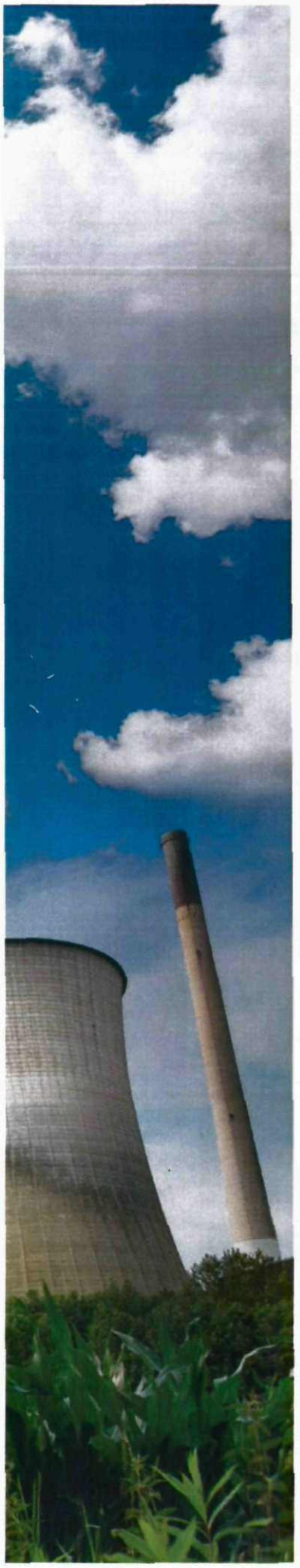
REC

Resource & Environmental Consultants Ltd



Air Quality Assessment
Midland Road, Royston

REC Report: 32941r4
Issued: 30th November 2012

Prepared for: Kier Property Developments Limited

Osprey House, Pacific Quay, Broadway, Manchester, M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk

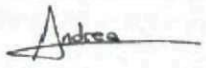
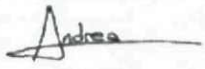
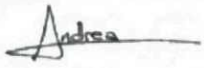
REC Air Quality

SAFEcontractor APPROVED

GREEN ACHIEVER

National Consultancy, Locally Delivered

REPORT ISSUE

Issue/revision	Issue 1	Revision 2	Revision 3	Revision 4
Remarks	Draft for comment	Draft to Local Authority	Final for submission	-
Date	15/10/2012	18/10/2012	15/11/2012	30/11/2012
Prepared by	Andrea Cordon	Andrea Cordon	Andrea Cordon	Andrea Cordon
Signature				
Position	Graduate Air Quality Consultant	Graduate Air Quality Consultant	Graduate Air Quality Consultant	Graduate Air Quality Consultant
Authorised by	Jethro Redmore	Jethro Redmore	Jethro Redmore	Jethro Redmore
Signature				
Position	Air Quality Impact Group Manager	Air Quality Impact Group Manager	Air Quality Impact Group Manager	Air Quality Impact Group Manager
Verified by	Paul Furmston	Paul Furmston	Paul Furmston	Paul Furmston
Signature				
Position	Director	Director	Director	Director
Project number	32941	32941	32941	32941

REC
Resource & Environmental Consultants

EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Kier Property Developments Limited to undertake an Air Quality Assessment in support of a proposed mixed-use development on land off Midland Road, Royston.

The proposed scheme includes the provision of residential and commercial land use, as well as associated car parking, landscaping and infrastructure.

The scheme 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 vehicle exhaust emissions from traffic generated by the development during the operational phase. As such, an Air Quality Assessment was required in order to assess potential impacts as a result of the proposals.

Baseline air quality conditions were defined and potential impacts during the construction and operational phase identified and assessed, as appropriate.

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

Potential impacts during the operational phase of the development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. A detailed assessment was therefore undertaken using dispersion modelling in order to quantify pollution levels with and without the proposals. This indicated impacts on pollutant concentrations were not predicted to be significant at any sensitive location in the vicinity of the site.

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Background 1
1.2 Site Location and Context 1
1.3 Limitations 1

2.0 AIR QUALITY LEGISLATION AND POLICY 2

2.1 European Legislation 2
2.2 UK Legislation 2
2.3 Local Air Quality Management 3
2.4 Dust 3
2.5 National Planning Policy 3
2.6 Local Planning Policy 4

3.0 METHODOLOGY 5

3.1 Predicting Impacts 5
3.2 Construction Phase Assessment 5
3.2.1 Step 1 6
3.2.2 Step 2 6
3.2.3 Step 3 8
3.2.4 Step 4 8
3.3 Operational Phase Assessment 9

4.0 BASELINE 13

4.1 Local Air Quality Management 13
4.2 Air Quality Monitoring 13
4.3 Background Pollutant Concentrations 14
4.4 Sensitive Receptors 14
4.4.1 Dust Receptors 15
4.4.2 Road Vehicle Exhaust Emission Sensitive Receptors 16

5.0 IMPACT ASSESSMENT 19

5.1 Construction Phase Assessment 19
5.1.1 Step 1 19
5.1.2 Step 2 19
5.1.3 Step 3 20
5.1.4 Step 4 21
5.2 Operational Phase Assessment 21
5.2.1 Nitrogen Dioxide 22
5.2.2 Particulate Matter 23
5.2.3 Impact Significance 26

6.0 CONCLUSION 28

7.0 ABBREVIATIONS 29

APPENDICES

Appendix I Figures
Appendix II Assessment Input Data
Appendix III Assessor's Curriculum Vitae

1.0 INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Kier Property Developments Limited to undertake an Air Quality Assessment in support of the hybrid planning application for a proposed mixed-use development on land off Midland Road, Royston.

Sensitive locations could potentially be affected by the proposed development during the construction and operational phases. As such, an Air Quality Assessment was required to quantify potential impacts in the vicinity of the site.

1.2 Site Location and Context

The site is located off Midland Road, Royston, South Yorkshire, at National Grid Reference (NGR): 436300, 411760. Reference should be made to Figure 1 for a location plan.

The hybrid planning application is for a mixed-use development including:

- Detailed planning application for the erection of 143 residential units, supermarket (Use Class A1), petrol filling station, additional parking for Community Campus, public open space, landscaping, access, parking and ancillary works; and,
- Outline application for a Health Centre (Use Class D1) with all matters reserved.

Pre-application consultation with Barnsley Metropolitan Borough Council (BMBC) indicated a requirement for an Air Quality Assessment in order to quantify potential impacts as a result of the development in the vicinity of the site. Impacts may occur due to fugitive dust emissions from the site during the construction phase and as a result of road vehicle exhaust emissions associated with traffic generated by the development during the operational phase. These have therefore been assessed in the following report.

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) and 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 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 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

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 report:

> "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 report.

2.6 Local Planning Policy

Barnsley's Local Development Framework (LDF) consists of a series of planning documents of which the Core Strategy[3] is the most important. The Core Strategy was adopted in 2011 and sets out the spatial vision, objectives, development strategy and a series of key policies that will guide the scale, location and type of development in the borough over the next 15 - 20 years. As such, the policies contained within the Core Strategy provide the current basis for the determination of planning applications within BMBC's area of jurisdiction.

A review of the Core Strategy indicated the following policies in relation to air quality that are relevant to this assessment:

"Policy CSP 28 - Reducing the Impact of Road Travel

We will reduce the impact of road travel by:

- developing and implementing robust, evidence based air quality action plans to improve air quality..."

"Policy 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."

These policies have been considered throughout this report by assessing potential air quality impacts as a result of the proposed development.

---

[3] Barnsley Core Strategy, Barnsley Metropolitan Borough Council, 2011.

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.

3.1 Predicting Impacts

The assessment of each potential air quality impact has been undertaken using the same approach:

- Identification of receptors sensitive to potential air quality impact;
- Identification of the sensitivity of the receptor;
- Assessment of the potential change in air quality as a result of the development;
- Assessment of the potential significance of impact based on the interaction between receptor sensitivity and potential change; and,
- Identification of suitable mitigation options to reduce the significance of predicted impacts.

3.2 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 four types to reflect their different potential impacts. These are:

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

It should be noted that as the previously existing school buildings have already been cleared demolition works will not be necessary as part of the proposals. As such, potential impacts associated with this activity have not been considered further in the context of this assessment.

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.

---

[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.

3.2.1 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.

3.2.2 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 determined the magnitude of dust arising as: small, medium or large; and,
- The proximity of receptors, considered separately for ecological and human receptors.

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

Magnitude	Activity	Criteria
	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
	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

3.2.3 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].

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

3.2.4 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

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

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
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 (less than 75%) • 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 and 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.

3.3 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

[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.

the site. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations for the following scenarios:

- Opening year (2013) do-minimum (predicted traffic flows in the anticipated year of opening should the development not proceed); and,
- Opening year (2013) do-something (predicted traffic flows in the anticipated year of opening should the development be completed).

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 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 • More than 35-days with PM_{10} concentrations greater than 50µg/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 • 32 to 35-days with PM_{10} concentrations greater than 50µg/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 • 26 to 32-days with PM_{10} concentrations greater than 50µg/m^3

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

Sensitivity	Description
Low	Pollutant levels below 75% of environmental assessment criteria e.g. • NO_2 or PM_{10} annual mean below 30µg/m^3 • Less than 26-days with PM_{10} concentrations greater than 50µg/m^3

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

Table 8 Operational Traffic Exhaust Emissions - Magnitude of Change

Magnitude of Change	Change in Pollutant Level as Proportion of Assessment Criteria (%)	Change in Number of Days with PM_{10} Concentrations Greater than 50µg/m^3 (days)
Large	Greater than 10	Greater than 4
Medium	5 - 10	2 - 4
Small	1 - 5	1 - 2
Imperceptible	Less than 1	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.

Table 9 Operational Traffic Exhaust Emissions - 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:

[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.

- 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.

[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 site 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, the closest of which to the proposed development site is described as:

> "Barnsley AQMA No.3. - An area encompassing the junction of the A61 Wakefield Road and Burton Road."

The development is located approximately 4km north-east of AQMA No.3. Due to the distance between the sites, potential impacts on NO_2 concentrations within the AQMA have not been considered in 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 techniques throughout their area of jurisdiction. A review of the most recent LAQM report[13] indicated the closest continuous monitor to the proposed development is Barnsley Royston at NGR: 437208, 411675. This is approximately 760m east of the site boundary at an urban industrial location. The pollutants currently monitored at this site are sulphur dioxide and PM_{10}. Recent PM_{10} monitoring results are shown in Table 10 and Table 11.

Table 10 Barnsley Royston- Annual Mean PM_{10} Monitoring Results

Site	Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
	2009	2010	2011
Barnsley Royston	21	20	22

Table 11 Barnsley Royston - 24-hour Mean PM_{10} Monitoring Results

Site	Number of Exceedences of 50$\mu g/m^3$ (days)		
	2009	2010	2011
Barnsley Royston	8	11	19

As shown in Table 10, there were no exceedences of the annual mean or 24-hour mean

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

AQLVs for PM_{10} at the Barnsley Royston monitoring site during recent years.

Concentrations of NO_2 were monitored at the Barnsley Royston site until 2008. Monitoring results are shown in Table 12.

Table 12 Barnsley Royston - Annual Mean NO_2 Monitoring Results

Site	Annual Mean NO_2 Concentration ($\mu g/m^3$)		
	2006	2007	2008
Barnsley Royston	26	25	21

As shown in Table 12, there were no exceedences of the annual mean AQLV for NO_2 at the Barnsley Royston monitoring site from 2006 to 2008.

BMBC also utilise passive diffusion tubes to monitor NO_2 concentrations throughout the borough. The closest of these to the proposals is located approximately 3.6km south-east of the development boundary. Due to the distance between the sites, similar pollutant concentrations would not be anticipated. As such, this source of data has not been considered further in the context of this assessment.

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 site is located in grid square NGR: 436500, 411500. Data for this location was downloaded from the DEFRA website[14] for the purpose of this assessment and is summarised in Table 13.

Table 13 Predicted Background Pollutant Concentrations

Pollutant	Predicted 2012 Background Concentration ($\mu g/m^3$)
NO_x	21.08
NO_2	15.01
PM_{10}	15.21

As indicated in Table 13, background pollutant concentrations at the development site are low and, as such, a significant increase in emissions would be required to result in air quality impacts.

