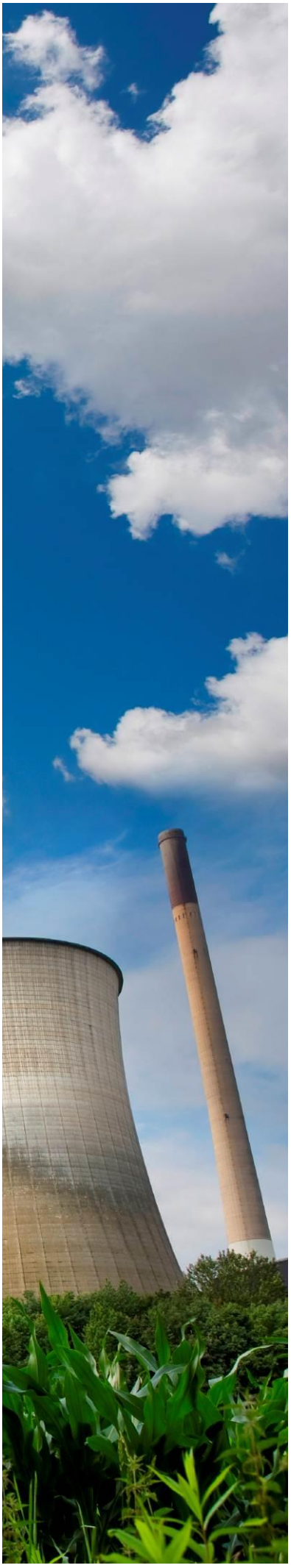
REC
Resource & Environmental Consultants Ltd

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

REC Report: 33410r2
Issued: 31st July 2013

Prepared for: Persimmon Homes West Yorkshire



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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Persimmon Homes West Yorkshire to undertake an Air Quality Assessment in support of the planning application for a proposed residential development at Barnsley Road, Wombwell.

The proposals comprise the development of up to 240 dwellings and associated infrastructure.

The development has the potential to cause air quality impacts during the construction and operational phases. An Air Quality Assessment was therefore required to provide consideration of potential changes in pollution levels as a result of emissions associated with the scheme at sensitive receptors in the vicinity of the site.

During the construction phase of the development there is potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the standard industry methodology. Assuming good practice dust control measures are implemented, potential air quality impacts from dust generated by earthworks, construction and trackout activities were not considered to be significant.

Dispersion modelling was undertaken in order to predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from Barnsley Metropolitan Borough Council.

The results of the dispersion modelling assessment indicated impacts on air quality as a result of operational phase road vehicle exhaust emissions were not predicted to be significant. The use of robust assumptions where necessary was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results, air quality is not considered a constraint to planning consent.

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1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Persimmon Homes West Yorkshire to undertake an Air Quality Assessment in support of the planning application for a proposed residential development on land at Barnsley Road, Wombwell.

The development has the potential to cause air quality impacts at sensitive locations. An Air Quality Assessment was therefore required in order to determine baseline conditions and consider potential impacts as a result of the construction and operational phases of the development.

1.2 Site Location and Context

The site is located off Barnsley Road, Wombwell, at National Grid Reference (NGR): 439450, 403633. The proposals comprise the development of up to 240 dwellings and associated infrastructure to the north of Barnsley Road. Reference should be made to Figure 1 for a location plan.

The development has the potential to cause air quality impacts at sensitive locations during the construction and operational phases. These may include fugitive dust emissions associated with construction works and road traffic exhaust emissions from vehicles travelling to and from the development during the operational phase. As such, an Air Quality Assessment was required to consider potential impacts and assess pollution levels at sensitive locations in the vicinity of the site both with and without the development in place.

1.3 Limitations

This report has been produced in accordance with REC's standard terms of engagement. REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2.0 AIR QUALITY LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is consolidated under 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 objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- 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.

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

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the 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. Table 1 presents the AQLVs for pollutants considered within this assessment.

Table 1 Air Quality Limit Values

Pollutant	Air Quality Limit Value	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year

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 2007[1]. The AQS sets out Air Quality Objectives (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.

2.3 Local Air Quality Management

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 considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an 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

The main requirements with respect to dust control from industrial or trade premises not regulated under the Environmental Permitting (England and Wales) Regulations (2010) and subsequent amendments, such as construction sites, is that provided in Section 79 of Part III of the Environmental Protection Act (1990). The Act defines nuisance as:

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

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

The National Planning Policy Framework (NPPF)[2] 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 this assessment:

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

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.
[2] National Planning Policy Framework, Department for Communities and Local Government, 2012.

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."

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

2.6 Local Planning Policy

The proposed development is located within the jurisdiction of Barnsley Metropolitan Borough Council (BMBC). The Barnsley Local Development Framework Core Strategy provides a spatial strategy for the future development of Barnsley up to 2026. It sets out the key elements of planning and the approach to the long term physical development of the borough. The strategy was adopted in 2011 and is the principal, overarching document within the Local Development Framework.

A review of the Barnsley Local Development Framework Core Strategy[3] indicated the following policy in relation to air quality that is relevant to this assessment:

"CSP 40 Pollution Control and Protection:

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

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

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

Reference has been made to this policy during the undertaking of this Air Quality Assessment.

[3] Barnsley Local Development Framework Core Strategy, Barnsley Metropolitan Borough Council, February 2010

3.0 METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases. These have been assessed in accordance with the following methodology which was agreed with Chris Shields, Enforcement Officer at BMBC on 16th July 2013.

3.1 Construction Phase Assessment

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 the Impacts of Construction on Air Quality and the Determination of their Significance'[4].

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

- Earthworks;
- Construction; and,
- Trackout.

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

- Annoyance due to dust soiling;
- Harm to ecological receptors; and,
- The risk of health effects due to a significant increase in exposure to PM_{10}.

The assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should sensitive receptors be identified within 350m from the site boundary or 100m from the construction vehicle route up to 500m from the site entrance then the assessment should proceed to Step 2. Should sensitive receptors not be present within the relevant distances then **negligible** impacts would be expected and further assessment is not necessary.

3.1.2 Step 2

Step 2 assessed the risk of potential dust impacts. The site was 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; and,
- The proximity of receptors, considered separately for ecological and human receptors.

[4] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, Institute of Air Quality Management, 2011.

The magnitude of potential unmitigated dust emissions was determined based on the criteria shown in Table 2.

Table 2 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	• Total site area greater than 10,000m^2 • 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 100,000m^3 • Piling • On site concrete batching • Sandblasting
	Trackout	• More than 100 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 2,500m^2 to 10,000m^2 • 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 25,000m^3 to 100,000m^3 • Potentially dusty construction material (e.g. concrete) • Piling • On site concrete batching
	Trackout	• 25 to 100 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 2,500m^2 • 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 10,000 tonnes • Earthworks during wetter months

Magnitude	Activity	Criteria
	Construction	• Total building volume less than 25,000m^3 • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	• Less than 25 HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

The risk category was then defined based upon the interaction between magnitude and receptor proximity. This is outlined in Table 3 for earthworks and construction activities.

Table 3 Dust Risk Category from Earthworks and Construction

Distance to Nearest Receptor (m)		Dust Emission Magnitude		
Dust Soiling and PM_{10}	**Ecological**	**Small**	**Medium**	**Large**
Less than 20	-	Medium	High	High
20 - 50	-	Low	Medium	High
50 - 100	Less than 20	Low	Medium	Medium
100 - 200	20 - 40	Negligible	Low	Medium
200 - 350	40 - 100	Negligible	Low	Low

Table 4 outlines the risk category from trackout.

Table 4 Dust Risk Category from Trackout

Distance to Nearest Receptor (m)		Dust Emission Magnitude		
Dust Soiling and PM_{10}	**Ecological**	**Small**	**Medium**	**Large**
Less than 20	-	Medium	Medium	High
20 - 50	Less than 20	Low	Medium	Medium
50 - 100	20 - 100	Negligible	Low	Low

3.1.3 Step 3

Step 3 required the identification of site specific mitigation measures to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. This was undertaken in accordance with the Greater London Authority 'Best Practice Guidance: The Control of Dust and Emissions from Construction and Demolition'[5]. Although it is accepted that the

[5] Best Practice Guidance: Control of Dust and Emissions from Construction and Demolition, Greater London Authority, 2006.

development is not located within London, the document is considered to provide suitable mitigation for construction sites throughout the UK and is recognised as an example of industry best practice.

For sites with **negligible** risk, mitigation measures beyond those required by legislation are not required.

3.1.4 Step 4

The significance of potential dust impacts was defined within Step 4. The sensitivity of the receiving environment was first defined based on the criteria shown in Table 5

Table 5 Construction Dust - Receptor Sensitivity

Sensitivity	Examples	
	Human Receptors	**Ecological Receptors**
Very high	• Very densely populated area • More than 100 dwellings within 20m • Local PM_{10} concentrations exceed the AQLV • Contaminated buildings present • Very sensitive receptors (e.g. oncology units) • Works continuing in one area of the site for more than one year	• European designated site
High	• Densely populated area • 10 to 100 dwellings within 20m of site • Local PM_{10} concentrations close to the AQLV (e.g. annual mean 36 - 40µg/m^3) • Commercially sensitive horticultural land within 20m	• Nationally designated site
Medium	• Suburban or edge of town area • Less than 10 receptors within 20m • Local PM_{10} concentrations below the AQLV (e.g. annual mean 30 - 36µg/m^3)	• Locally designated site
Low	• Rural or industrial area • No receptors within 20m • Local PM_{10} concentrations well below the AQLV (e.g. annual mean less than 30µg/m^3) • Wooded area between site and receptors	• No designations

The impact significance was defined based on the interaction between the sensitivity of the receiving environment and risk category, as shown in Table 6.

Table 6 Construction Dust - Significance of Impact

Sensitivity	Risk Category		
	Small	Medium	Large
Very high	Negligible	Slight adverse	Slight adverse
High	Negligible	Negligible	Slight adverse
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

It should be noted that the impact significance shown in Table 6 assumes that the mitigation measures identified within Step 3 are implemented at the site.

The final step was to determine the overall significance of the effects arising from the construction phase of the proposed development. This was based on professional judgement but took account of the significance of the effects for each of the potential dust generating activities.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM[6] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

3.2 Operational Phase Assessment

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations through dispersion modelling for the following scenarios:

- 2012 - Verification;
- 2018 - Do-minimum (DM); and,
- 2018 - Do-something (DS) scenario.

The "DM" (i.e. without development) scenario is representative of predicted traffic flows should the development not proceed. The "DS" scenario is representative of baseline traffic data in addition to predicted operational traffic associated with the proposals.

Reference should be made to Appendix II for assessment input data.

Receptors potentially sensitive to operational traffic exhaust emissions were identified within 200m of the affected highway network in accordance with the guidance provided within the Design Manual for Roads and Bridges (DMRB)[7] on the likely limits of pollutant dispersion from road sources. LAQM.TG(09)[8] provides the following examples of where annual mean

[6] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, Institute of Air Quality Management, 2011.
[7] Design Manual for Roads and Bridges Volume 11, Section 3, Part 1, HA207/07, Highways Agency, 2007.
[8] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

AQLVs should apply:

- Residential properties;
- Schools;
- Hospitals; and,
- Care homes.

These were considered during the selection of receptor locations.

The sensitivity of each receptor was defined based on air quality conditions should the development proceed and the criteria contained within Table 7. These are based upon the guidance provided within the Environmental Protection UK (EPUK) Development Control: Planning for Air Quality (2010 update)[9].

Table 7 Operational Traffic Exhaust Emissions - Receptor Sensitivity

Sensitivity	Description
Very high	Pollutant levels above environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean greater than 40µg/m^3
High	Pollutant levels between 90% and 100% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean 36 - 40µg/m^3
Medium	Pollutant levels between 75% and 90% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean 30 - 36µg/m^3
Low	Pollutant levels below 75% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean below 30µg/m^3

The magnitude of change in pollutant concentrations was defined based on the criteria outlined in Table 8.

