



AIR QUALITY ASSESSMENT 29-35 STATION ROAD, READING

REC REFERENCE: AQ102093R1

**REPORT PREPARED FOR: TITAN PROPERTY DEVELOPMENTS
LIMITED**

DATE: AUGUST 2016



National Consultancy, Locally Delivered

A CONCEPT LIFE SCIENCES COMPANY





Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	-			
Date	22/08/2016			
Prepared by	María López Vera			
Signature	MARÍA.LV.			
Position	Graduate Air Quality Consultant			
Checked by	Gabor Antony			
Signature				
Position	Principal Consultant			
Verified by	Gabor Antony			
Signature				
Position	Gabor Antony			
Project number	AQ102093r1			





EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned by Titan Property Developments Limited to undertake an Air Quality Assessment in support of a proposed development at 29-35 Station Road, Reading.

A planning permission is sought for a residential-led development comprising the construction of a 23-storey building to provide C3 residential apartments, A1/A3 retail floorspace on the ground and first floor levels and associated infrastructure.

The site is located within an area identified by the Reading Borough Council as experiencing elevated pollutant concentrations and subsequently there are concerns that the proposals will introduce future users to poor air quality. Additionally, the development has the potential to cause air quality impacts at sensitive locations during the construction phase. As such, an Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for the proposed use and assess potential impacts as a result of the development.

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

Dispersion modelling was undertaken in order to predict pollutant concentrations across the proposed site as a result of emissions from the local highway network. The results indicated high pollutant concentrations at the second, third, fourth and fifth floor of the development. As such, appropriate mitigation has been suggested for the affected unit including mechanical ventilation and a high specification of window tightness. This type of mitigation is considered suitable for a development of this size and nature.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the proposed development, subject to the inclusion of relevant mitigation measures.





TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Background	1
1.2 Site Location and Context	1
1.3 Limitations	1
2. LEGISLATION AND POLICY	2
2.1 European Legislation	2
2.2 UK Legislation	2
2.3 Local Air Quality Management	4
2.4 Dust	4
2.5 National Planning Policy	4
2.5.1 National Planning Policy Framework	4
2.5.2 National Planning Practice Guidance	5
2.6 Local Planning Policy	5
3. METHODOLOGY	6
3.1 Construction Phase Assessment	6
3.1.1 Step 1	6
3.1.2 Step 2	6
3.1.3 Step 3	12
3.1.4 Step 4	12
3.2 Operational Phase Assessment	12
3.2.1 Future Exposure	12
4. 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
5. ASSESSMENT	17
5.1 Construction Phase Assessment	17
5.1.1 Step 1	17
5.1.2 Step 2	17
5.1.3 Step 3	19
5.1.4 Step 4	20
5.2 Operational Phase Assessment	20
5.2.1 Future Exposure	20
5.2.2 Nitrogen Dioxide	21
5.2.3 Particulate Matter - Annual Mean	21
5.2.4 Particulate Matter - 24 Hour Mean	21





6. MITIGATION	23
7. CONCLUSION	24
8. ABBREVIATIONS	25

APPENDICES

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





1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Titan Property Developments Limited to undertake an Air Quality Assessment in support of a proposed development at 29-35 Station Road, Reading.

The development site is located within an area identified by the Reading Borough Council (RBC) as experiencing elevated pollutant concentrations. Subsequently there are concerns that the proposals will introduce future site users to poor air quality. As such, an Air Quality Assessment was required in order to determine baseline conditions, assess site suitability for the proposed end use and consider potential impacts as a result of the development.

1.2 Site Location and Context

The site is located at Station Road, Reading at approximate National Grid Reference (NGR): 471490, 173690. Reference should be made to Figure 1 for a location plan.

The planning permission is sought for a residential-led development comprising the construction of a 23-storey building to provide C3 residential apartments, A1/A3 retail floorspace on the ground and first floor levels and associated infrastructure.