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.

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

4.4.1 Dust 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 14.

Table 14 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	100 - 500	0
50 - 100	100 - 500	0
100 - 350	More than 500	0

Reference should be made to Figure 2 for a graphical representation of earthworks and construction dust sensitive locations. The closest receptors to the development are located to the north-west of the boundary off Common Lane, to the north-east off Ruston Drive and to the south off Midland Road. There is also an existing food store to the south-east and a leisure centre to the west. There is vegetative screening around part of the site boundary which would provide some abatement of dust emissions.

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 15.

Table 15 Trackout Dust Sensitive Receptors

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

Reference should be made to Figure 3 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 is considered to be **medium**. Although there are between 10 - 100 dwellings within 20m of the site boundary, local PM_{10} concentrations are well below the AQLVs and there is vegetative screening around part of the site boundary which would contribute to some reduction of dust emissions. Additionally, there are no ecological designations within the assessment extents.

4.4.2 Road Vehicle Exhaust Emission Sensitive Receptors

Receptors sensitive to potential road vehicle exhaust emission impacts were identified from a desk-top study and are summarised in Table 16. The receptor height was defined at the lowest potential level of exposure in order to allow consideration of other uses, such as commercial units, at lower floor level.

Table 16 Road Vehicle Exhaust Emission Sensitive Receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	Residential - Station Rd	436023	411754	1.5
R2	Residential - Station Rd	436051	411638	1.5
R3	Residential - Station Rd	436160	411468	1.5
R4	Residential - Church St	436197	411452	4.5
R5	Residential - High St	436143	411387	1.5
R6	Residential - Midland Rd	436247	411484	1.5
R7	Residential - Midland Rd	436341	411550	1.5
R8	Residential - Midland Rd	436470	411620	1.5
R9	Residential - Midland Rd	436582	411669	1.5
R10	Residential - The Lane	436436	411727	1.5
R11	Residential - Southern site access	436297	411543	1.5
R12	Residential - Church St	436211	411408	1.5

The sensitive receptors identified in Table 16 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 4 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Receptor sensitivity to changes in annual mean NO_2 and PM_{10} levels was defined based upon the methodology outlined in Table 7 and predicted pollutant concentrations for the development opening year of 2013. These are detailed within Table 17.

Table 17 Road Vehicle Exhaust Emission Receptor Sensitivity

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity
R1	23.30	Low	22.42	Low

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity	Predicted Annual Mean Concentration ($\mu g/m^3$)	Sensitivity
R2	23.49	Low	22.45	Low
R3	26.72	Low	22.84	Low
R4	24.57	Low	22.53	Low
R5	26.40	Low	22.83	Low
R6	26.74	Low	22.89	Low
R7	25.71	Low	22.76	Low
R8	29.55	Low	23.33	Low
R9	24.85	Low	22.62	Low
R10	25.46	Low	22.74	Low
R11	26.34	Low	22.89	Low
R12	26.13	Low	22.83	Low

As indicated in Table 17, receptor sensitivity to changes in annual mean NO_2 and PM_{10} concentrations was **low** at all locations.

Receptor sensitivity to changes in the number of days with PM_{10} concentrations greater than $50\mu g/m^3$ was defined based upon the methodology outlined in Table 7 and the predicted number of exceedences of the 24-hour mean AQLV for the development opening year of 2013. These are detailed within Table 18.

Table 18 Road Vehicle Exhaust Emission Receptor Sensitivity

Receptor	Number of Days with PM_{10} Concentrations Greater than $50\mu g/m^3$	Sensitivity
R1	7	Low
R2	7	Low
R3	8	Low
R4	7	Low
R5	8	Low
R6	8	Low
R7	8	Low
R8	9	Low
R9	7	Low

Receptor	Number of Days with PM_{10} Concentrations Greater than 50µg/m^3	Sensitivity
R10	8	Low
R11	8	Low
R12	8	Low

As indicated in Table 18, receptor sensitivity to changes in the number of days with PM_{10} concentrations greater than 50µg/m^3 was **low** at all locations.

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 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.

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.

As indicated in Table 13, background PM_{10} concentrations at the development site are low and a significant increase in emissions would be required to result in AQLV exceedences.

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 covers an area of 71,200m^2 (7.12ha). In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions is therefore **large**. Table 14 indicates there are 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

It is likely that a potentially dusty construction material will be utilised for the development and the total building volume will be greater than 100,000m^3. In accordance with the criteria outlined in Table 2, the magnitude of potential dust emissions from construction is therefore **large**. Table 14 indicates there are 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 was not available for this assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it was assumed 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 15 indicates there are a number of sensitive receptors within 20m of the local road 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 potential risk from each dust generating activity is provided in Table 19.

Table 19 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 19, 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 has been 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 20. 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 20 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 • All site personnel to be fully trained • Trained and responsible manager on site during working times to maintain logbook and carry out site inspections • Hard surface site haul routes
Construction traffic	• All vehicles to switch off engines - no idling vehicles • Effective cleaning and specific fixed 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 • 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 4.4.1, the receiving environment is considered to be of **medium** sensitivity to potential dust impacts. As such, assuming the relevant mitigation measures outlined in Table 20 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 proposed development will generate exhaust emissions, such as NO_2 and PM_{10}, on the local and regional road networks. An assessment of operational phase road vehicle exhaust emissions was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

The assessment considered the following scenarios:

- Do-minimum; and,
- Do-something.

The "do-minimum" (i.e. without development) scenario is representative of baseline traffic data for 2013. The "do-something" scenario is representative of baseline traffic data for 2013 in addition to predicted operational traffic associated with the proposals.

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 21. Reference should be made to Figure 5 and Figure 6 for graphical representations of predicted levels throughout the assessment extents with and without the development.

Table 21 Predicted Annual Mean NO_2 Concentrations

Sensitive Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R1	Residential - Station Rd	23.11	23.30	0.19
R2	Residential - Station Rd	23.27	23.49	0.22
R3	Residential - Station Rd	26.19	26.72	0.53
R4	Residential - Church St	24.17	24.57	0.40
R5	Residential - High St	25.92	26.40	0.48
R6	Residential - Midland Rd	25.57	26.74	1.17
R7	Residential - Midland Rd	25.01	25.71	0.70
R8	Residential - Midland Rd	28.01	29.55	1.54
R9	Residential - Midland Rd	24.46	24.85	0.39
R10	Residential - The Lane	24.14	25.46	1.32
R11	Residential - Southern site access	24.64	26.34	1.70
R12	Residential - Church St	25.72	26.13	0.41

As indicated in Table 21, predicted concentrations of NO_2 were below the relevant AQLV at all sensitive receptors for both scenarios considered.

Predicted impacts on annual mean NO_2 concentrations are summarised in Table 22.

Table 22 Predicted NO_2 Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - Station Rd	Imperceptible	Low	Negligible
R2	Residential - Station Rd	Imperceptible	Low	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R3	Residential - Station Rd	Small	Low	Negligible
R4	Residential - Church St	Imperceptible	Low	Negligible
R5	Residential - High St	Small	Low	Negligible
R6	Residential - Midland Rd	Small	Low	Negligible
R7	Residential - Midland Rd	Small	Low	Negligible
R8	Residential - Midland Rd	Small	Low	Negligible
R9	Residential - Midland Rd	Imperceptible	Low	Negligible
R10	Residential - The Lane	Small	Low	Negligible
R11	Residential - Southern site access	Small	Low	Negligible
R12	Residential - Church St	Small	Low	Negligible

As indicated in Table 22, predicted impacts on annual mean NO_2 concentrations as a result of the development were **negligible** at all locations.

5.2.2 Particulate Matter

Annual Mean Concentrations

Annual mean PM_{10} concentrations were predicted for each scenario and are summarised in Table 23. Reference should be made to Figure 7 and Figure 8 for graphical representations of predicted levels throughout the assessment extents with and without the development.

Table 23 Predicted Annual Mean PM_{10} Concentrations

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R1	Residential - Station Rd	22.38	22.42	0.04
R2	Residential - Station Rd	22.41	22.45	0.04
R3	Residential - Station Rd	22.76	22.84	0.08
R4	Residential - Church St	22.47	22.53	0.06
R5	Residential - High St	22.75	22.83	0.08
R6	Residential - Midland Rd	22.70	22.89	0.18
R7	Residential - Midland Rd	22.64	22.76	0.12
R8	Residential - Midland Rd	23.07	23.33	0.26
R9	Residential - Midland Rd	22.55	22.62	0.07

Sensitive Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
		Do-minimum	Do-something	Change
R10	Residential - The Lane	22.51	22.74	0.23
R11	Residential - Southern site access	22.58	22.89	0.31
R12	Residential - Church St	22.77	22.83	0.07

As indicated in Table 23, predicted PM_{10} concentrations were below the relevant AQLV at all sensitive receptors for both scenarios considered.

Predicted impacts on annual mean PM_{10} concentrations are summarised in Table 24.

Table 24 Predicted Annual Mean PM_{10} Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - Station Rd	Imperceptible	Low	Negligible
R2	Residential - Station Rd	Imperceptible	Low	Negligible
R3	Residential - Station Rd	Imperceptible	Low	Negligible
R4	Residential - Church St	Imperceptible	Low	Negligible
R5	Residential - High St	Imperceptible	Low	Negligible
R6	Residential - Midland Rd	Imperceptible	Low	Negligible
R7	Residential - Midland Rd	Imperceptible	Low	Negligible
R8	Residential - Midland Rd	Imperceptible	Low	Negligible
R9	Residential - Midland Rd	Imperceptible	Low	Negligible
R10	Residential - The Lane	Imperceptible	Low	Negligible
R11	Residential - Southern site access	Imperceptible	Low	Negligible
R12	Residential - Church St	Imperceptible	Low	Negligible

As indicated in Table 24, predicted impacts on annual mean PM_{10} concentrations as a result of the development were **negligible** at all locations.

24-hour Mean Concentrations

The number of days with PM_{10} concentrations greater than $50\mu g/m^3$ was predicted for each scenario and is summarised in Table 25.

Table 25 Predicted Number of Days with PM_{10} Concentrations Greater than 50µg/m^3

Sensitive Receptor		Number of Days with PM_{10} Concentrations Greater than 50µg/m^3		
		Do-minimum	Do-something	Change
R1	Residential - Station Rd	7	7	0
R2	Residential - Station Rd	7	7	0
R3	Residential - Station Rd	8	8	0
R4	Residential - Church St	7	7	0
R5	Residential - High St	8	8	0
R6	Residential - Midland Rd	8	8	0
R7	Residential - Midland Rd	7	8	1
R8	Residential - Midland Rd	8	9	1
R9	Residential - Midland Rd	7	7	0
R10	Residential - The Lane	7	8	1
R11	Residential - Southern site access	7	8	1
R12	Residential - Church St	8	8	0

As indicated in Table 25, the predicted number of days with PM_{10} concentrations greater than 50µg/m^3 was less than the 35 permitted at all sensitive receptors for both scenarios considered.

Predicted impacts on the 24-hour mean AQLV for PM_{10} are summarised in Table 26.

Table 26 Predicted 24-hour Mean PM_{10} Impacts

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R1	Residential - Station Rd	Imperceptible	Low	Negligible
R2	Residential - Station Rd	Imperceptible	Low	Negligible
R3	Residential - Station Rd	Imperceptible	Low	Negligible
R4	Residential - Church St	Imperceptible	Low	Negligible
R5	Residential - High St	Imperceptible	Low	Negligible
R6	Residential - Midland Rd	Imperceptible	Low	Negligible
R7	Residential - Midland Rd	Imperceptible	Low	Negligible
R8	Residential - Midland Rd	Imperceptible	Low	Negligible
R9	Residential - Midland Rd	Imperceptible	Low	Negligible

Sensitive Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
R10	Residential - The Lane	Imperceptible	Low	Negligible
R11	Residential - Southern site access	Imperceptible	Low	Negligible
R12	Residential - Church St	Imperceptible	Low	Negligible

As indicated in Table 26, predicted impacts on the 24-hour mean AQLV for PM_{10} as a result of the development were **negligible** at all locations.