Table 8 Operational Impacts - Magnitude of Change

Magnitude of Change	Change in Pollutant Level as Proportion of Assessment Criteria (%)
Large	Greater than 10
Medium	5 - 10
Small	1 - 5
Imperceptible	Less than 1

Impact significance was defined based on the interaction between the sensitivity of the affected receptor and the magnitude of change, as outlined in Table 9.

[9] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

Table 9 Operational Impacts - Significance of Impact

Sensitivity	Magnitude of Change			
	Imperceptible	Small	Medium	Large
Very high	Negligible	Slight	Moderate	Substantial
High	Negligible	Slight	Moderate	Moderate
Medium	Negligible	Negligible	Slight	Slight
Low	Negligible	Negligible	Negligible	Slight

It should be noted that the criteria shown in Table 7 and Table 8 and the matrix shown in Table 9 are adapted from the EPUK Development Control: Planning for Air Quality (2010 update)[10] guidance document with sensitivity descriptors included to allow comparisons of various air quality impacts.

Following the prediction of impacts at discrete receptor locations the EPUK[11] document 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:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant;
- The magnitude of changes and the descriptions of the impacts at the receptors;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced; and,
- The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The EPUK[12] guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

[10] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.
[11] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.
[12] Development Control: Planning for Air Quality (2010 update), Environmental Protection UK, 2010.

4.0 BASELINE

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

4.1 Local Air Quality Management

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 NO_2 are above the AQLV within the borough. As such, six AQMAs have been declared, with an additional two areas having been identified and currently undergoing declaration. The closest of the declared AQMAs to the proposed site is described as:

"A61 Harborough Hill Road"

The AQMA is located approximately 5.3km north-west of the development. Due to the distance between the sites, potential impacts on NO_2 concentrations within the AQMA are not anticipated to be significant and they have not been considered further in the context of this assessment.

BMBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQLVs and as such no further AQMAs have been designated.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by BMBC using continuous and periodic methods throughout their area of jurisdiction. A review of the most recent LAQM report[13] indicated that no continuous monitoring is undertaken in the vicinity of the site.

BMBC utilises passive diffusion tubes to monitor NO_2 concentrations throughout the borough. There are two sites located in the vicinity of the proposed development and recent monitoring results are shown in Table 10. Exceedences of the relevant AQLV are highlighted in **bold**.

Table 10 NO_2 Diffusion Tube Monitoring Results

Site Number	Location	Annual Mean Concentration (µg/m^3)		
		2010	2011	2012
DT56	Billington Steel, Wombwell Lane	36.7	35.3	34.1
DT57	Tesco, Wombwell Lane	**45.8**	**45.9**	**46.2**

As indicated in Table 10 the annual mean AQLV for NO_2 was exceeded in recent years at location DT57. This is due to the diffusion tube being in close proximity to the A633 Barnsley Road.

Reference should be made to Figure 2 for a map of the diffusion tube locations.

[13] 2012 Updating and Screening Assessment for Barnsley Metropolitan Borough Council, 2012.

Monitoring of PM_{10} concentrations is not currently undertaken in the vicinity of the proposed development.

4.3 Background Pollutant Concentrations

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 is located within the grid square 439500, 403500. Data for this location was downloaded from the DEFRA website[14] for the purpose of this assessment and is summarised in Table 11.

Table 11 Predicted Background Pollutant Concentrations

Pollutant	Predicted 2013 Background Concentration (µg/m^3)
NO_x	24.32
NO_2	16.94
PM_{10}	15.17

As indicated in Table 11, background pollutant concentrations were predicted to be below the relevant AQLVs in 2013. Comparison with the diffusion tube monitoring results shows the significant influence of emissions from the surrounding highway network on ambient concentrations.

4.4 Sensitive Receptors

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.

4.4.1 Construction Phase Sensitive Receptors

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 12.

Table 12 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	10 - 100	0
50 - 100	10 - 100	0
100 - 350	100 - 500	0

[14] http://laqm.defra.gov.uk/maps/maps2010.html.

Reference should be made to Figure 3 for a graphical representation of earthworks and construction dust receptors. The proposed development is located within a suburban area, with the majority of receptors to the west of the site.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 100m from the road network within 500m of the site access. These are summarised in Table 13. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, given the local road layout, traffic can access the site from several routes. This was therefore considered during the identification of receptors.

Table 13 Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	10 - 100	0
50 - 100	10 - 100	0

Reference should be made to Figure 4 for a graphical representation of trackout dust sensitive receptor locations.

Based on the criteria shown in Table 5, the sensitivity of the receiving environment to potential dust impacts was considered to be **medium**. This was because although there are more than 10 receptors within 20m of the site boundary, the site is located in a populated but suburban area, local PM_{10} concentrations are below the relevant AQLV and there are no ecological designations within the assessment extents.

4.4.2 Operational Phase Sensitive Receptors

Receptors sensitive to potential operational phase impacts were identified from a desk-top study and are summarised in Table 14. The height was defined as the lowest location of relevant exposure to allow consideration of other land use, such as commercial units, at ground floor level.

Table 14 Road Vehicle Exhaust Emission Sensitive Receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - A633 Barnsley Road	439168	403895	1.5
R2	Residential - A633 Barnsley Road	439074	404061	1.5
R3	Residential - A633 Barnsley Road	439007	404099	1.5
R4	Residential - A633 Wombwell Lane	438478	404584	1.5
R5	Residential - A633 Wombwell Lane	438271	404600	1.5

Receptor		NGR (m)		Height (m)
		X	Y	
R6	Residential - A633 Wombwell Lane	437945	404848	1.5
R7	Residential - A633 Wombwell Lane	437547	405288	1.5
R8	Residential - A633 Wombwell Lane	437388	405437	3.0
R9	Residential - Bradberry Balk Lane	439765	404143	1.5
R10	Residential - Barnsley Road	439195	403795	1.5
R11	Residential - Barnsley Road	439267	403650	1.5
R12	Residential - Barnsley Road	439288	403590	1.5
R13	Residential - Barnsley Road	439628	403351	1.5
R14	Residential - Barnsley Road	439569	403367	1.5
R15	Residential - High Street	439819	403185	3.0

The sensitive receptors identified in Table 14 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 proposed development that have not been individually identified above. Reference should be made to Figure 5 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Receptor sensitivity was defined based upon the methodology outlined in Table 7 and predicted pollutant concentrations for the development opening year with the proposals in place. These are detailed within Table 15.

Table 15 Road Vehicle Exhaust Emission Receptor Sensitivity

Receptor	Predicted Annual NO_2 Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual PM_{10} Mean Concentration ($\mu g/m^3$)	Sensitivity
R1	32.26	Medium	19.67	Low
R2	43.56	Very High	22.27	Low
R3	30.74	Medium	19.56	Low
R4	39.78	High	21.49	Low
R5	30.80	Medium	19.59	Low
R6	42.56	Very High	22.11	Low
R7	36.95	High	20.50	Low
R8	35.47	Medium	19.99	Low
R9	24.11	Low	18.46	Low

Receptor	Predicted Annual NO_2 Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual PM_{10} Mean Concentration ($\mu g/m^3$)	Sensitivity
R10	30.79	Medium	19.29	Low
R11	31.69	Medium	19.43	Low
R12	27.83	Low	18.81	Low
R13	32.55	Medium	19.56	Low
R14	28.81	Low	18.94	Low
R15	27.55	Low	18.54	Low

As indicated in Table 15, receptor sensitivity to changes in annual mean PM_{10} changes was **low** at all receptor locations. Receptor sensitivity to changes in NO_2 concentrations varied from **low** to **very high**. This is due to some receptors being located close to the A633 Barnsley Road. Local monitoring data has demonstrated that concentrations along this link are close to or in exceedence of the AQLV.

5.0 IMPACT ASSESSMENT

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.

5.1 Construction Phase Assessment

5.1.1 Step 1

The undertaking of activities such as construction, excavation, ground works, cutting, 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.

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.

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.

5.1.2 Step 2

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The proposed development site is estimated to cover an area greater than 10,000m². In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions from earthworks is therefore **large**. Table 12 indicates a number of sensitive receptors within 20m of the site boundary. In accordance with the criteria outlined in Table 3, the development is considered to be a **high** risk site as a result of earthwork activities.

Construction

Due to the size of the development site and the number of residential units proposed, the total building volume is predicted to be between 25,000m^3 and 100,000m^3. In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions from construction is therefore **medium**. Table 12 indicates a number of sensitive receptors within 20m of the site boundary. In accordance with the criteria outlined in Table 3, the development is considered to be a **high** risk site as a result of construction activities.

Trackout

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. Similarly, the surface material and unpaved road length was not known at this stage of the project.

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 2, the magnitude of potential dust emissions from trackout is therefore **large**. Table 13 indicates there are a number of sensitive receptors within 20m of the local highway network. In accordance with the criteria outlined in Table 4, the development is considered to be a **high** risk site as a result of trackout.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 16.

Table 16 Summary of Potential Unmitigated Dust Risks

Source	Dust Soiling Effects	Ecological Effects	PM_{10} Effects
Earthworks	High	None	High
Construction	High	None	High
Trackout	High	None	High

As indicated in Table 16, the potential risk of dust soiling and increases in PM_{10} concentrations is **high** from earthworks, construction and trackout activities.

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

5.1.3 Step 3

The Greater London Authority 'Best Practice Guidance: The Control of Dust and Emissions from Construction and Demolition' provides a number of potential mitigation measures to reduce potential impacts from **high** risk sites. These have been adapted for the proposed site as summarised in Table 17. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the Local Planning Authority.

Table 17 Fugitive Dust Mitigation Measures

Issue	Control Measure
Site planning	• Erect solid barriers to site boundary • No bonfires • Plan site layout - machinery and dust causing activities should be located away from sensitive receptors • Hard surface site haul routes

Issue	Control Measure
Construction traffic	• All vehicles to switch off engines - no idling vehicles • Effective vehicle cleaning and specific wheel-washing on leaving site and damping down of haul routes • All loads entering and leaving site to be covered • No site runoff of water or mud • On-road vehicles to comply to set emission standards • All non-road mobile machinery (NRMM) to use ultra-low sulphur tax-exempt diesel (ULSD) where available • Minimise movement of construction traffic around site • Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site
Earth moving works	• Minimise dust generating activities • Use water as dust suppressant where applicable • Cover, seed or fence stockpiles to prevent wind whipping • Re-vegetate earthworks and exposed areas • If applicable, ensure concrete crusher or concrete batcher has permit to operate

5.1.4 Step 4

As indicated in Section 4.0 the receiving environment is considered to be of **medium** sensitivity to potential dust impacts. As such, assuming the relevant mitigation measures outlined in Table 17 are implemented, the residual significance of potential impacts from all dust generating activities is **negligible**, in accordance with the methodology outlined in Table 6.

5.2 Operational Phase Assessment

Additional vehicle movements associated with the operation of the proposals 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 development.

For the purpose of this assessment traffic data was obtained for 2018 as the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2012 were utilised within the dispersion model. The use of 2018 traffic data and 2012 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

5.2.1 Nitrogen Dioxide

Annual mean NO_2 concentrations were predicted for each scenario and are summarised in Table 18. Exceedences of the AQLV are highlighted in **bold**. Reference should be made to Figure 6 and Figure 7 for graphical representations of predicted NO_2 concentrations

throughout the assessment extents.