The site is located within an Air Quality Management Area (AQMA), declared by RBC due to exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). As such, there are concerns that the proposals could expose future site users to elevated pollution levels. Additionally, the development has the potential to cause air quality impacts at sensitive receptor locations as a result of emissions associated with the construction phase. An Air Quality Assessment was therefore required to determine baseline conditions and consider potential exposure as a result of the development. This is detailed 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. LEGISLATION AND POLICY

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality 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 NO₂, oxides of nitrogen (NO_x), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- ▶ Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and
- ▶ Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

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

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

2.2 UK Legislation

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

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out AQOs that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

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

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.





Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu\text{g}/\text{m}^3$)	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

Table 2 summarises the advice provided in DEFRA guidance LAQM (TG16)² on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

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





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 administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at sensitive locations where members of the public are regularly present for the relevant averaging period are likely to be exceeded, the LA is required to declare an AQMA. For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Dust

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

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

Enforcement of the Act, in regard to nuisance, is currently under the administration of the local Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance. If the LA is satisfied that a statutory nuisance exists, or is likely to occur or happen again, it must serve an Abatement Notice under Part III of the Environmental Protection Act (1990). Enforcement can insist that there be no dust beyond the boundary of the works. The only defence is to show that the process to which the nuisance has been attributed and its operation are being controlled according to best practice measures.

2.5 National Planning Policy

2.5.1 National Planning Policy Framework

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

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

[...]

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

"Planning policies should sustain compliance with and contribute towards EU limit values or

³ National Planning Policy Framework, Department for Communities and Local Government, 2012.





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

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

2.5.2 National Planning Practice Guidance

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

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

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

2.6 Local Planning Policy

The Local Development Framework (LDF) sets out RBC's plans for future development within the borough. The LDF comprises a number of documents, including the Core Strategy⁵ which sets out RBC's spatial policy framework for delivering the development and change needed to shape the Borough up to 2020. It includes plans relating to economic, social and environmental issues and will provide the strategic framework against which decisions about the use of land can be planned. A review of RBC's Core Strategy indicated the following policy in relation to air quality:

"i) 4 CROSS CUTTING POLICIES

Living within Environmental Limits

4. Minimise air, water, soil/ground and noise pollution and address the factors that contribute to climate change, recognising the heightened knowledge of the severity of climate change related impacts."

This policy has been considered within this report by assessing site suitability for the proposed end-use.

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

⁵ Core Strategy, Reading Borough Council, 2015.





3. METHODOLOGY

The proposed development has the potential to cause air quality impacts during the construction and operational phases in addition to exposing future site users to elevated pollution levels. These issues have been assessed in accordance with the following methodology.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'⁶.

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

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

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

The assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

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

3.1.2 Step 2

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

⁶ Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2014.





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

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

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

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	• Total building volume greater than 50,000m³ • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	• Total site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than 10 heavy earth moving vehicles active at any one time • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	• Total building volume greater than 100,000m³ • On site concrete batching • Sandblasting
	Trackout	• More than 50 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	• Total building volume 20,000m³ to 50,000m³ • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	• Total site area 2,500m² to 10,000m² • Moderately dusty soil type (e.g. silt) • 5 to 10 heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	• Total building volume 25,000m³ to 100,000m³ • Potentially dusty construction material (e.g. concrete) • On site concrete batching





Magnitude	Activity	Criteria
Medium	Trackout	10 to 50 HDV trips per day - Moderately dusty surface material (e.g. high clay content) - Unpaved road length 50m to 100m
Small	Demolition	- Total building volume under 20,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber) - Demolition activities less than 10m above ground level - Demolition during wetter months
	Earthworks	- Total site area less than 2,500m² - Soil type with large grain size (e.g. sand) - Less than 5 heavy earth moving vehicles active at any one time - Formation of bunds less than 4m in height - Total material moved less than 20,000 tonnes - Earthworks during wetter months
	Construction	- Total building volume less than 25,000m³ - Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	- Less than 10 HDV trips per day - Surface material with low potential for dust release - Unpaved road length less than 50m

Step 2B defines the sensitivity of the area around the development site for demolition, construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 4.