It should be noted that the predicted number of days with PM_{10} concentrations greater than 50µg/m^3 was calculated using the methodology outlined in DEFRA guidance LAQM.TG(09), as detailed in Appendix II. As such, these are lower than the monitoring results obtained from the Barnsley Royston analyser during 2011. However, even if a baseline value of 19-days was utilised, the magnitude of change and receptor sensitivity would not vary, resulting in the same predicted impact significance.

5.2.3 Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the most significant predicted impact at discrete receptor locations and the considerations outlined in Section 3.3. Further justification is provided in Table 27.

Table 27 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 receptors. These represent worst-case locations and therefore it is unlikely that any other sensitive receptors would be significantly affected by the proposed development
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 site will not result in any new exposure to NO_2 or PM_{10} concentrations above the AQLVs
The magnitude of changes and the descriptions of the impacts at the receptors	A small increase in annual mean NO_2 concentrations was predicted at a number of locations. However, this was not considered to be significant due to the relatively low pollutant levels within Royston
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 predicted exceedences of the annual mean AQLV for NO_2 at non-sensitive locations within the study area both with and without the development. It is not considered the area of exceedence will substantially increase as a result of the proposals

Guidance	Comment
Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced	The area of exceedence is 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 no predicted exceedences of the relevant AQLVs at any sensitive receptor location in the do-minimum or do-something scenarios

6.0 CONCLUSION

REC Ltd was commissioned by Kier Property Developments Limited to undertake an Air Quality Assessment in support of a proposed mixed-use development on land off Midland Road, Royston.

The scheme has the potential to cause air quality impacts at sensitive locations during the construction and operational phases. This may include fugitive dust emissions associated with construction works and road vehicle exhaust emissions from traffic generated by the development during the operational phase. As such, an Air Quality Assessment was required in order to assess potential impacts as a result of the development.

An assessment of fugitive dust emissions during the construction phase was undertaken 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**.

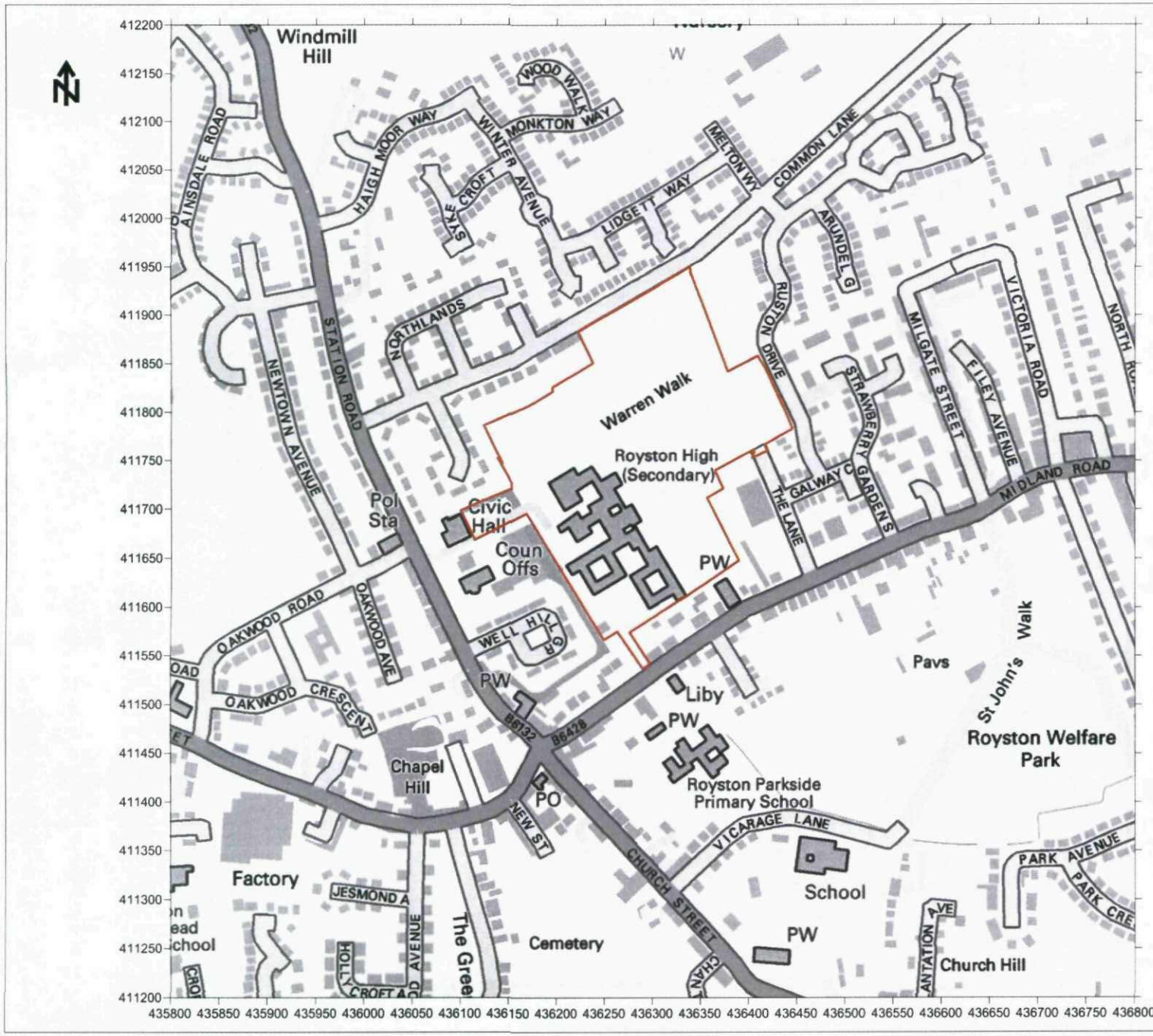
Dispersion modelling was undertaken in order to quantify NO_2 and PM_{10} concentrations in the vicinity of the site with and without the proposals and predict air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from BMBC.

Impacts on NO_2 and PM_{10} levels 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. The overall significance of potential impacts was determined to be **negligible**, in accordance with the EPUK guidance.

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 Objectives
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
DMRB	Design Manual for Roads and Bridges
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LDF	Local Development Framework
LDV	Light Duty Vehicle
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
$PM_{2.5}$	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
z_0	Roughness length

APPENDIX I FIGURES



Legend

Site Boundary

Title

Figure 1 - Site Location Plan

Project

Air Quality Assessment
Midland Road, Royston

Project Number

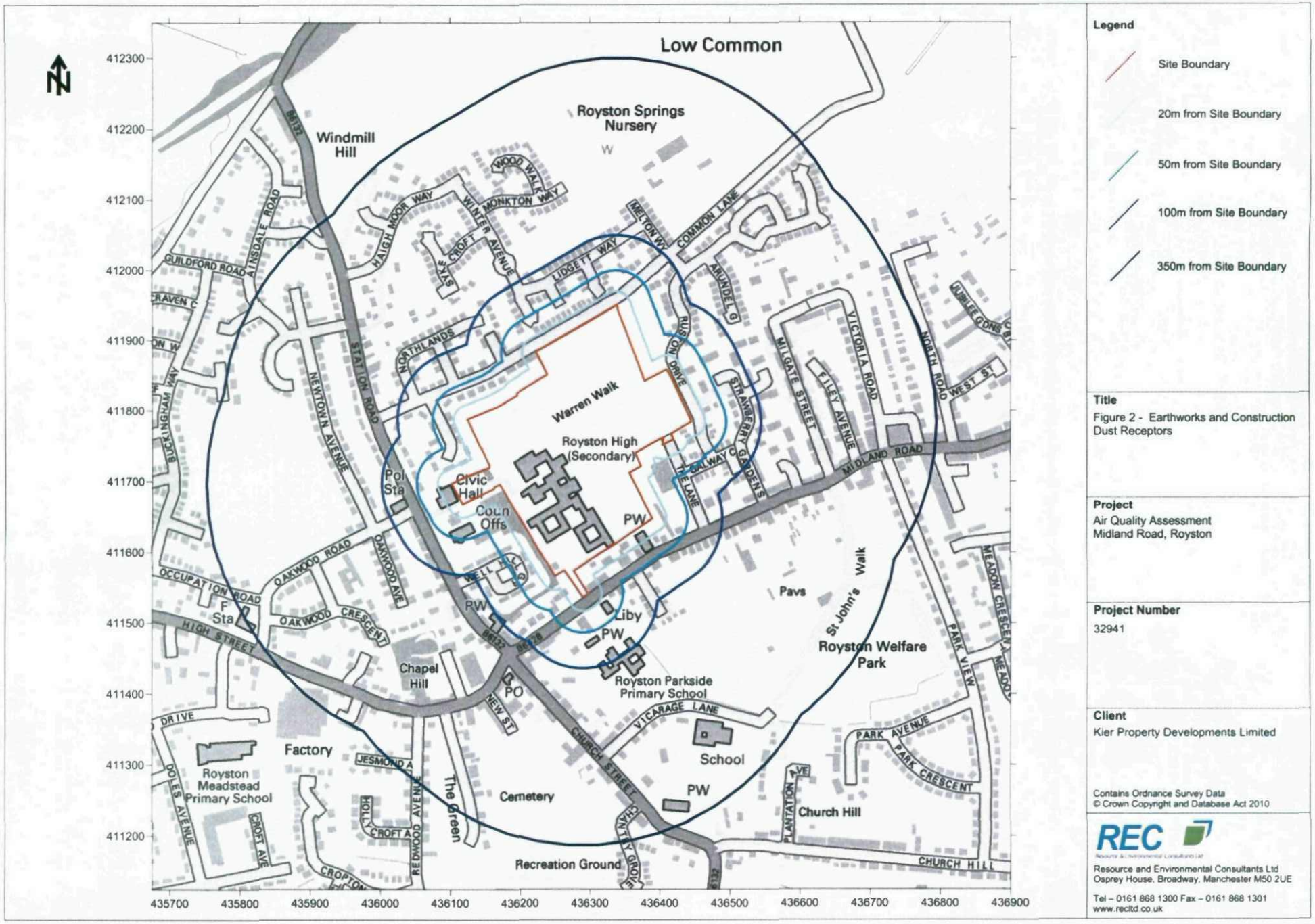
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

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

Title

Figure 2 - Earthworks and Construction Dust Receptors

Project

Air Quality Assessment
Midland Road, Royston

Project Number

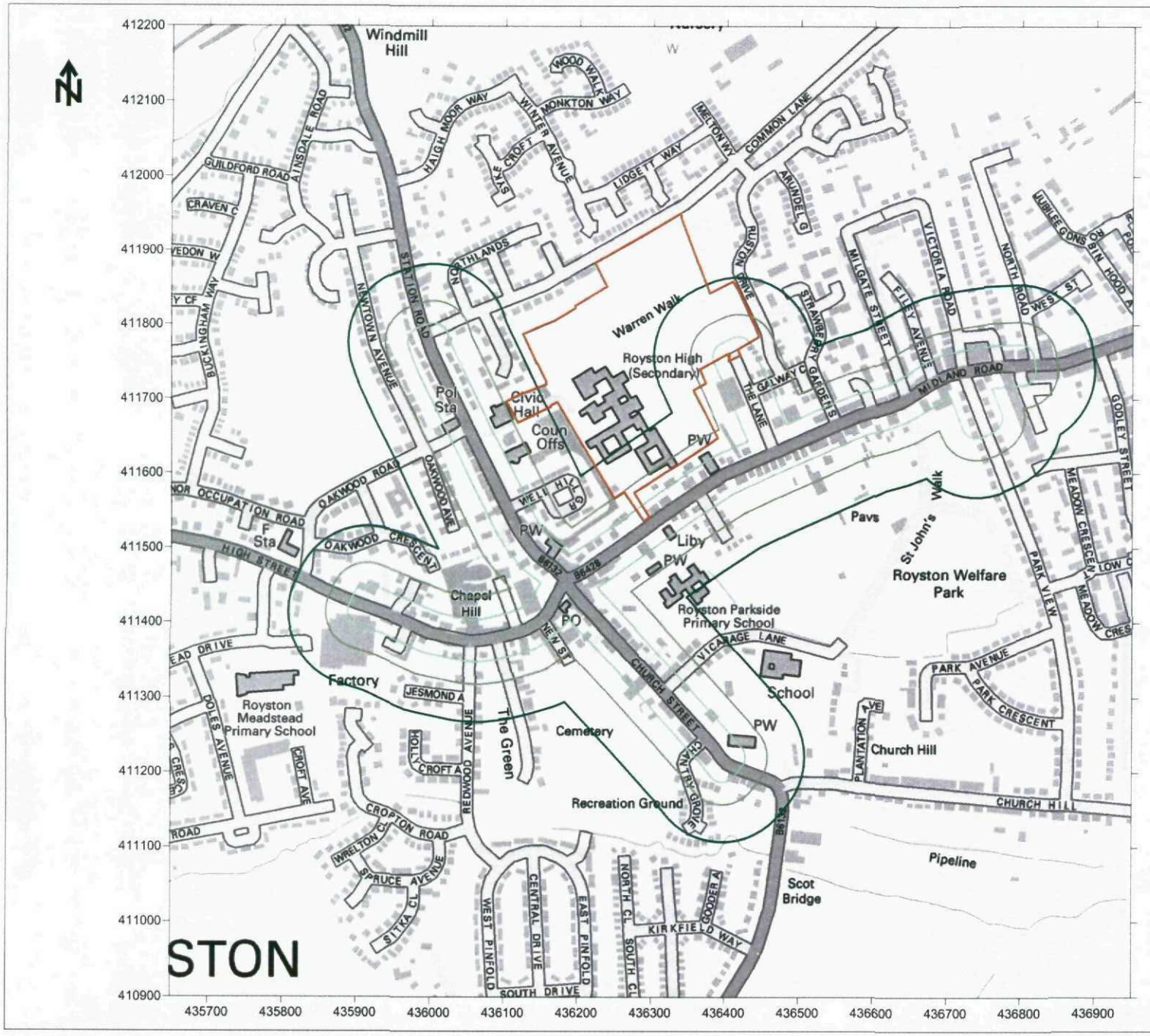
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