Table 18 Predicted Annual Mean NO_2 Concentrations

Sensitive Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A633 Barnsley Road	31.96	32.26	0.30
R2	Residential - A633 Barnsley Road	**43.14**	**43.56**	0.42
R3	Residential - A633 Barnsley Road	30.51	30.74	0.23
R4	Residential - A633 Wombwell Lane	39.42	39.78	0.36
R5	Residential - A633 Wombwell Lane	30.58	30.80	0.22
R6	Residential - A633 Wombwell Lane	**42.18**	**42.56**	0.38
R7	Residential - A633 Wombwell Lane	36.66	36.95	0.29
R8	Residential - A633 Wombwell Lane	35.28	35.47	0.19
R9	Residential - Bradberry Balk Lane	24.06	24.11	0.05
R10	Residential - Barnsley Road	30.22	30.79	0.57
R11	Residential - Barnsley Road	31.00	31.69	0.69
R12	Residential - Barnsley Road	27.34	27.83	0.49
R13	Residential - Barnsley Road	31.80	32.55	0.75
R14	Residential - Barnsley Road	28.25	28.81	0.56
R15	Residential - High Street	27.10	27.55	0.45

As indicated in Table 18, concentrations of NO_2 were predicted to exceed the annual mean AQLV at R2 and R6 for both scenarios considered. It should be noted that there are no new exceedences in the DS scenario when compared with the DM results.

Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 19.

Table 19 Predicted NO_2 Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - A633 Barnsley Road	Imperceptible	Medium	Negligible
R2	Residential - A633 Barnsley Road	Small	Very High	Slight
R3	Residential - A633 Barnsley Road	Imperceptible	Medium	Negligible
R4	Residential - A633 Wombwell Lane	Imperceptible	High	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R5	Residential - A633 Wombwell Lane	Imperceptible	Medium	Negligible
R6	Residential - A633 Wombwell Lane	Imperceptible	Very High	Negligible
R7	Residential - A633 Wombwell Lane	Imperceptible	High	Negligible
R8	Residential - A633 Wombwell Lane	Imperceptible	Medium	Negligible
R9	Residential - Bradberry Balk Lane	Imperceptible	Low	Negligible
R10	Residential - Barnsley Road	Small	Medium	Negligible
R11	Residential - Barnsley Road	Small	Medium	Negligible
R12	Residential - Barnsley Road	Small	Low	Negligible
R13	Residential - Barnsley Road	Small	Medium	Negligible
R14	Residential - Barnsley Road	Small	Low	Negligible
R15	Residential - High Street	Small	Low	Negligible

As indicated in Table 19, the significance of impacts on annual mean NO_2 concentrations as a result of the development was predicted to be **negligible** at all locations except R2, where impacts were predicted to be **slight adverse**.

5.2.2 Particulate Matter

Annual mean PM_{10} concentrations were predicted for each scenario and are summarised in Table 20. Reference should be made to Figure 8 and Figure 9 for graphical representations of predicted PM_{10} concentrations throughout the assessment extents.

Table 20 Predicted Annual Mean PM_{10} Concentrations

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R1	Residential - A633 Barnsley Road	19.61	19.67	0.05
R2	Residential - A633 Barnsley Road	22.16	22.27	0.11
R3	Residential - A633 Barnsley Road	19.51	19.56	0.05
R4	Residential - A633 Wombwell Lane	21.38	21.49	0.11
R5	Residential - A633 Wombwell Lane	19.56	19.59	0.03
R6	Residential - A633 Wombwell Lane	22.00	22.11	0.11
R7	Residential - A633 Wombwell Lane	20.42	20.50	0.08
R8	Residential - A633 Wombwell Lane	19.94	19.99	0.05

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		DM	DS	Change
R9	Residential - Bradberry Balk Lane	18.43	18.46	0.03
R10	Residential - Barnsley Road	19.16	19.29	0.13
R11	Residential - Barnsley Road	19.27	19.43	0.16
R12	Residential - Barnsley Road	18.67	18.81	0.13
R13	Residential - Barnsley Road	19.37	19.56	0.19
R14	Residential - Barnsley Road	18.81	18.94	0.13
R15	Residential - High Street	18.43	18.54	0.11

As indicated in Table 20, predicted annual mean PM_{10} concentrations were below the relevant AQLV at all receptor locations for both scenarios considered.

Predicted impacts on annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Table 21.

Table 21 Predicted Annual Mean PM_{10} Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - A633 Barnsley Road	Imperceptible	Low	Negligible
R2	Residential - A633 Barnsley Road	Imperceptible	Low	Negligible
R3	Residential - A633 Barnsley Road	Imperceptible	Low	Negligible
R4	Residential - A633 Wombwell Lane	Imperceptible	Low	Negligible
R5	Residential - A633 Wombwell Lane	Imperceptible	Low	Negligible
R6	Residential - A633 Wombwell Lane	Imperceptible	Low	Negligible
R7	Residential - A633 Wombwell Lane	Imperceptible	Low	Negligible
R8	Residential - A633 Wombwell Lane	Imperceptible	Low	Negligible
R9	Residential - Bradberry Balk Lane	Imperceptible	Low	Negligible
R10	Residential - Barnsley Road	Imperceptible	Low	Negligible
R11	Residential - Barnsley Road	Imperceptible	Low	Negligible
R12	Residential - Barnsley Road	Imperceptible	Low	Negligible
R13	Residential - Barnsley Road	Imperceptible	Low	Negligible
R14	Residential - Barnsley Road	Imperceptible	Low	Negligible
R15	Residential - High Street	Imperceptible	Low	Negligible

As indicated in Table 21, predicted impacts on annual mean PM_{10} concentrations as a result of the development were predicted to be **negligible** at all receptor locations.

5.2.3 Overall Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **negligible,** as this was representative of impacts at the majority of receptor locations. Although one sensitive receptor was predicted to experience **slight adverse** impacts, it is anticipated that future concentrations will be lower than those reported due to worst-case assumptions of background concentrations and emission factors being adopted throughout the assessment. Further justification is provided in Table 22 for the determination of overall significance.

Table 22 Overall Road Traffic Exhaust Emission Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Air quality impacts were predicted to be negligible at all sensitive receptors except R2, where a slight adverse impact was predicted. As worst-case assumptions have been made throughout the assessment, it is likely that future impacts will be lower than those predicted and that all receptor locations would experience negligible impacts
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The proposed development will not result in any new exposure to annual mean NO_2 or PM_{10} concentrations above the AQLVs, as shown in Figures 6 to 9
The magnitude of changes and the descriptions of the impacts at the receptors	The magnitude of change was imperceptible or small at all locations, and the significance of impacts was negligible at all but one location
Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased	There were exceedences of the AQLV for NO_2 predicted in the vicinity of the road network. However, the area of exceedence was not predicted to substantially increase as a result of the development
Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced	The areas of exceedence are not anticipated to reduce as a result of the development
The extent to which an objective or limit value is exceeded e.g. an annual mean NO_2 concentration of 41µg/m^3 should attract less significance than an annual mean of 51µg/m^3	There were predicted exceedences of the relevant AQLV at R2 and R6 in both the DM and DS scenarios. However, the highest modelled concentration was 43.56µg/m^3 and as worst-case assumptions were made throughout the assessment, the magnitude of exceedence is not considered to be of concern

6.0 MITIGATION

6.1 Construction Phase

Reference should be made to Table 17 for suggested fugitive dust mitigation measures for the construction phase of the development. These are based on the Greater London Authority guidance[15] and as such are considered suitable for proposals of this size and nature.

6.2 Operational Phase

There is a number of air quality mitigation options available to reduce potential exposure of future site users to elevated pollutant concentrations or off-set impacts associated with a development. However, all techniques have financial implications and may therefore affect scheme viability. As such, they should only be included if necessary.

Emissions during the operational phase have the potential to cause an adverse impact on local air quality. Although the overall impact significance was determined as **negligible**, a **slight adverse** impact was predicted at one receptor location. As such, an aim for the development should to be to reduce vehicle trips to and from the site in order to help to reduce pollution levels in sensitive areas. Specific consideration should be made to the following measures:

- Promotion of alternative transport options within the development;
- Inclusion of green infrastructure within the development; and,
- Integration of public transport provisions.

Implementing traffic management measures may result in fewer vehicle trips and, therefore, fewer occasions of network capacity exceedences. Additionally, the use of green infrastructure has been shown to reduce pollution levels, particularly in urban environments. These measures are therefore likely to result in reductions of the mean roadside concentrations of traffic-related pollutants.

[15] Best Practice Guidance: Control of Dust and Emissions from Construction and Demolition, Greater London Authority, 2006.

7.0 CONCLUSION

REC Ltd was commissioned by Persimmon Homes West Yorkshire to undertake an Air Quality Assessment in support of the planning application for a proposed residential development on land at Barnsley Road, Wombwell.

The development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works and road vehicle exhaust emissions associated with traffic generated by the proposals. An Air Quality Assessment was therefore required in order to provide consideration of potential impacts associated with the proposals on sensitive locations in the vicinity of the development.

During the construction phase of the development there is 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 **negligible**.

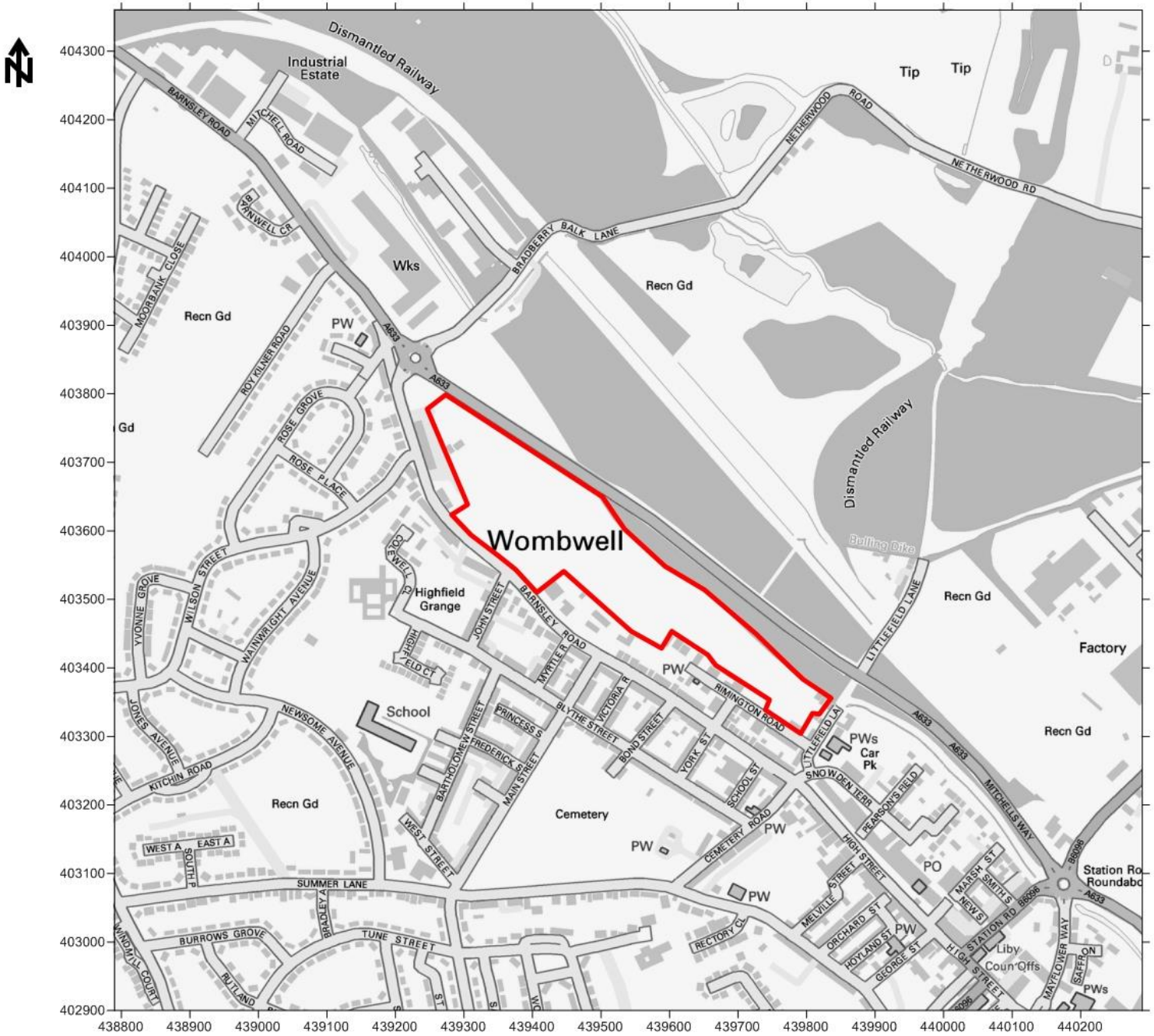
The development may cause air quality impacts as a result of exhaust emissions associated with vehicle trips generated by the proposed scheme. A dispersion modelling assessment was undertaken in order to quantify NO_2 and PM_{10} concentrations with and without the proposals. Results were subsequently verified using monitoring results obtained from BMBC.