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

Title
Figure 3 - Trackout Dust Receptors

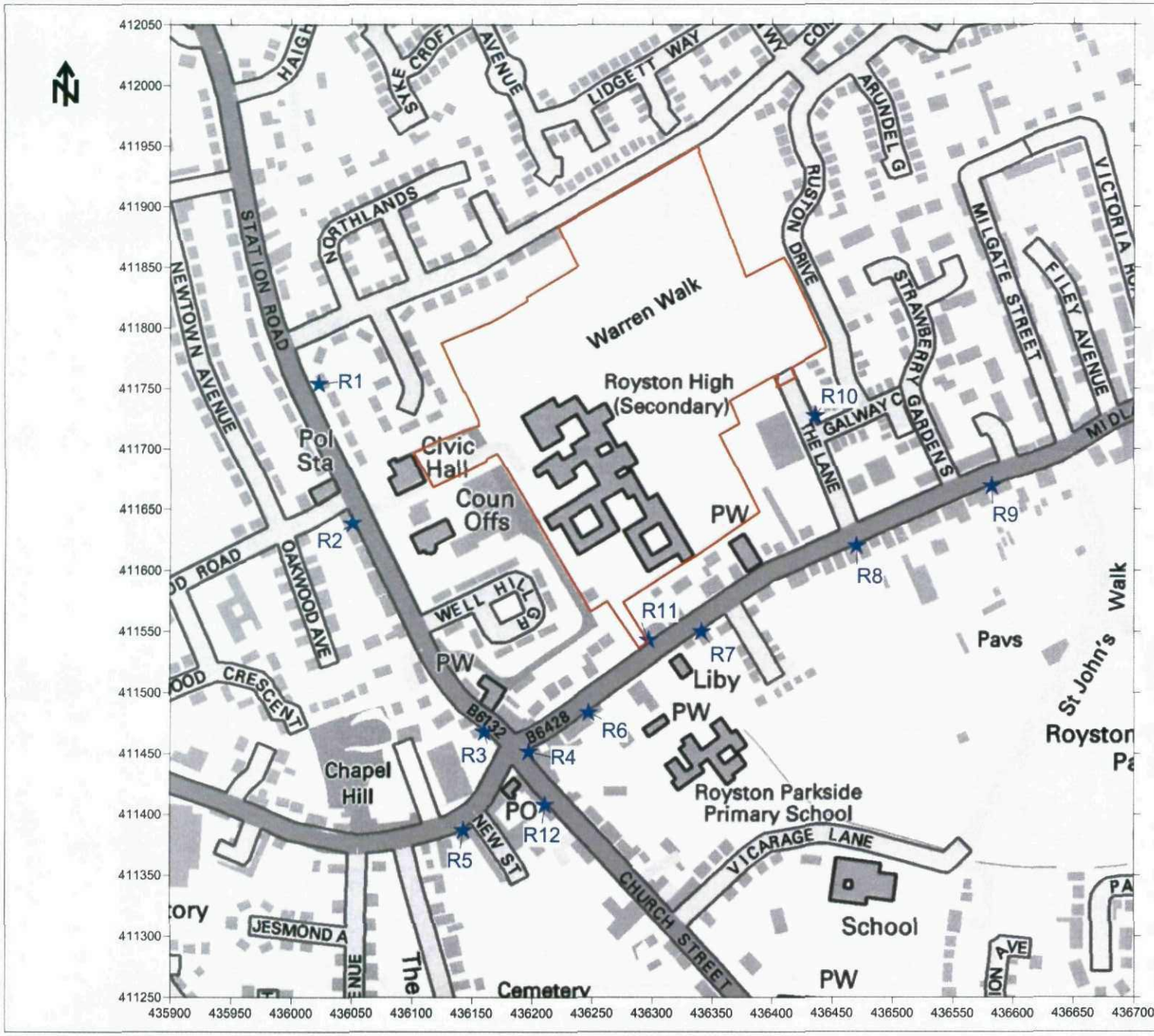
Project
Air Quality Assessment
Midland Road, Royston

Project Number
32941

Client
Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource & Environmental Consultants Ltd
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

Site Boundary

Sensitive Receptor

Title

Figure 4 - Road Vehicle Exhaust Emission Sensitive Receptor Locations

Project

Air Quality Assessment
Midland Road, Royston

Project Number

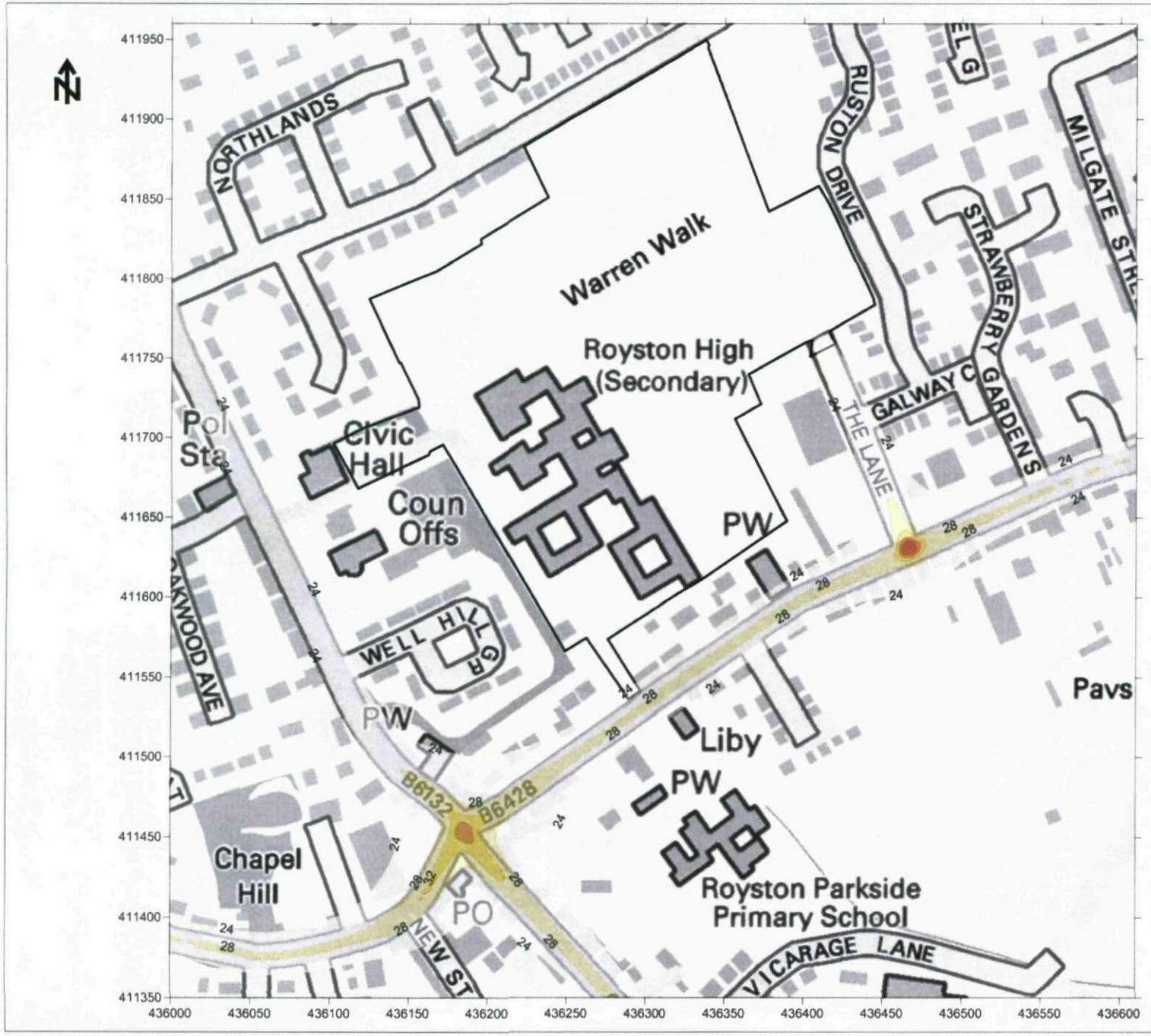
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

Site Boundary

40
36
32
28
24

Predicted Annual Mean NO2 Concentration (µg/m3)

Title

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

Project

Air Quality Assessment
Midland Road, Royston

Project Number

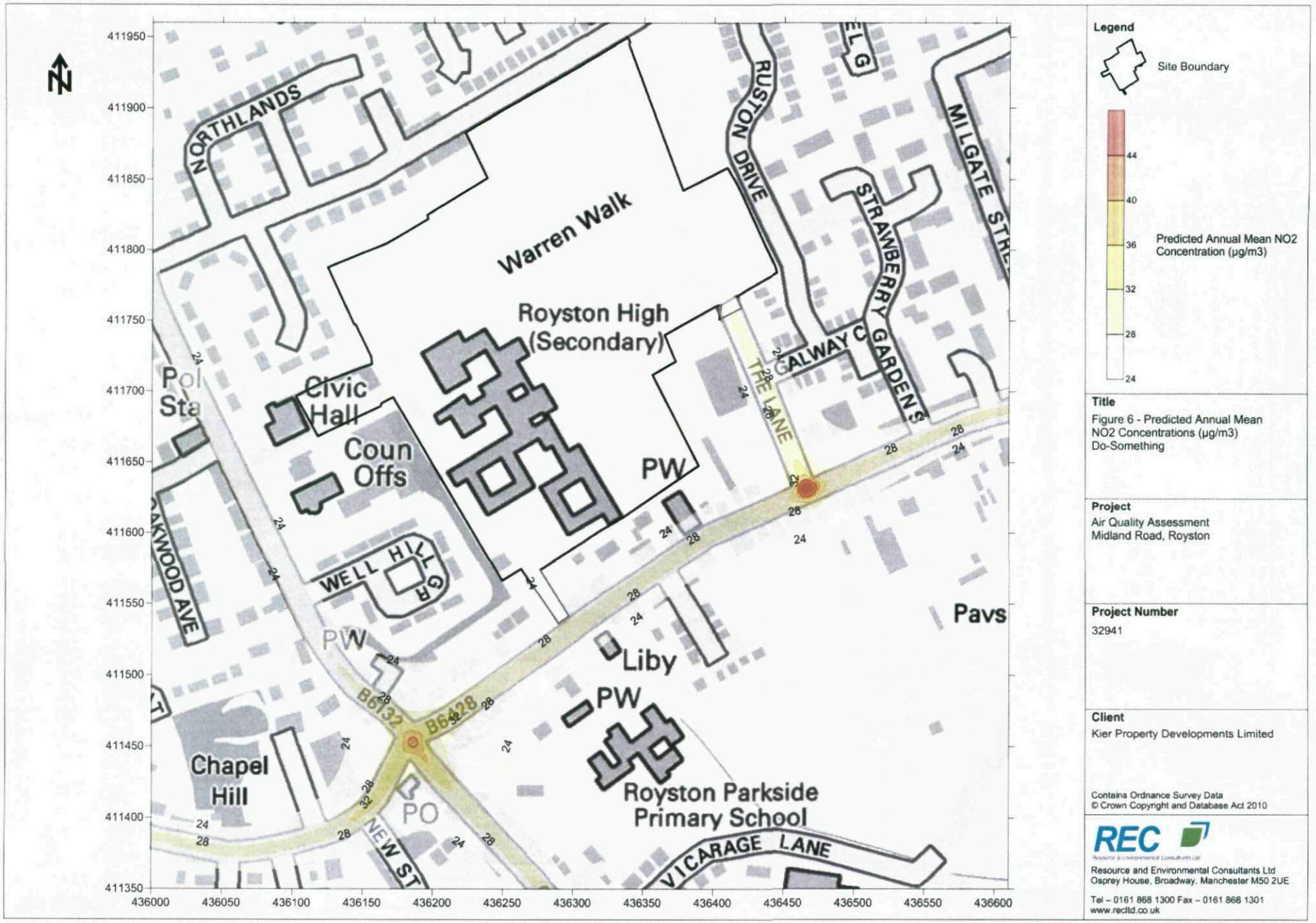
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Title