Predicted impacts on NO_2 and PM_{10} concentrations as a result of operational phase road vehicle exhaust emissions were predicted to be **negligible** at all sensitive receptor locations within the vicinity of the site except one, which was predicted to experience **slight adverse** impacts. As worst-case assumptions were made throughout the assessment, it is anticipated that future concentrations will be lower than those predicted. The overall significance of potential impacts was therefore determined to be **negligible**, in accordance with the EPUK guidance. As such, air quality is not considered to be a constraint to planning consent.

8.0 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 Objectives
AQS	Air Quality Strategy
BMBC	Barnsley Metropolitan Borough Council
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DM	Do-minimum
DMRB	Design Manual for Roads and Bridges
DS	Do-something
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
LA	Local Authority
LAQM	Local Air Quality Management
LDF	Local Development Framework
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
REC	Resource and Environmental Consultants
ULSD	Ultra-Low Sulphur Diesel
z_0	Roughness Length

APPENDIX I FIGURES



Legend

Site Boundary

Title

Figure 1 - Site Location

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

33410

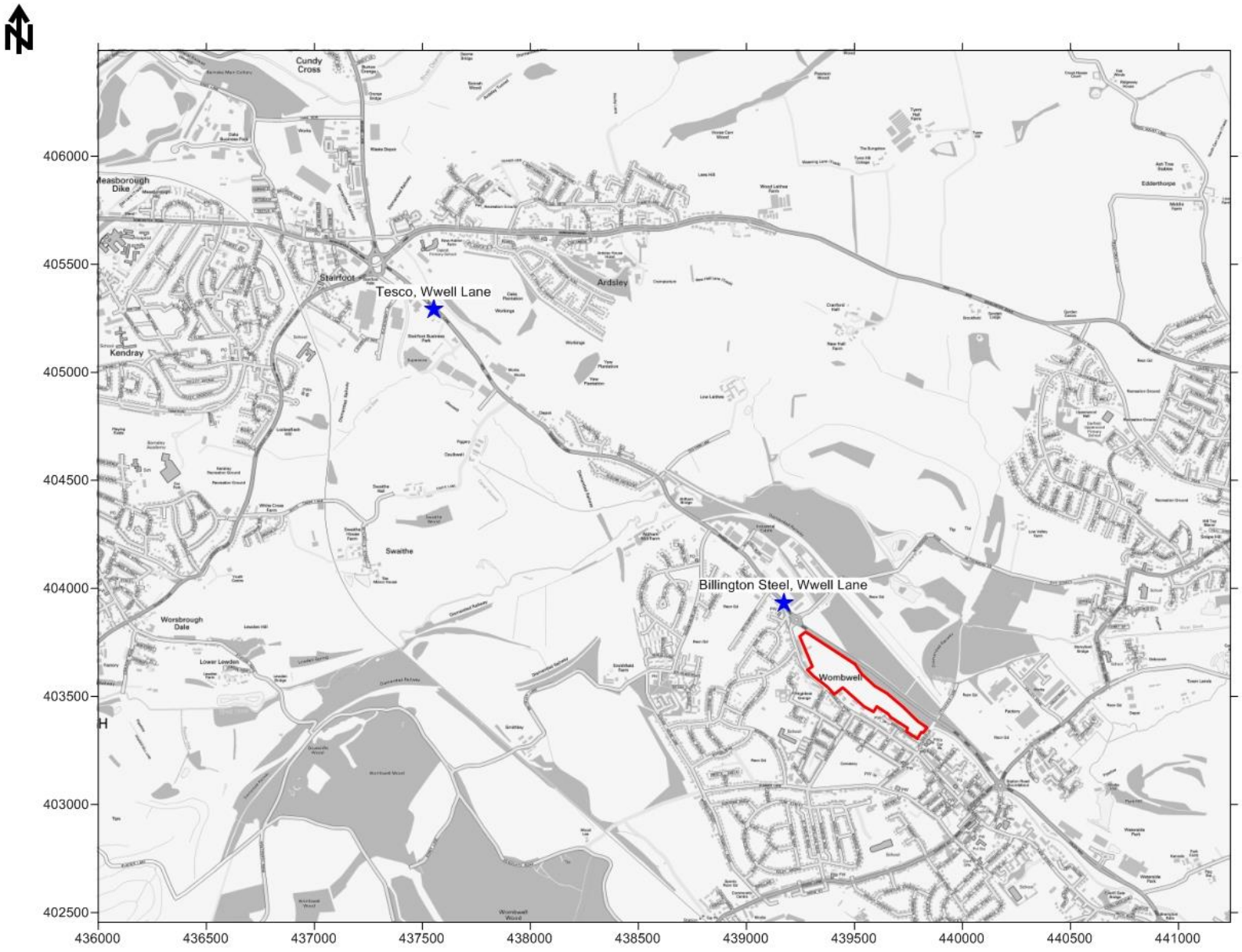
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Legend

Site Boundary

Diffusion Tube

Title

Figure 2 - Diffusion Tube Locations

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

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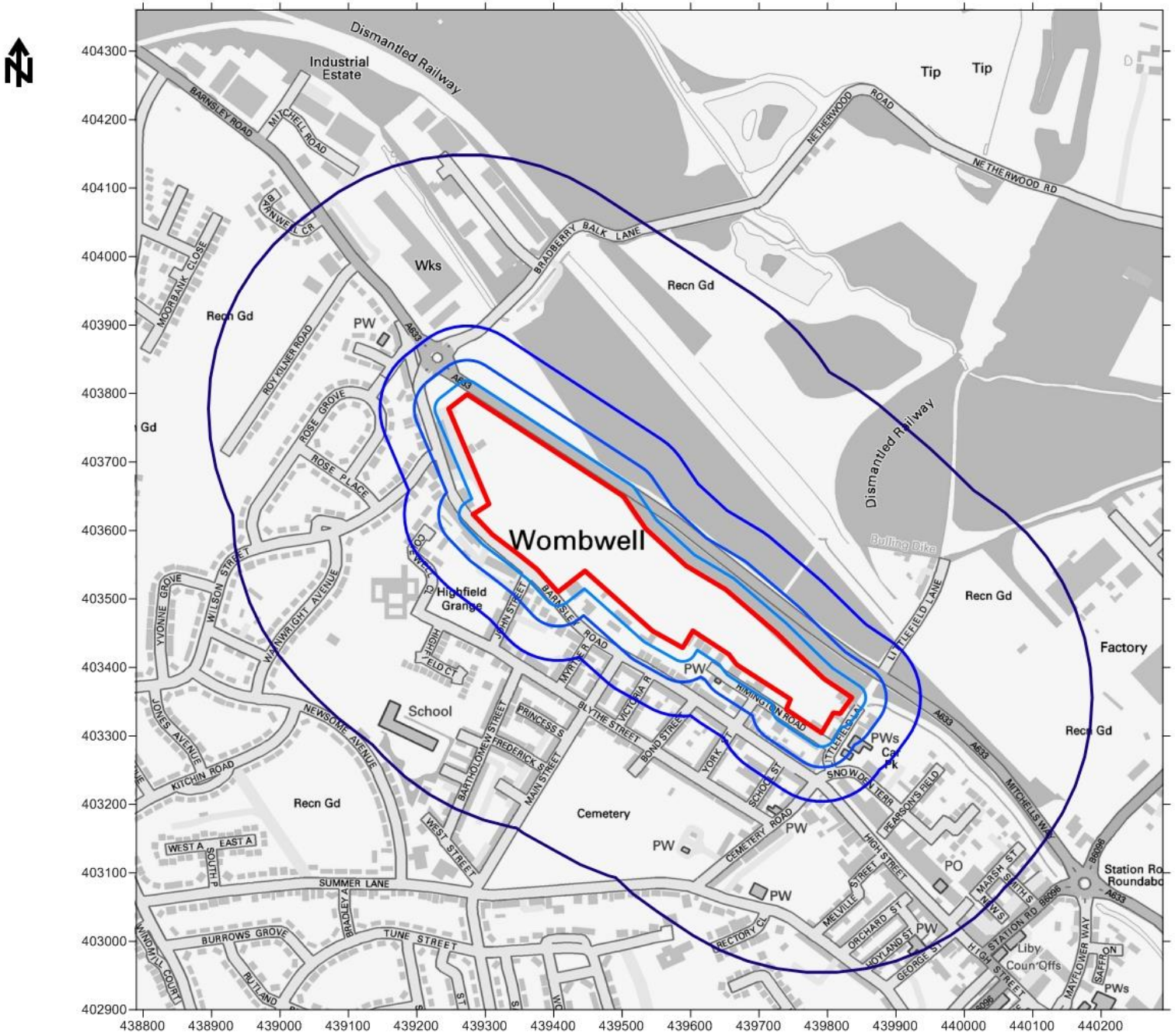
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Legend

- Site Boundary
- 20m from Site Boundary
- 50m from Site Boundary
- 100m from Site Boundary
- 350m from Site Boundary

Title

Figure 3 - Earthworks and Construction Dust Sensitive Receptors

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

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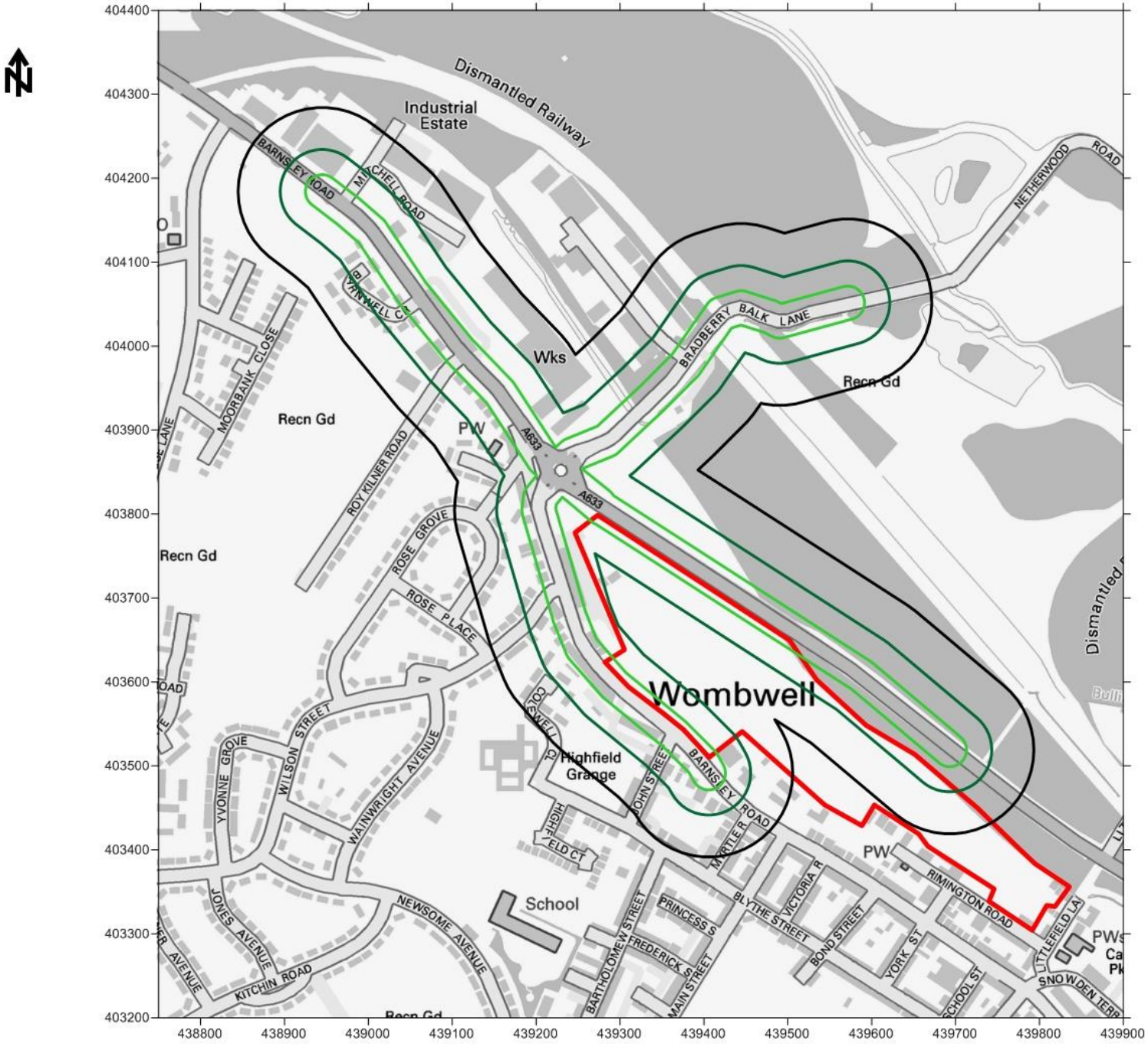
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Legend

- Site Boundary
- 20m from Site Access Route
- 50m from Site Access Route
- 100m from Site Access Route

Title

Figure 4 - Trackout Dust Sensitive Receptors

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Legend

Site Boundary

Sensitive Receptor

Title

Figure 5 - Road Vehicle Exhaust Emission Sensitive Receptor Locations

Project

Air Quality Assessment
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Project Number

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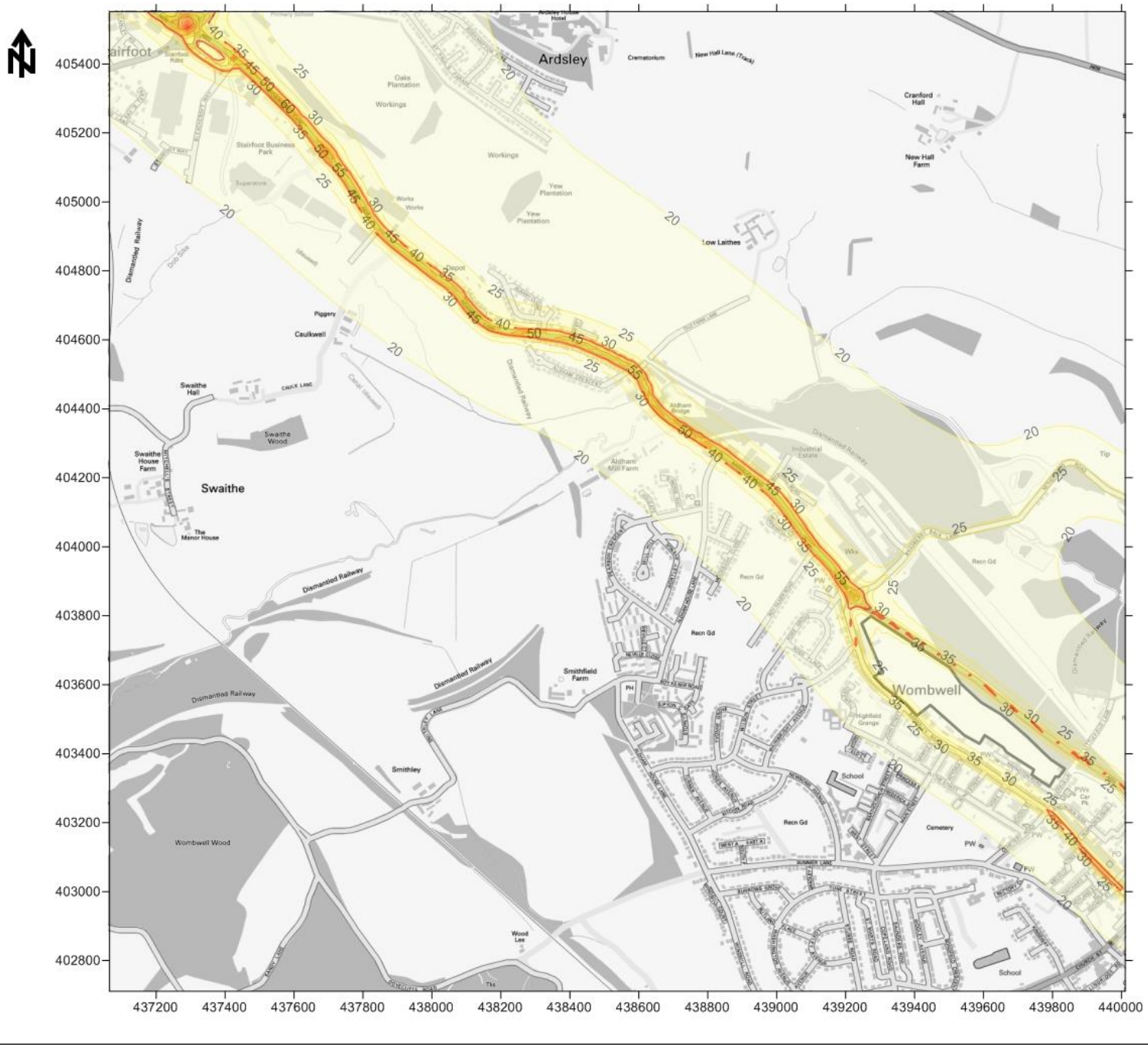
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Legend

Site Boundary

Predicted Annual Mean NO2 Concentrations (µg/m3)

90
85
80
75
70
65
60
55
50
45
40
35
30
25
20

Title

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

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

33410

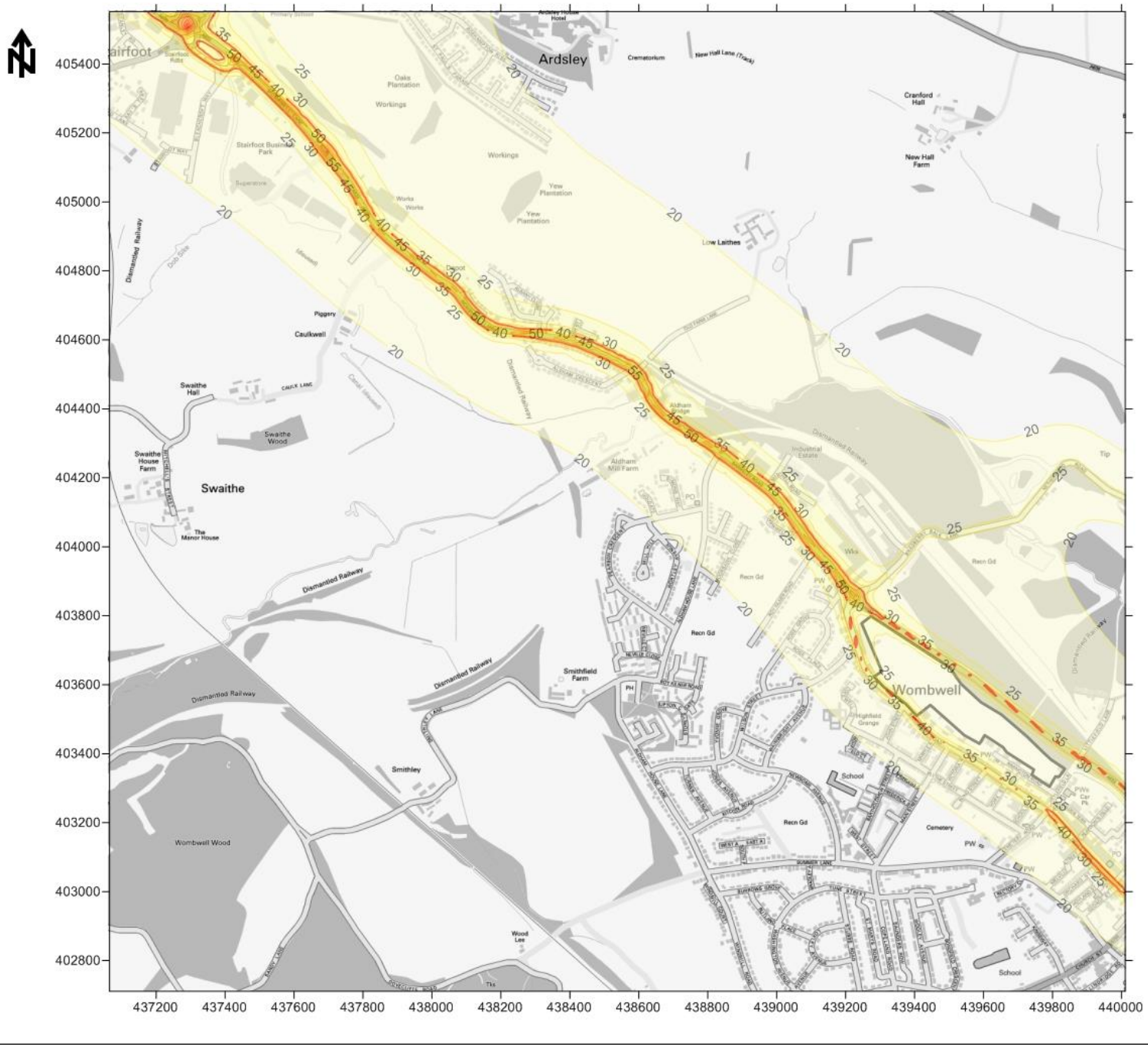
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Legend

Site Boundary

Predicted Annual Mean NO2 Concentrations (µg/m3)