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

Project

Air Quality Assessment
Midland Road, Royston

Project Number

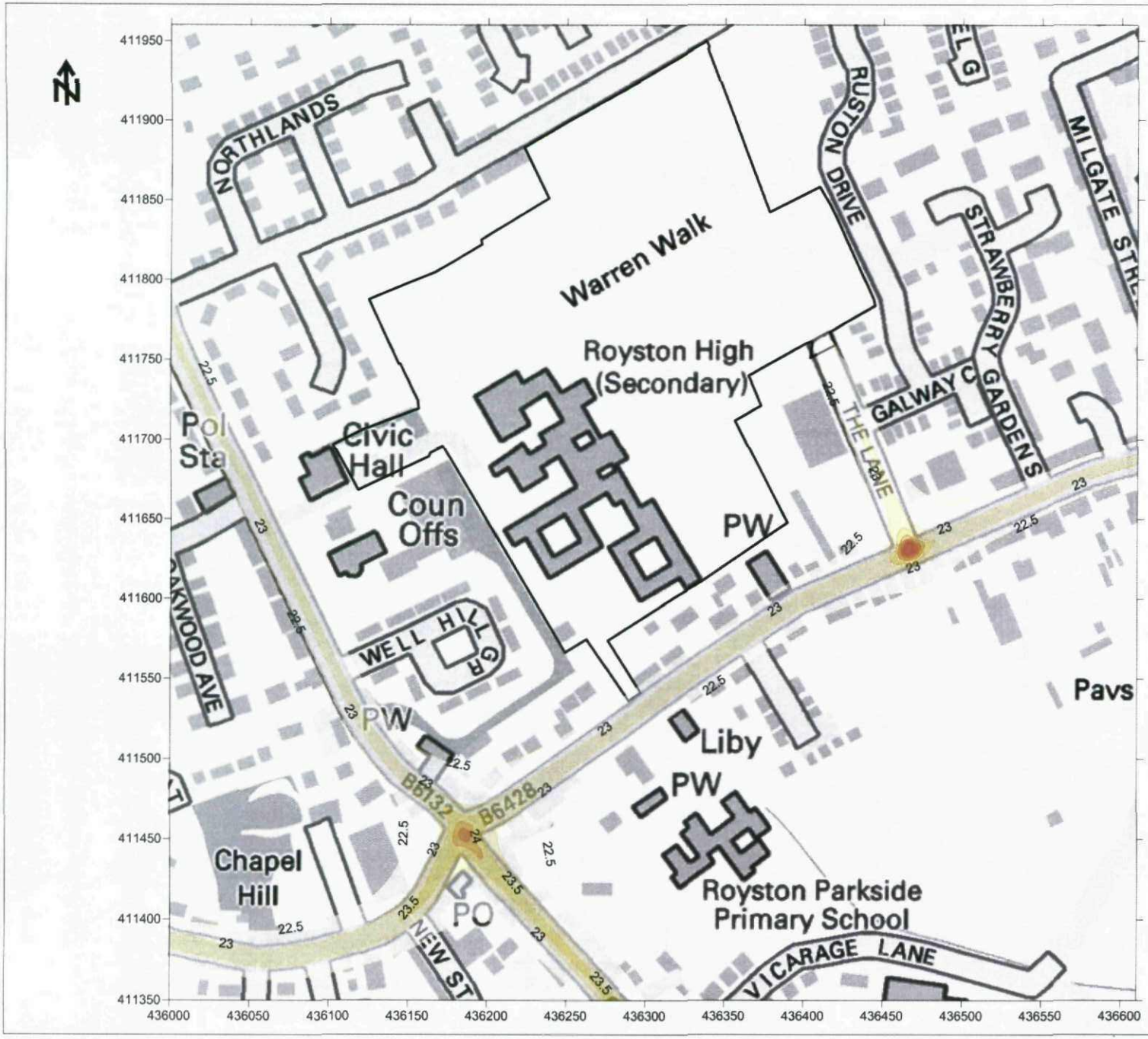
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.rectld.co.uk



Title

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

Project

Air Quality Assessment
Midland Road, Royston

Project Number

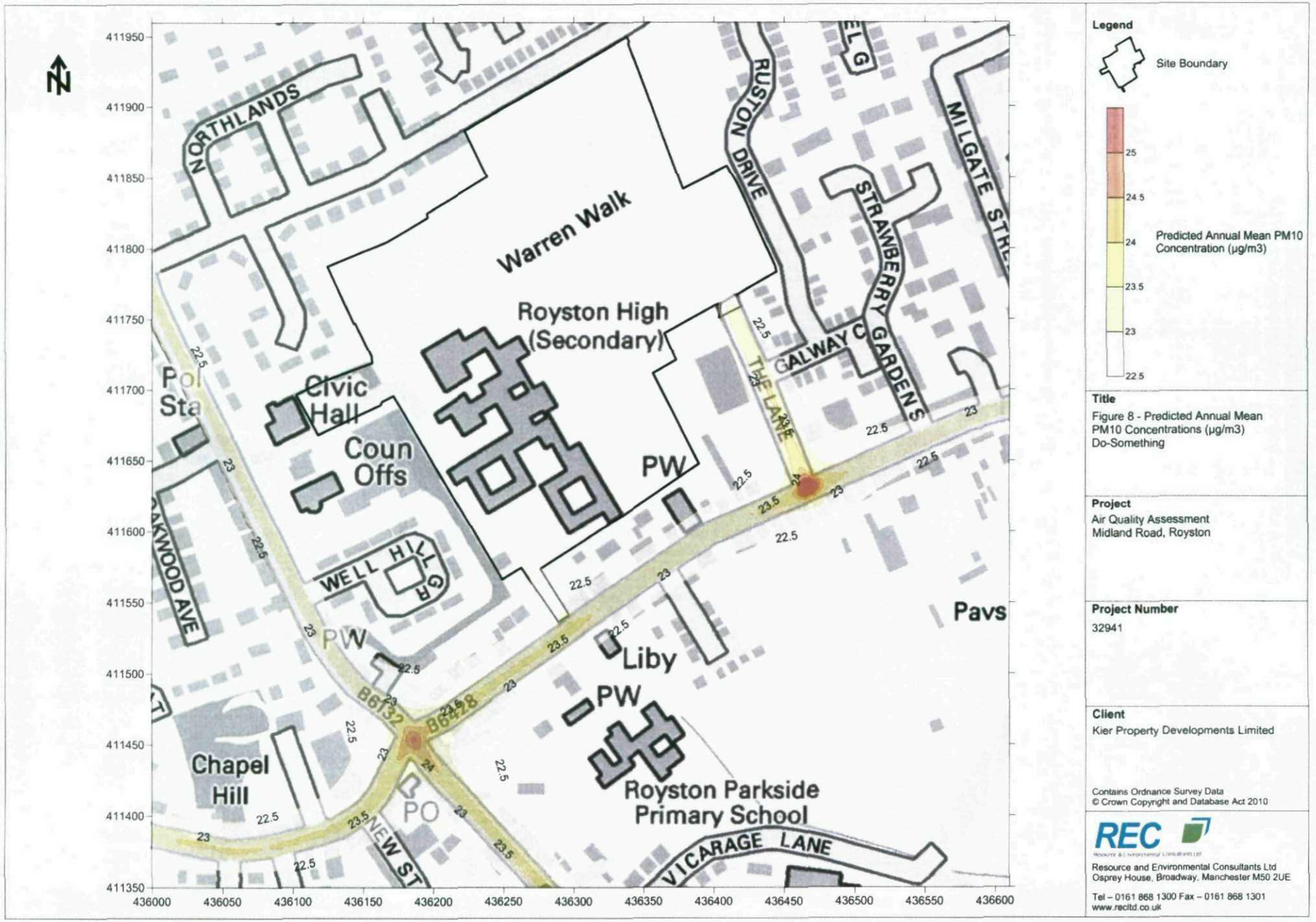
32941

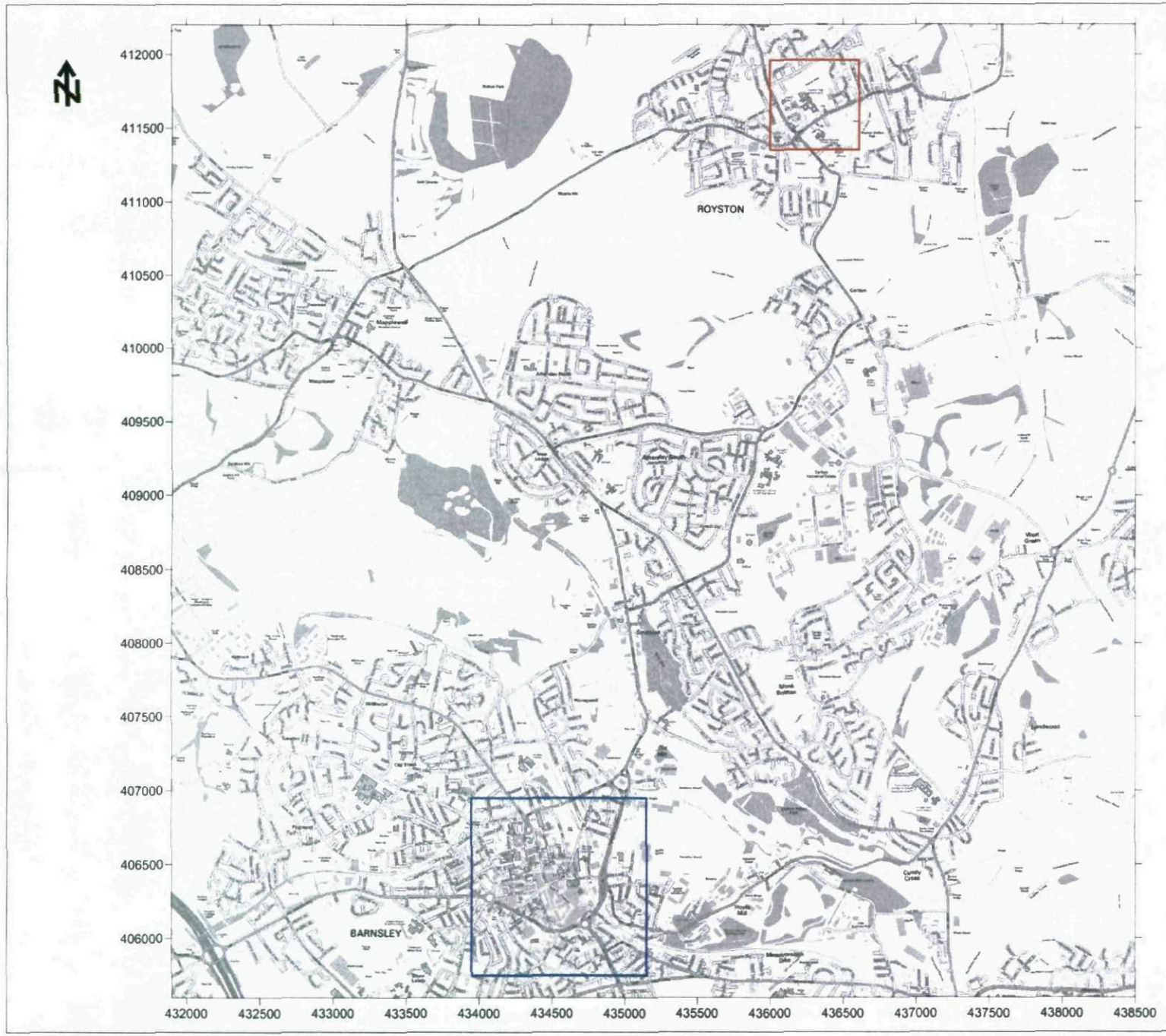
Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk


Warren Walk
Royston High (Secondary)
Civic Hall
Coun Offs
Pol Sta
PW
WELL HILL GR
OAKWOOD AVE
THE LANE
GALWAY CL
STRAWBERRY GARDENS
RUSTON DRIVE
MILLGATE STRE
Liby
Pavs
B6132
B6428
Chapel Hill
PO
NEW ST
Royston Parkside Primary School
VICARAGE LANE
NORTHLANDS
411950
411900
411850
411800
411750
411700
411650
411600
411550
411500
411450
411400
411350
436000
436050
436100
436150
436200
436250
436300
436350
436400
436450
436500
436550
436600
Legend
Site Boundary
25
24.5
24
23.5
23
22.5
Predicted Annual Mean PM10 Concentration (µg/m3)
Title
Figure 8 - Predicted Annual Mean PM10 Concentrations (µg/m3) Do-Something
Project
Air Quality Assessment
Midland Road, Royston
Project Number
32941
Client
Kier Property Developments Limited
Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010
REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.reclt.co.uk



Legend

Verification

Development Site

Title

Figure 9 - Assessment Areas

Project

Air Quality Assessment
Midland Road, Royston

Project Number

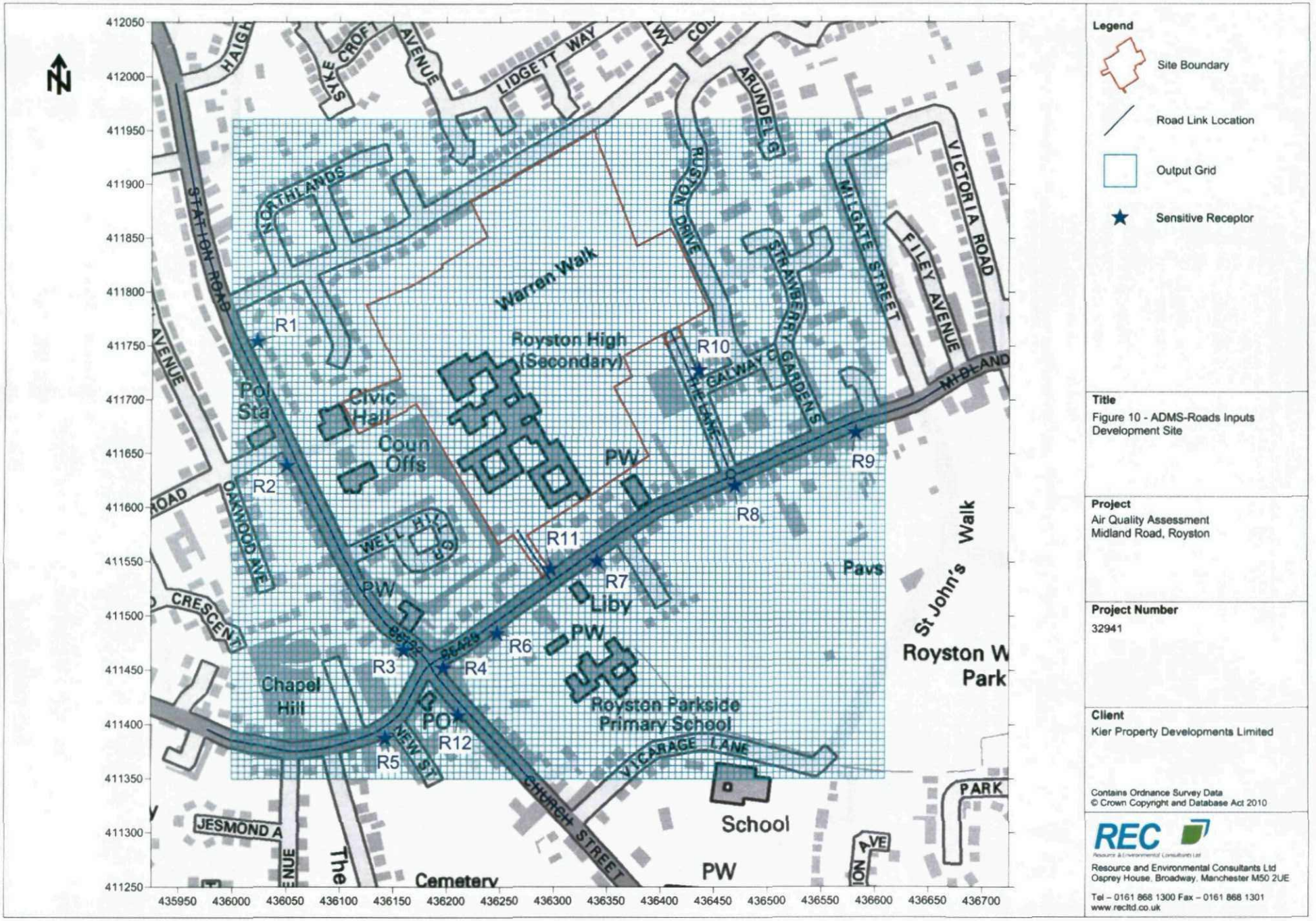
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

- Site Boundary
- Road Link Location
- Output Grid
- Sensitive Receptor

Title

Figure 10 - ADMS-Roads Inputs
Development Site

Project

Air Quality Assessment
Midland Road, Royston

Project Number

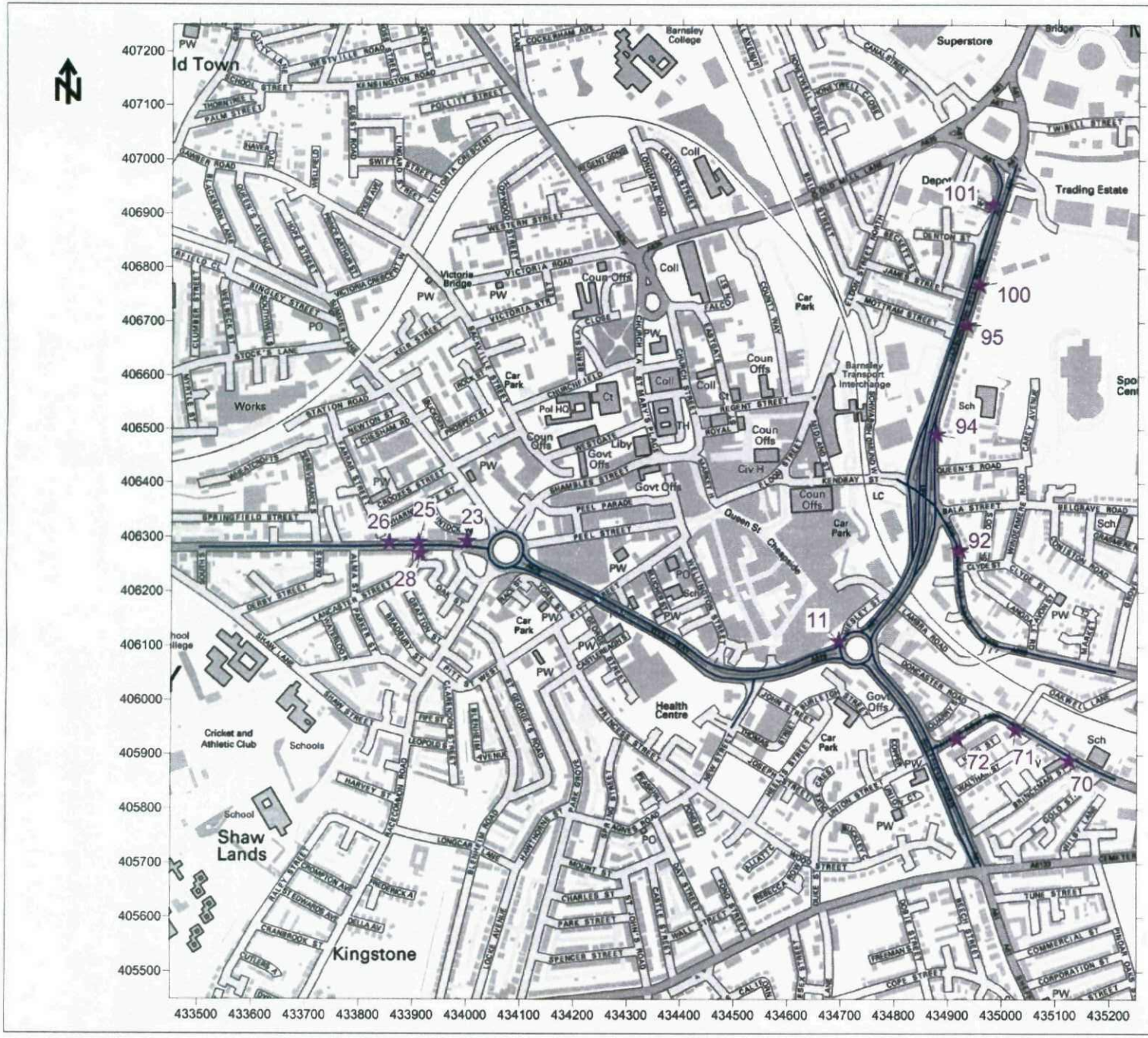
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.rectd.co.uk