90
85
80
75
70
65
60
55
50
45
40
35
30
25
20

Title

Figure 7 - Predicted Annual Mean NO2 Concentrations (µg/m3)
Do-Something

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

33410

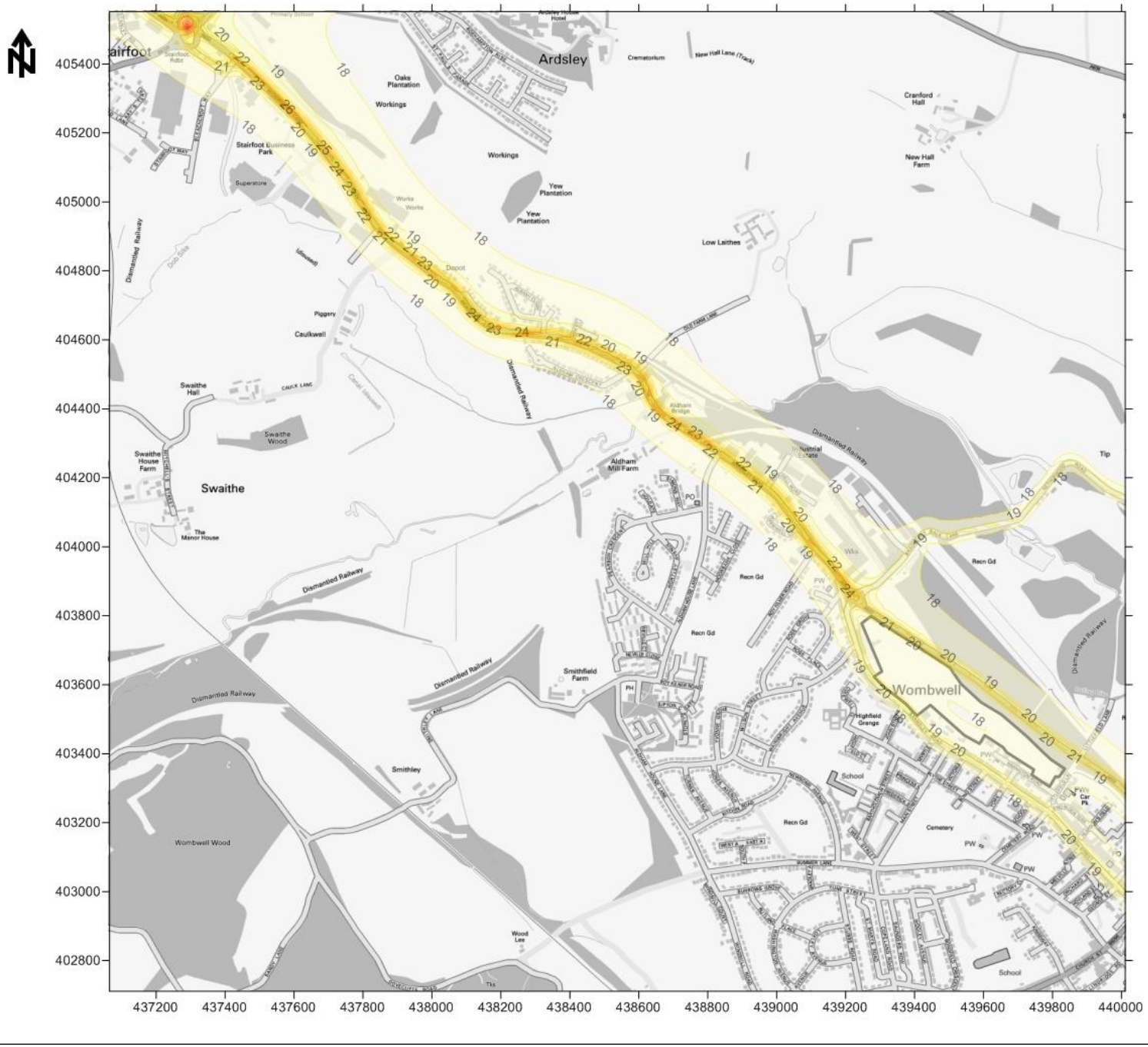
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Legend

Site Boundary

Predicted Annual Mean PM10 Concentrations (µg/m3)

31
30
29
28
27
26
25
24
23
22
21
20
19
18

Title

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

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

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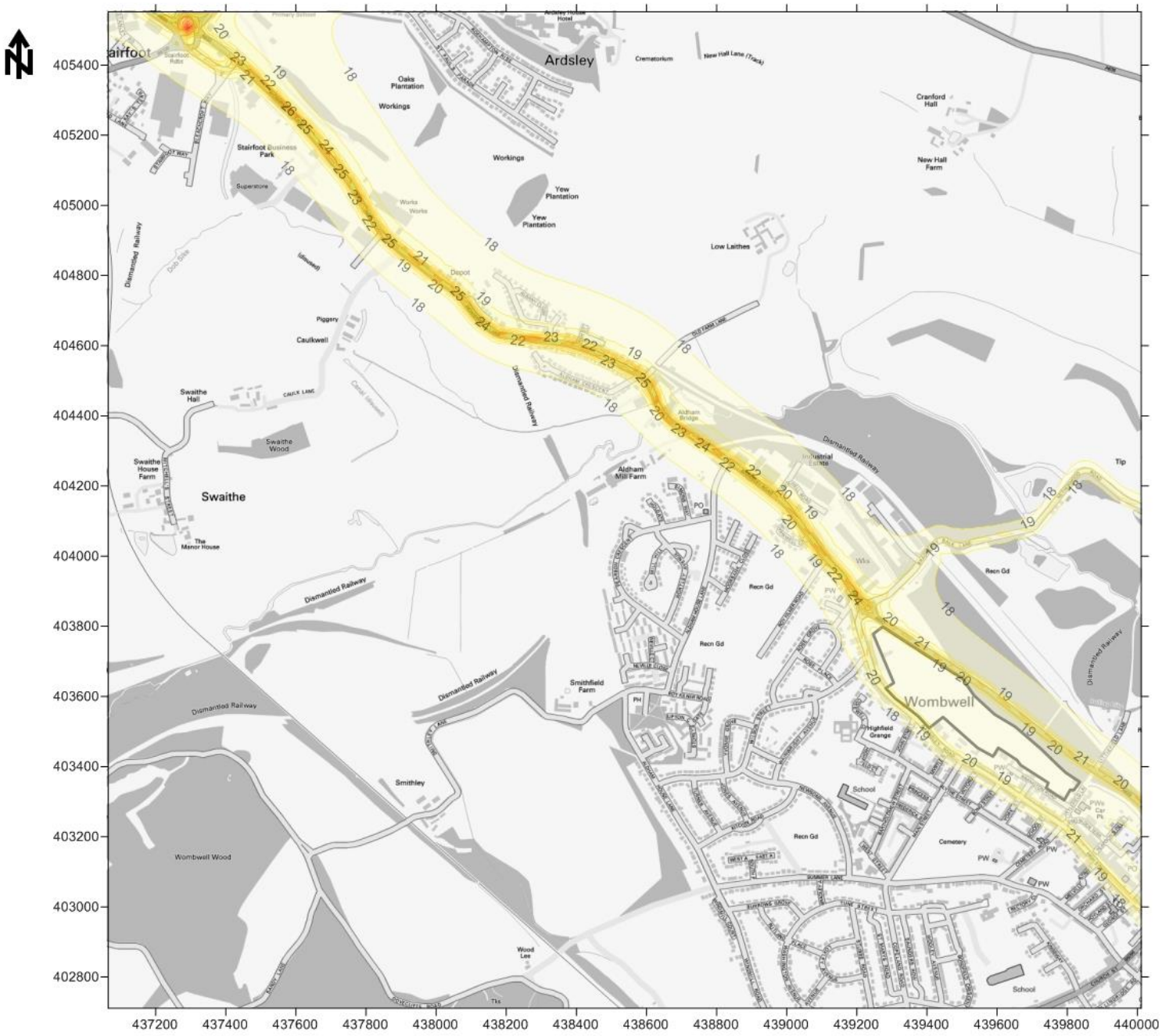
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Legend

Site Boundary

31
30
29
28
27
26
25
24
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22
21
20
19
18

Predicted Annual Mean PM10 Concentrations (µg/m3)

Title

Figure 9 - Predicted Annual Mean PM10 Concentrations (µg/m3)
Do-Something

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

33410

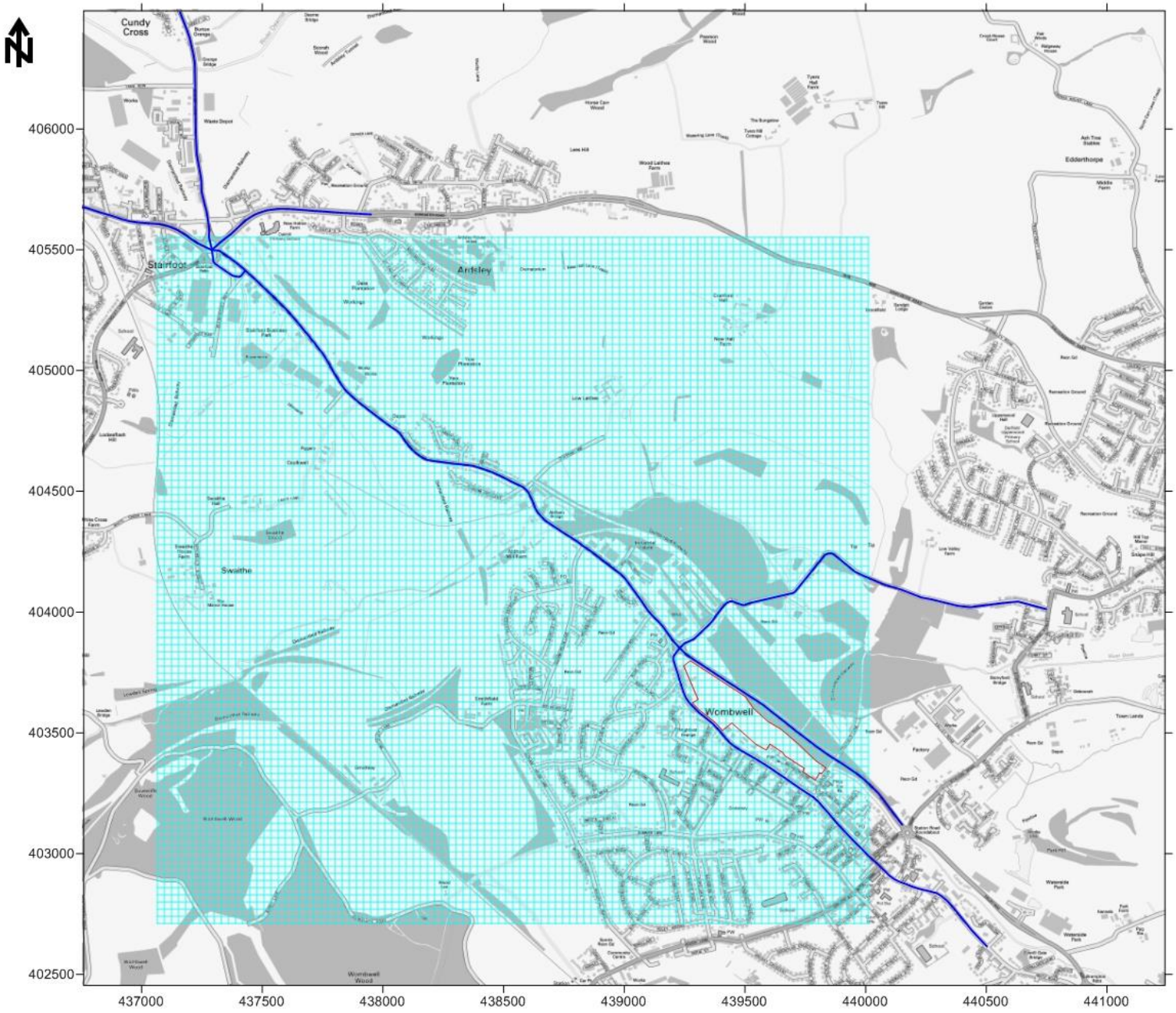
Client

Persimmon Homes West Yorkshire

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Legend

Site Boundary

Output Grid

Road Link Location

Title

Figure 10 - ADMS Roads Inputs

Project

Air Quality Assessment
Barnsley Road Residential Development, Wombwell

Project Number

33410

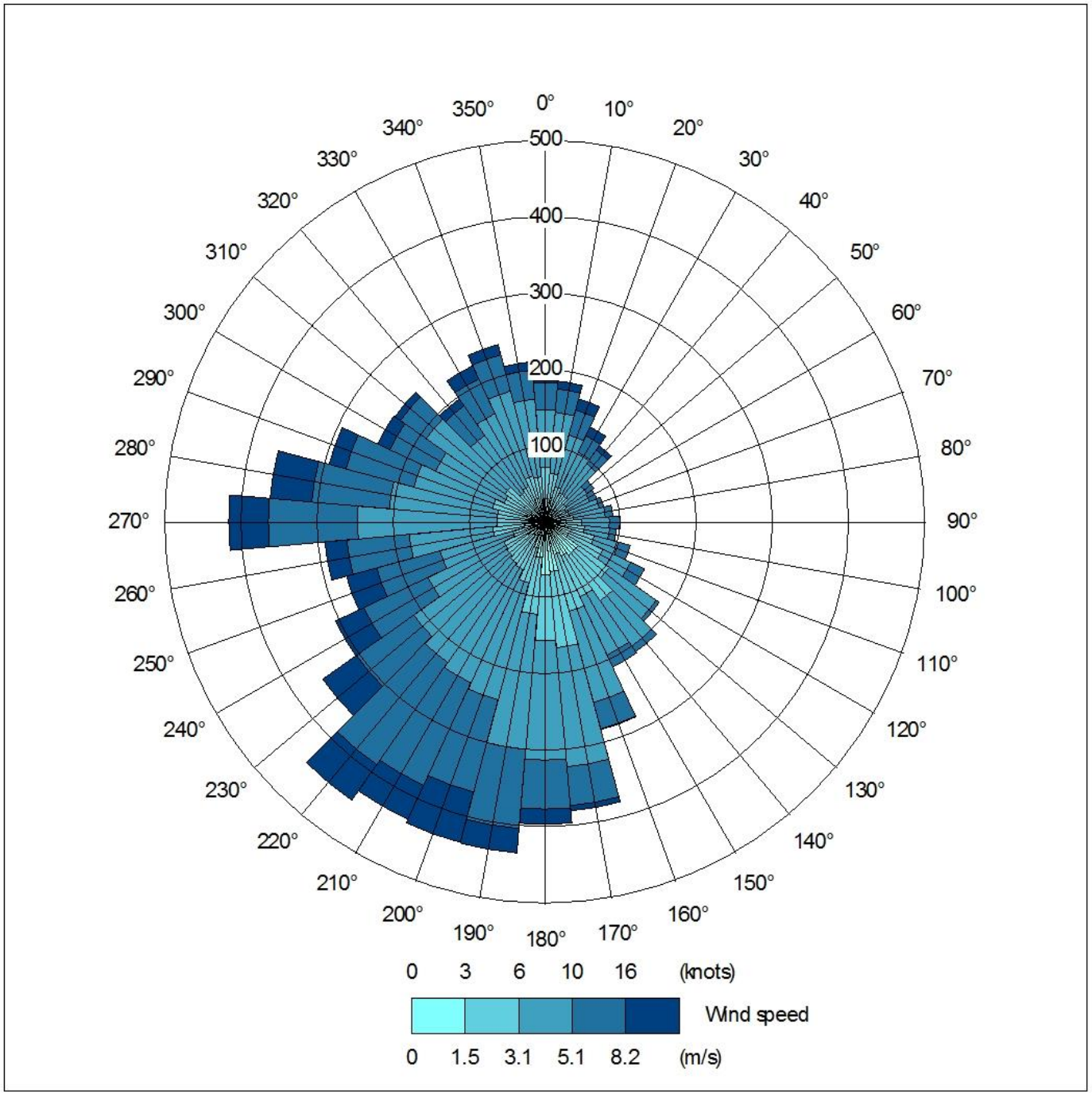
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Legend

Title

Figure 10 - Wind Rose of 2012 Robin Hood Airport Meteorological Data

Project

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APPENDIX II ADMS-ROADS INPUT DATA

ASSESSMENT INPUTS

Vehicle trips associated with the development have the potential to result in air quality impacts as a result of increased traffic exhaust emissions. Dispersion modelling using ADMS-Roads was therefore undertaken to predict NO_2 and PM_{10} concentrations at sensitive locations both with and without the development in order to consider potential changes as a result of the proposals.

The dispersion 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; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 3.1.4). 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.

Assessment Area

Ambient concentrations were predicted over the area NGR: 437065, 402711 to 440011, 405552. 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 10 for a graphical representation of the assessment grid extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV percentage, were obtained from Optima Highways and Transportation, the transport consultants for the project, for the following road links:

- A633 Mitchell's Way;
- A633 Barnsley Road (W);
- Barnsley Road; and,
- Bradberry Balk Lane.

Data were provided for 2013 and 2018. 2013 data were factored to 2012 for use in the

verification scenario using the Road Transport Forecasts 2011 spreadsheet[16] produced by the Department for Transport (DfT).

Traffic data for a number of roads was not available from the transport consultants. As such, data were downloaded from the DfT Matrix[17] for the following links:

- A635 Doncaster Road East;
- A635 Doncaster Road West; and,
- A633 Grange Road.

The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network in Great Britain for the years 1999 to 2012. It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM.TG(09)[18] as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

AADT flows for 2018 were calculated from 2012 data using the Road Transport Forecasts 2011 spreadsheet[19] produced by the DfT.

Road widths were estimated from aerial photography and UK highway design standards. Table AII.1 shows the 2012 and 2018 traffic data used in the assessment. Reference should be made to Figure 10 for a graphical representation of the road link locations.

Table AII.1 Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow			HDV Proportion of Fleet (%)			Mean Vehicle Speed (km/h)
			Verif. 2012	DM 2018	DS 2018	Verif. 2012	DM 2018	DS 2018	
L1	A633 southbound from roundabout	12.5	9,127	9,882	10,165	7.6	7.7	7.4	40
L2	A633 traffic lights	8.5	9,127	9,882	10,165	7.6	7.7	7.4	16
L3	A633 northbound to traffic lights	11.0	10,049	10,880	11,187	5.1	5.1	5.0	24
L4	A633 northbound to roundabout	7.2	10,049	10,880	11,187	5.1	5.1	5.0	40

16 http://assets.dft.gov.uk/publications/road-transport-forecasts-2011/road-transport-forecasts-2011-annex-kilometres.xls.
17 www.dft.gov.uk/matrix.
18 Local Air Quality Management Guidance LAQM.TG(09), DEFRA, 2009.
19 http://assets.dft.gov.uk/publications/road-transport-forecasts-2011/road-transport-forecasts-2011-annex-kilometres.xls.

Road Link		Road Width (m)	24-hour AADT Flow			HDV Proportion of Fleet (%)			Mean Vehicle Speed (km/h)
			Verif. 2012	DM 2018	DS 2018	Verif. 2012	DM 2018	DS 2018	
L5	A633	9.0	19,176	20,762	21,352	6.3	6.3	6.2	58
L6	A633	7.5	19,176	20,762	21,352	6.3	6.3	6.2	35
L7	A633 to traffic lights	11.0	19,176	20,762	21,352	6.3	6.3	6.2	58
L8	A633 Tesco junction	11.5	19,176	20,762	21,352	6.3	6.3	6.2	16
L9	A633	10.3	19,176	20,762	21,352	6.3	6.3	6.2	58
L10	A633	7.0	19,176	20,762	21,352	6.3	6.3	6.2	58
L11	A633/Albany Close junction	7.0	19,176	20,762	21,352	6.3	6.3	6.2	48
L12	A633	11.2	19,176	20,762	21,352	6.3	6.3	6.2	58
L13	A633/Aldham Crescent junction	12.0	19,176	20,762	21,352	6.3	6.3	6.2	48
L14	A633	11.0	19,176	20,762	21,352	6.3	6.3	6.2	58
L15	A633	6.6	19,176	20,762	21,352	6.3	6.3	6.2	58
L16	A633/Aldham House Lane junction	12.3	19,176	20,762	21,352	6.3	6.3	6.2	40
L17	A633	12.3	19,176	20,762	21,352	6.3	6.3	6.2	58
L18	A633	10.2	19,176	20,762	21,352	6.3	6.3	6.2	58
L19	A633 roundabout approach	15.5	19,176	20,762	21,352	6.3	6.3	6.2	32
L20	Bradberry Balk Lane roundabout approach	13.5	4,145	4,488	4,532	4.4	4.4	4.3	32
L21	Bradberry Balk Lane	7.5	4,145	4,488	4,532	4.4	4.4	4.3	90
L22	Mitchell's Way roundabout approach	14.2	10,845	11,741	12,200	3.7	3.7	3.5	32
L23	Mitchell's Way	7.2	10,845	11,741	12,200	3.7	3.7	3.5	58

Road Link		Road Width (m)	24-hour AADT Flow			HDV Proportion of Fleet (%)			Mean Vehicle Speed (km/h)
			Verif. 2012	DM 2018	DS 2018	Verif. 2012	DM 2018	DS 2018	
L24	Mitchell's Way/Littlefield Lane junction	7.2	10,845	11,741	12,200	3.7	3.7	3.5	40
L25	Mitchell's Way	7.2	10,845	11,741	12,200	3.7	3.7	3.5	58
L26	Barnsley Road roundabout approach	15.6	6,415	6,946	7,910	8.0	8.0	7.0	32
L27	Barnsley Road	9.6	6,415	6,946	7,910	8.0	8.0	7.0	42
L28	Barnsley Road/Wilson Street Junction	8.5	6,415	6,946	7,910	8.0	8.0	7.0	32
L29	Barnsley Road	8.5	6,415	6,946	7,910	8.0	8.0	7.0	42
L30	High Street	7.5	6,415	6,946	7,910	8.0	8.0	7.0	26
L31	A635 east roundabout approach	22.0	13,386	14,184	14,380	3.7	3.7	3.7	24
L32	A635 east	17.4	13,386	14,184	14,380	3.7	3.7	3.7	58
L33	A635 west roundabout approach	23.3	18624	19,734	19,930	5.4	5.4	5.4	24
L34	A635 west	16.0	18624	19,734	19,930	5.4	5.4	5.4	58
L35	A635 west	10.0	18624	19,734	19,930	5.4	5.4	5.4	42
L36	A633 roundabout approach	19.3	18886	20,011	20,208	6.1	6.1	6.1	24
L37	A633	8.0	18886	20,011	20,208	6.1	6.1	6.1	64

Emission Factors

Emission rates for each road link were calculated from the information shown in Table All.1 and the Emission Factor Toolkit (version 5.2c). This incorporates updated COPERT4v8.1 vehicle emission factors for NO_x and vehicle fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2012 emission factors have been utilised in preference to the development opening year in order to provide a robust assessment. However, it should be

noted that 2018 traffic data was utilised in the assessment, which includes anticipated future growth. Therefore predicted concentrations are likely to be an overestimate of actual concentrations, resulting in a worst-case assessment scenario.

Meteorological Data

Meteorological data used in this assessment was taken from Robin Hood Airport observation station over the period 1st January 2012 to 31st December 2012 (inclusive). Robin Hood Airport weather station is located at NGR: 465932, 398488, which is approximately 27km east of the proposed development. DEFRA guidance LAQM.TG(09) recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

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

Roughness Length

A roughness length (z_0) of 0.5m was used in the dispersion model. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used in this dispersion modelling study. This value is considered appropriate for the nature of both assessment areas and is suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

Background Concentrations

The background concentrations provided by DEFRA were used in the assessment to represent existing annual mean NO_2 and PM_{10} levels throughout the modelling extent. These are shown in Table AII.3. The highest of the backgrounds across the spatial extent of the assessment area were used in order to provide a worst-case estimation of pollution concentrations as a result of the proposed development.

Table AII.3 Background Concentrations 2012

Pollutant	2012 Background Concentration (µg/m^3)								
	437500, 403500	437500, 404500	437500, 405500	438500, 403500	438500, 404500	438500, 405500	439500, 403500	439500, 404500	439500, 405500
NO_x	20.23	23.72	**26.89**	21.10	22.65	22.42	25.49	24.11	20.27
NO_2	14.45	16.56	**18.47**	15.00	15.96	15.81	17.62	16.76	14.48
PM_{10}	15.18	16.70	**17.36**	15.56	16.24	16.65	15.36	16.00	16.88

Similarly to emission factors, background concentrations for 2012 were utilised in preference to the development opening year. This provided a robust assessment and is likely to

overestimate actual pollutant concentrations during the operation of the proposal.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.TG(09).

Verification

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

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

BMBC undertakes diffusion tube monitoring of NO_2 concentrations at two locations in the vicinity of the development. Raw monitoring results were obtained from BMBC and bias adjusted using their factor of 0.91. The road contribution to total NO_x concentration was then calculated for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.TG(09)[20]. The monitored annual mean NO_2 concentration and calculated roadside NO_x concentrations are summarised in Table AII.4.