Legend

Road Link Location

Diffusion Tube Location

Title

Figure 11 - ADMS-Roads Inputs Verification

Project

Air Quality Assessment
Midland Road, Royston

Project Number

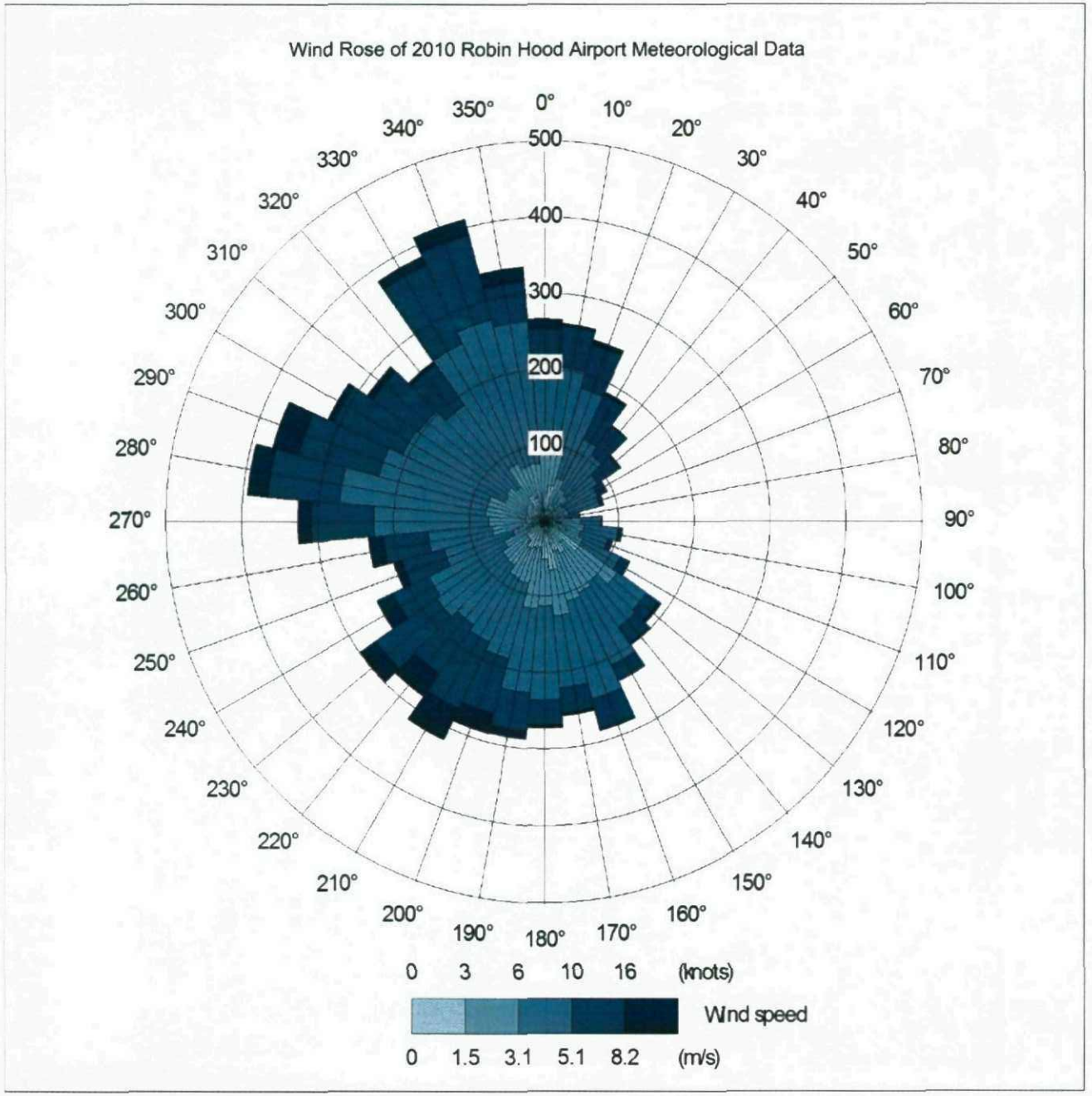
32941

Client

Kier Property Developments Limited

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

REC
Resource & Environmental Consultants Ltd
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

Title

Figure 12 - Wind Rose of 2010 Robin Hood Airport Meteorological Data

Project

Air Quality Assessment
Midland Road, Royston

Project Number

32941

Client

Kier Property Developments Limited

REC
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk

APPENDIX II ASSESSMENT INPUT DATA

ASSESSMENT INPUTS

Additional 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 pollutant 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). 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: 436000, 411350 to 436610, 411960. One Cartesian grid with a resolution of 6.1m and a height of 1.5m was used within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 9 for a location plan of the assessment area in the context of Barnsley and 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, was provided by Pell Frischmann, the Transport Engineers for the development.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the assessment is provided in Table AII.1.

Table AII.1 2013 Traffic Data - Development Opening Year

Road Link		Road Width (m)	2013 24-hour AADT Flow		Mean Vehicle Speed (km/h)	HDV Proportion of Fleet (%)	
			Do-minimum	Do-something		Do-minimum	Do-something
L1a	High St	7.3	7,670	8,467	45	2.7	2.7
L1b	High St - junction	9.5	7,670	8,467	20	2.7	2.7
L2a	Midland Rd - E Church St - junction	9.7	5,919	7,898	20	2.4	2.4
L2b	Midland Rd - E Church St	7.4	5,919	7,898	30	2.4	2.4
L3	Midland Rd - W The Lane	7.6	6,463	7,483	30	2.5	2.5
L4	Midland Rd - E The Lane	7.1	6,007	6,745	30	2.4	2.3
L5a	The Lane	7.3	4,204	6,631	30	2.0	1.7
L5b	Roundabout - The Lane/Midland Rd	3.9	10,667	14,114	20	2.3	2.1
L6a	Church St - junction	7.5	7,275	7,688	20	2.9	2.9
L6b	Church St	5.6	7,275	7,688	45	2.9	2.9
L7a	Station Rd - junction	7.3	4,642	5,057	20	2.9	2.9
L7b	Station Rd	6.3	4,642	5,057	45	2.9	2.9
L8	Southern site access	5.0	-	2,183	30	0.0	0.0

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

Emission Factors

Emission factors for each link were calculated using the traffic flows and the Emissions Factor Toolkit (version 5.1.3) released in August 2012, which incorporates updated COPERT4v8.1 vehicle emissions factors for NO_x and vehicle fleet information.

Meteorological Data

Meteorological data used in this assessment was taken from Robin Hood Airport meteorological station over the period 1st January 2010 to 31st December 2010 (inclusive). Robin Hood Airport observation station is located at NGR: 465993, 398444, which is

approximately 32.5km south-east of the proposed development.

Consultation was undertaken with Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of meteorological data within the UK, in order to identify the most appropriate dataset for use in the modelling assessment. This indicated that the closest observation site to the development was Sheffield Airport. However, this has been closed for a number of years and therefore recent datasets were not available. As verification was being undertaken for 2010, it was considered best practice to utilise meteorological data from this year. Robin Hood Airport was identified as the closest observation station to the modelling area with data available and as such information from this site was used in lieu of closer observations.

Reference should be made to Figure 12 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 the assessment area and is suggested within ADMS-Roads as being suitable for 'small towns < 50,000'.

Background Concentrations

Annual mean pollutant concentrations measured at the Barnsley Royston monitoring site were used to represent background levels in the vicinity of the site, as requested by BMBC. The results used in the assessment are shown in Table AII.2.

Pollutant	Annual Mean Concentration (µg/m^3)
NO_2	21
PM_{10}	22

It should be noted that the background NO_2 concentration for 2008 and the background PM_{10} concentration for 2011 were utilised as requested by BMBC.

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 available from the DEFRA website, which is the method detailed within LAQM.TG(09)[15].

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

Calculation of the Number of Exceedences of the 24-hour Mean PM_{10} AQLV

The number of exceedences of the 24-hour mean AQLV for PM_{10} was calculated based on the methodology outlined within LAQM.TG(09)[16].

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

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.

A review of the most recent LAQM report issued by BMBC[17] indicated diffusion tube monitoring of NO_2 concentrations is not currently undertaken in the vicinity of the proposed development. As such, an additional modelling area was defined within Barnsley for the purpose of verification. This approach was agreed with Chris Shields, Environmental Health Officer at BMBC. Given the proximity of the modelling areas, it is considered the calculated verification factor is likely to be reasonably representative of conditions throughout the borough and is therefore suitable for an assessment of this nature.

Model verification was undertaken for 2010, using traffic data, emission factors, meteorological data and monitoring results from this year.

Reference should be made to Figure 9 for a location plan of the modelling areas.

Traffic Flow Data

Traffic data for use in the verification process, including 24-hour AADT flows and fleet composition as Light Duty Vehicle (LDV) and HDV proportion, was downloaded from the Department for Transport (DfT) Matrix[18]. This 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 2011. It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM.TG(09)[19] 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.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards. A summary of the traffic data used in the verification process is provided in Table AII.4.

---

17 2012 Air Quality Updating and Screening Assessment, Barnsley Metropolitan Borough Council, 2012.
18 www.dft.gov.uk/matrix.
19 Local Air Quality Management Guidance LAQM.TG(09), DEFRA, 2009.

Table AII.4 2010 Traffic Data - Verification

Road Link		Road Width (m)	2010 24-hour AADT Flow	Mean Vehicle Speed (km/h)	HDV Proportion of Fleet (%)
L1	West Way westbound	11.2	15,784	30	2.3
L2	West Way westbound	7.3	15,784	30	2.3
L3	West Way westbound	7.3	15,784	45	2.3
L4	West Way westbound	7.3	15,784	20	2.3
L5	West Way eastbound	7.3	15,784	25	2.3
L6	West Way eastbound	7.3	15,784	45	2.3
L7	West Way eastbound	7.3	15,784	20	2.3
L8	West Way eastbound	7.3	15,784	25	2.3
L9	Sheffield Rd southbound	7.3	8,391	25	5.5
L10	Sheffield Rd southbound	7.3	8,391	40	5.5
L11	Sheffield Rd southbound	7.3	8,391	20	5.5
L12	Sheffield Rd southbound	10.2	6,917	40	5.0
L13	Sheffield Rd southbound	7.3	6,917	20	5.0
L14	Sheffield Rd northbound	11.4	6,917	25	5.0
L15	Sheffield Rd northbound	7.3	6,917	40	5.0
L16	Sheffield Rd northbound	7.3	6,917	20	5.0
L17	Sheffield Rd northbound	7.3	8,391	40	5.5
L18	Sheffield Rd northbound	7.3	8,391	20	5.5
L19	Taylor Row	7.3	12,274	15	4.9
L20	Doncaster Rd	7.3	12,274	30	4.9
L21	Dodworth Rd	7.3	24,808	20	7.7
L22	Dodworth Rd	7.3	24,808	40	7.7
L23	Pontefract Rd	7.3	8,396	40	5.4
L24	Harborough Hill Rd northbound	7.3	11,769	40	6.5
L25	Harborough Hill Rd northbound	7.3	11,769	45	6.5
L26	Harborough Hill Rd northbound	7.3	11,709	45	3.6
L27	Harborough Hill Rd northbound	23	11,709	25	3.6

Road Link		Road Width (m)	2010 24-hour AADT Flow	Mean Vehicle Speed (km/h)	HDV Proportion of Fleet (%)
L28	Harborough Hill Rd southbound	7.3	11,709	25	3.6
L29	Harborough Hill Rd southbound	7.3	11,709	40	3.6
L30	Harborough Hill Rd southbound	7.3	11,769	45	6.5
L31	Harborough Hill Rd southbound	7.3	11,769	45	6.5
L32	Harborough Hill Rd southbound	7.3	11,769	20	6.5
L33	Pontefract Rd	7.5	2,099	30	5.4
L34	Harborough Hill Rd - sliproad	7.3	2,099	30	5.4
L35	Harborough Hill Rd - sliproad	7.3	2,099	30	5.4
L36	Harborough Hill Rd - sliproad	10.2	2,099	30	5.4
L37	Harborough Hill Rd - sliproad	7.3	2,099	25	5.4
L38	New St	7.3	5,001	25	2.3
R1	Roundabout - West Way/Sheffield Rd	9.6	48,348	35	3.4
R2	Roundabout - West Way/Dodworth Rd	9.6	56,375	35	4.6

Reference should be made to Figure 11 for a graphical representation of the road link locations.

Emission Factors

Emission factors for each link were calculated using the traffic flows and the Emissions Factor Toolkit (version 5.1.3).

The procedure provided within Appendix 2 of DEFRA Guidance LAQM.TG(09) was utilised in order to calculate appropriate NO_x emission factors for Harborough Hill Road due to the significant gradient in this area of Barnsley. As such, a 'hill section' was introduced in the model, which included the following road links:

- L26 - Harborough Hill Road northbound: downhill gradient of 10.5%; and,
- L29 - Harborough Hill Road southbound: uphill gradient of 10.5%.

In accordance with the DEFRA guidance, normal speed related emission factors from the Emissions Factor Toolkit were used for LDVs, whereas revised emission factors were calculated for HDVs. This is shown in Table AII.5.

Table AII.5 NO_x Emission Factors

Road Link		Speed related Emission Factor (g/km)	Revised Emission Factor (g/km)
L26	Harborough Hill Rd northbound	6,436.1	4,222.6
L29	Harborough Hill Rd southbound	6,785.4	16,012.5

Meteorological Data

Meteorological data was taken from Robin Hood Airport meteorological station over the period 1st January 2010 to 31st December 2010 (inclusive) as previously described.

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

A minimum Monin-Obukhov length of 30m was used in the verification model. This value is considered appropriate for the area of Barnsley and is stated within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

BMBC undertakes diffusion tube monitoring of background NO_2 concentrations at three locations within Barnsley. The 2010 mean concentration was calculated for diffusion tubes 96, 97 and 98 off James Street for use in the assessment. As such, an annual mean NO_2 concentration of 31.57µg/m^3 was used to represent background levels throughout the verification area during 2010.