Table AII.4 Diffusion Tube Monitoring Results

Monitoring Location	2012 Monitored NO_2 Concentration ($\mu g/m^3$)	2012 Background NO_2 Concentration ($\mu g/m^3$)	Calculated Roadside NO_x Concentration ($\mu g/m^3$)
Billington Steel, Wombwell Lane	33.97	18.47	33.47
Tesco, Wombwell Lane	46.26	18.47	65.42

The dispersion model was run with traffic input data for 2012 to predict NO_x concentrations at the diffusion tube monitoring locations. The results are shown in Table AII.5.

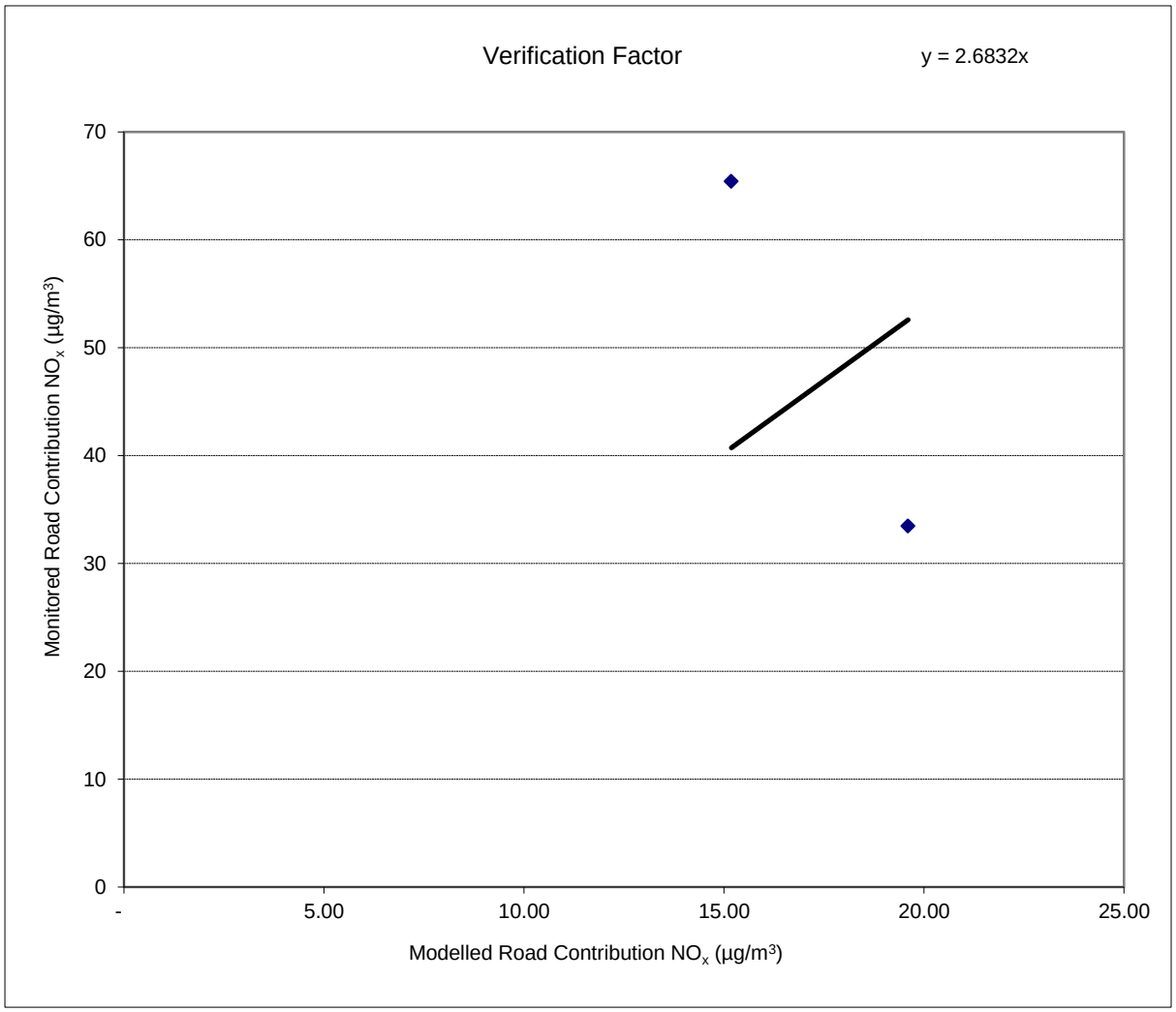
Table AII.5 Modelled Concentrations

Monitoring Location	Modelled Roadside NO_x Concentration ($\mu g/m^3$)
Billington Steel, Wombwell Lane	19.60
Tesco, Wombwell Lane	15.18

[20] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trendline based on linear progression though zero calculated. This indicated that a verification factor of 2.6832 was required to be applied to all 2018 modelling results, as shown in Graph 1.

Graph 1 Verification Factor



Due to the absence of PM_{10} monitoring data in the vicinity of the proposed development, the NO_x verification factor was used to adjust PM_{10} model predictions in accordance with the guidance provided within LAQM.TG(09).

APPENDIX III ASSESSOR'S CURRICULUM VITAE

CHARLOTTE GOODMAN

Senior Air Quality Consultant

BSc (Hons), MSc

KEY EXPERIENCE:

Charlotte is a Senior Environmental Consultant with specialist experience in the air quality and odour sector. Her key capabilities include:

- Production of air quality and odour assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail, infrastructure and commercial sectors.
- Produced assessments for inclusion into Environmental Impact Assessments (EIAs) for large projects throughout the UK.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-Roads and ADMS4. Studies have included impact assessment of ground level pollutant and odour concentrations and assessment of suitability of development sites for proposed end-use.
- Detailed dispersion modelling of congestion and queuing to inform Local Authority Air Quality Action Plans.
- Design and management of automatic and passive pollutant monitoring campaigns to define baseline conditions and inform future assessment in accordance with Defra and Environment Agency guidance.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.

QUALIFICATIONS:

- Bachelor of Science
- Master of Science

PROJECTS SUMMARY:

Roscommon Way Extension, Essex

An Air Quality Environmental Impact Assessment for a highway extension in the vicinity of a designated conservation site to relieve local congestion. Assessment of the construction phase fugitive dust emissions was undertaken in accordance with IAQM methodology.

West One Supermarket, Eccles

An Air Quality Assessment for the impacts of a new supermarket situated on a retail park within an Air Quality Management Area (AQMA), using ADMS Roads. The impacts on local concentrations of NO_2 and PM_{10} as a result of the operational and construction phases of the development were assessed, as well as quantification of impacts on the AQMA.

Mechanical Biotreatment Plant, Barrow-in-Furness

An Air Quality Environmental Impact Assessment for a mechanical bio-treatment plant at Barrow-in-Furness using ADMS4. Assessment was made of concentrations of NO_2 and PM_{10} from the construction phase of the development, along with assessment of process emissions from the bio-filters and fines stabilisation building which included PM_{10}, volatile organic compounds (VOCs), hydrogen sulphide (H_2S), odour and bioaerosols. Concentrations of ammonia (NH_3) were assessed due to the presence of a sensitive Site of Special Scientific Interest (SSSI) in the vicinity of the site. A site-specific, passive monitoring survey was undertaken to establish baseline concentrations of NO_2, H_2S and NH_3 prior to the facility operation and allow a detailed appreciation of existing conditions to be developed.

Junction Improvements on the A1 at Elkesley, Nottinghamshire

An Air Quality Assessment of the impacts of junction improvements on a section of the A1 at the village of Elkesley, to provide safer access and egress for local residents. A site-specific monitoring survey of NO_2 was undertaken prior to the assessment to establish baseline concentrations. A DMRB modelling assessment was subsequently undertaken to assess operational phase impacts associated with variation in traffic flows at nearby receptors for both NO_2 and PM_{10} concentrations.

Junction Improvements at the M25/M3 junction, Surrey

An Air Quality Assessment of potential impacts associated with improvements to the junction of the M3 with the M25 to relieve congestion and improve journey times and reliability. Detailed dispersion modelling was undertaken using ADMS Roads in order to quantify changes in concentrations of NO_2 and PM_{10} at sensitive receptor locations as a result of the scheme.

Modelling of NO_2 hotspots for a Further Assessment, Coventry

Assessment of six discreet hotspots across Coventry City Council's borough to quantify the magnitude of exceedences of the air quality standard for NO_2, following designation of a city-wide AQMA. In order to represent queues and congestion that were resulting in high concentrations, time varying emissions were modelled in ADMS Roads and results were verified with local monitoring data. Source apportionment was undertaken to establish which sources of NO_2 should be tackled in the Air Quality Action Plan (AQAP) to reduce concentrations.

JETHRO REDMORE

Manager - Air Quality Impact Group

BEng (Hons), MSc, MIAQM, MIEnvSc, AIEMA, CEnv

KEY EXPERIENCE:

Jethro is a Chartered Environmentalist with specialist experience in the air quality and odour sector. His key capabilities include:

- Production and management of Air Quality and Odour Assessments to DEFRA, Environment Agency and EPUK methodologies for a wide-range of clients from the retail, residential, infrastructure, commercial and industrial sectors.
- Significant proportion of assessments produced as part of over-arching Environmental Statements (ES) for large developments throughout the UK.
- Detailed dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS, ADMS-4, 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 EIAs and scoping reports for developments throughout the UK.
- Design and project management of pollutant monitoring campaigns to define baseline conditions and inform future assessment in accordance with DEFRA and Environment Agency guidance.
- Co-ordination and management of large-scale multi-disciplinary projects and submissions.
- Provision of expert advice to local government and international environmental bodies.

PROJECTS SUMMARY:

Residential Developments

Wood St Mill, Bury - Air Quality Assessment for residential development adjacent to scrap metal yard.

Church Way Doncaster - Air Quality Assessment for mixed use scheme adjacent to AQMA.

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

Mill Street, Crewe - Air Quality Assessment for residential development in proximity of 2-AQMAs.

Wheatstone House, London - Air Quality Assessment for mixed use scheme in AQMA.

Elephant and Castle Leisure Centre - baseline Air Quality Assessment for redevelopment.

Poplar Business Park, Tower Hamlets - Air Quality Assessment for residential development.

Bicester Ecotown - dispersion modelling of energy centre for EIA.

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

Temple Point Leeds - Air Quality Assessment for residential development adjacent to M1.

Bury Road, Bury - Air Quality Assessment for residential development in proximity of AQMA.

Commercial and Retail Developments

Wakefield College - redevelopment of city centre campus in AQMA.

Pleckgate School, Blackburn - biomass boiler and odour assessment.

Deptford Terrace, Sunderland - Air Quality Assessment for mixed use development.

Lidl, Honiton - Air Quality Assessment for food store development close to AQMA.

Witton Park School, Blackburn - biomass boiler feasibility assessment.

Manchester Airport Cargo Shed - Air Quality Assessment for commercial development.

Farnworth Superstore - Air Quality Assessment in support of new food superstore.

Basford West, Crewe - mixed use development in proximity of AQMA.

Wild Rose Holiday Park, Cumbria - EIA for holiday park extension.

Coolmore Estates, Seaham - EIA in support of creative centre of excellence.

Morton District Shopping Centre, Carlisle - air quality EIA for commercial development.

Westwood Park, Wigan - air quality EIA for new business park.

Manchester Airport Apron Extension - EIA including aircraft emission modelling.

Preston East - EIA for employment park.

Industrial Developments

Blue Star Fibres, Grimsby - Air Quality Assessment for fibre manufacturing plant adjacent to SPA.

Maesgwyn Biomass Plant - Air Quality Assessment including ecological assessment.

Lynchford Lane Waste Transfer Station - Air Quality Assessment for biomass facility energy recovery plant.

Barnes Wallis Heat and Power, Cobham - Air Quality Assessment for biomass facility adjacent to AQMA.

Countrystyle Biomass Plant, Kent - EIA for biomass facility.

Beddington Heat and Power, London - biomass energy recovery plant.

Brook Bridge Poultry Farm - Ammonia dispersion modelling of quail farm.