Verification Factor Calculation

BMBC undertakes diffusion tube monitoring of NO_2 concentrations at a large number of locations within Barnsley. These were reviewed and thirteen suitable sites identified for the purpose of verification. Reference should be made to Figure 11 for a map of diffusion tube locations.

Monitoring results were obtained from the most recent LAQM report[20] and the road contribution to total NO_x concentration calculated for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.TG(09)[21]. The monitored annual mean NO_2 concentration and calculated roadside NO_x concentrations are summarised in Table AII.6.

---

[20] 2012 Air Quality Updating and Screening Assessment, Barnsley Metropolitan Borough Council, 2012.
[21] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Table AII.6 2010 Monitoring Results

Monitoring Location		Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Roadside NO_x Concentration ($\mu g/m^3$)
11	Alhambra R/bt	53.50	56.38
23	23 Dodworth Rd	46.20	35.42
25	53 Dodworth Rd	54.50	59.44
26	75 Dodworth Rd	35.10	7.87
28	Lancaster St	34.80	7.18
70	Doncaster Rd - Brinckmann St	39.60	18.48
71	Doncaster Rd - Oakwell Ln	43.80	29.05
72	Taylor Row	49.10	43.45
92	Pontefract Rd/Clyde St	39.00	17.02
94	Slip Rd/Harborough Hills Rd	37.30	12.97
95	49 Harborough Hill Rd	66.50	100.09
100	Harb"gh Hills Rd - adj ex- bakery	67.30	103.04
101	Harborough Hills Rd/Meadow St	38.10	14.86

The dispersion model was run with the traffic input data previously detailed for 2010 to predict NO_x concentrations at the diffusion tube monitoring locations. The results are shown in Table AII.7.

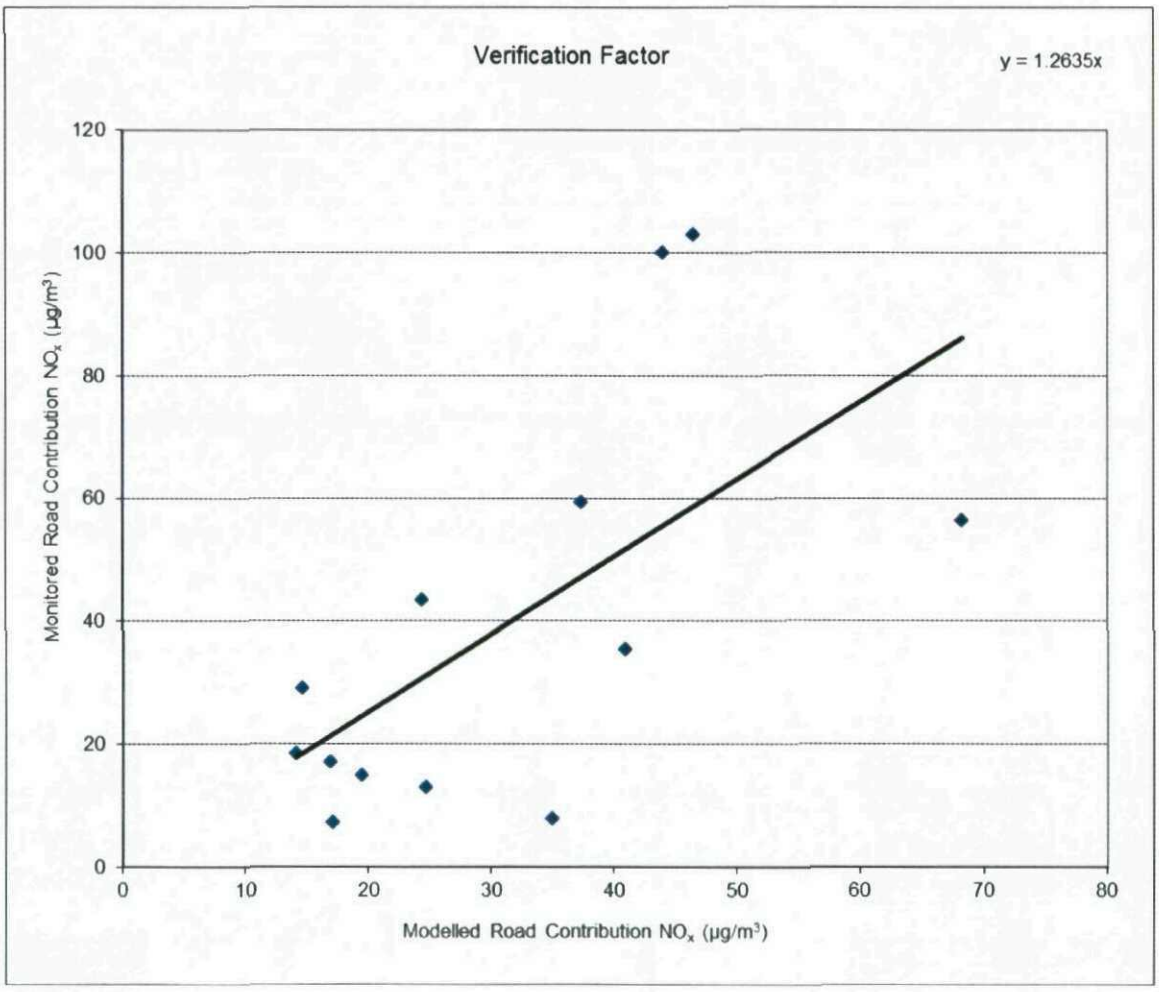
Table AII.7 Verification Results

Monitoring Location		Monitored Roadside NO_x Concentration ($\mu g/m^3$)	Modelled Roadside NO_x Concentration ($\mu g/m^3$)
11	Alhambra R/bt	56.38	68.20
23	23 Dodworth Rd	35.42	40.99
25	53 Dodworth Rd	59.44	37.45
26	75 Dodworth Rd	7.87	35.01
28	Lancaster St	7.18	17.13
70	Doncaster Rd - Brinckmann St	18.48	14.12
71	Doncaster Rd - Oakwell Ln	29.05	14.64
72	Taylor Row	43.45	24.47
92	Pontefract Rd/Clyde St	17.02	16.91
94	Slip Rd/Harborough Hills Rd	12.97	24.74

Monitoring Location		Monitored Roadside NO_x Concentration ($\mu g/m^3$)	Modelled Roadside NO_x Concentration ($\mu g/m^3$)
95	49 Harborough Hill Rd	100.09	43.99
100	Harb"gh Hills Rd - adj ex- bakery	103.04	46.50
101	Harborough Hills Rd/Meadow St	14.86	19.50

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 1.2635 was required to be applied to all modelling results, as shown in Graph 1.

Graph 1 Verification Factor Calculation



Monitoring of PM_{10} concentrations is not undertaken within the assessment extents. The NO_x verification factor was therefore used to adjust PM_{10} model predictions in lieu of more accurate data in accordance with the guidance provided within LAQM.TG(09).

The model was shown to both under and over predict NO_2 concentrations at diffusion tube

locations. This may have been for a number of reasons, including errors in the utilised traffic data, under prediction of background concentrations or restrictions associated with dispersion modelling, as well as monitoring inaccuracies associated with diffusion tubes.

It should be noted that the calculated verification factor is higher due to the inclusion of results from diffusion tubes 95 and 100, which are located on Harborough Hill Road. The local conditions in this area cannot be represented accurately within the model, leading to an under prediction of pollution levels. If these monitoring locations had not been included within the calculation, the overall verification factor would have been lower, resulting in reduced impact predictions. As such, it is considered the under prediction of NO_x concentrations at diffusion tubes 95 and 100 has not significantly affected the outcome of this assessment.

APPENDIX III ASSESSOR'S CURRICULUM VITAE

ANDREA CORDON

Graduate Air Quality Consultant

BSc, MSc

KEY EXPERIENCE:

Andrea is a Graduate Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments (AQAs) and Air Quality Environmental Impact Assessments (EIAs) 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.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of ground level pollutant concentrations and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Execution of field odour surveys and assessments in accordance with the Environment Agency methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- Bachelor of Science
- Master of Science
- Graduate IEMA

PROJECTS SUMMARY:

Residential and Mixed Use Developments

Cranage, Cheshire - relocation of two residential properties situated within an AQMA, to a new site further away from the M6 motorway.

Shoppenhangers Manor, Maidenhead - residential development adjacent to the A404(M).

Former Roadside Restaurant, Ermine Street, Alconbury - baseline AQA in support of a gypsy and traveller site in close proximity to the A14/A1(M).

Bective Road, Northampton - construction phase assessment of fugitive dust emissions in accordance with IAQM methodology and dispersion modelling in support of a residential development in close proximity of an AQMA.

Wheatstone House, Brentford - residential scheme in AQMA and in close proximity to the A4 and the M4.

Former Beeston Castle Hotel - odour risk assessment in support of a residential development adjacent to a livestock market.

Dystelegh Court, Disley - residential scheme adjacent to AQMA and in close proximity to the A6.

Oxford Road, Reading - baseline AQA for mixed use development in an AQMA.

Belbroughton Road, Blakedown - residential development located in the proximity of two AQMAs.

Bradgate Quarry 2, Rotherham - AQA including DMRB for residential scheme in close proximity to AQMA.

29 Crescent, Salford - baseline AQA for a change of use from offices to a house in multiple occupation.

Springfield Lane, Salford - mixed use scheme in AQMA.

Sillavan Way, Salford - residential development in an AQMA.

Wycke Hill, Spital Road, Maldon - construction phase assessment of fugitive dust emissions in accordance with IAQM methodology and dispersion modelling using ADMS-Roads in support of residential development.

Church Road, Litherland - residential scheme adjacent to major road and in close proximity to a proposed AQMA.

Commercial and Retail Developments

Lion Garage, Gravesend - AQA in support of commercial development with associated car parking.

Commissioners Road, Strood - commercial development with B1 and B8 floor space in close proximity to AQMA.

Hugh Baird College, Bootle - baseline AQA for new college building adjacent to a major junction.

Solent Retail Park, Havant - AQA in support of commercial and industrial development in close proximity to a proposed AQMA.

Ellistown, Coalville - Air Quality EIA in support of a development comprising B8 - Storage and Distribution floor space.

Industrial Developments

Leacon Lane, Charing - AQA including DMRB in support of the planning application appeal for a renewable energy unit facility.

Spring Farm, Taverham - AQA including DMRB in support of a planning condition variation for a biomass renewable energy unit.

Infrastructure Developments

Hazel Grove, Stockport - construction phase assessment of fugitive dust emissions in accordance with IAQM methodology and AQA including DMRB for park and ride scheme in AQMA.

REC
Resource & Environmental Consultants

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 - residential development adjacent to scrap metal yard.

Church Way Doncaster - mixed use scheme adjacent to AQMA.

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

Mill Street, Crewe - residential development in proximity of 2-AQMAs.

Wheatstone House, London - mixed use scheme in AQMA.

Elephant and Castle Leisure Centre - baseline AQA for redevelopment.

Carr Lodge, Doncaster - EIA for large residential development.

Poplar Business Park, Tower Hamlets – AQA for residential development.

Queensland Road, Highbury - residential scheme including CHP.

Bicester Ecotown - dispersion modelling of energy centre for EIA.

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

Temple Point Leeds - residential development adjacent to M1.

Bury Road, Bury - residential development in proximity of AQMA.

Commercial and Retail Developments

Pleasington Lakes, Blackburn - EIA for holiday village adjacent to M65.

Wakefield College - redevelopment of city centre campus in AQMA.

Pleckgate School, Blackburn - biomass boiler and odour assessment.

Deptford Terrace, Sunderland - AQA for mixed use development.

Pakeezah Gourmet, Bradford - AQA including DMRB for new food store.

Lidl, Honiton - Food store development close to AQMA.

Witton Park School, Blackburn - biomass boiler feasibility assessment.

Manchester Airport Cargo Shed - commercial development.

New Crown Wood School, Greenwich - biomass boiler emission assessment.

Basford West, Crewe - AQA of industrial and business park.

Farnworth Superstore - AQA 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 - fibre manufacturing plant adjacent to SPA.

Maesgwyn Biomass Plant - AQA including ecological assessment.

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

Barnes Wallis Heat and Power, Cobham - 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.