Table 4 Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	- Users expect of high levels of amenity - High aesthetic or value property - People expected to be present continuously for extended periods of time - Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes	Internationally or nationally designated site e.g. Special Area of Conservation





Sensitivity	Examples	
	Human Receptors	Ecological Receptors
Medium	• Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	• Nationally designated site e.g. Sites of Special Scientific Interest
Low	• Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	• Locally designated site e.g. Local Nature Reserve

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

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

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 5.

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

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low





Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table 6 outlines the sensitivity of the area to human health impacts.

Table 6 Sensitivity of the Area to Human Health Impacts

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





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

Table 7 outlines the sensitivity of the area to ecological impacts.

Table 7 Sensitivity of the Area to Ecological Impacts

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

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts. Table 8 outlines the risk category from demolition activities.

Table 8 Dust Risk Category from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table 9 outlines the risk category from earthworks and construction activities.

Table 9 Dust Risk Category from Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 10 outlines the risk category from trackout.





Table 10 Dust Risk Category from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

3.1.3 Step 3

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

3.1.4 Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'. This has been described as **negligible** within this report to provide continuity between assessment terminologies.

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 IAQM⁶ guidance suggests the provision of details of the assessor's qualifications and experience. These are provided in Appendix III.

3.2 Operational Phase Assessment

3.2.1 Future Exposure

The proposed development includes sensitive land use and is located within an AQMA. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling was therefore undertaken to quantify NO₂ and PM₁₀ concentrations across the site and determine suitability for the proposed use. Reference should be made to Appendix II for details of the assessment inputs.





4. 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), RBC has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean NO₂ concentrations are above the AQO within the borough. As such, an AQMA has been declared, described as:

"An area covering Reading Town Centre, areas along the major radial road routes into Reading (including J11 of the M4) and along the railway lines where they pass through built-up areas."

The development is located within the AQMA. As such, there is the potential for exposure to elevated pollutant concentrations for future residents and to cause adverse impacts to existing pollution levels within this sensitive area as a result of the scheme. This has been considered within this report.

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

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by RBC using continuous and periodic methods throughout their area of administration. A review of RBC's most recent Progress Report⁷ indicated that the closest continuous monitor to the proposed development is at Caversham Road (RD1), located at NGR: 471153, 174429, approximately 800m north of the site boundary.

RBC also utilises passive diffusion tubes to monitor NO₂ concentrations throughout their area of administration. There are two diffusion tubes located in the vicinity of the proposed development and monitoring results from recent years are summarised in Table 11. Exceedances of the relevant AQO are highlighted in **bold**.

Table 11 Diffusion Tube Monitoring Results

Site Name	Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
				2012	2013	2014
Garrard Street	Roadside	471421	173693	39	52	40
Friar Street	Roadside	471437	173589	52	52	51

As indicated in Table the annual mean AQO for NO₂ was exceeded at the three monitoring locations during the recent years. This is to be expected due to their roadside locations within an AQMA. Reference should be made to Figure 2 for a graphical representation of the diffusion tube monitoring location.

⁷ 2015 Updated and Screening Assessment, Reading Borough Council, 2015.





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: 471500, 173500. Data for this location was downloaded from the DEFRA website⁸ for the purpose of this assessment for the verification year (2014) and the predicted development opening year (2019) and is summarised in Table 12.

Table 12 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)	
	2014	2019
NO _x	54.16	45.50
NO ₂	32.27	27.90
PM ₁₀	18.66	17.18

As shown in Table 12, background concentrations of NO₂ exceed the relevant AQOs. Comparison with the monitoring results indicates the impact that vehicle exhaust emissions from the highway network have on pollutant concentrations at roadside locations.

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.

Receptors sensitive to potential dust impacts during demolition, 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 13.

Table 13 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	1 - 10	0
20 - 50	10 - 100	0
50 - 100	10 - 100	-
100 - 350	More than 100	-

Reference should be made to Figure 3 for a graphical representation of earthworks and construction dust buffer zones.

⁸ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>.





Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access route. These are summarised in Table 14. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials. This is likely to be decided by the contractor. However, it was assumed construction traffic would access the site from Station Road to ensure the maximum potential trackout distance was considered.

Table 14 Trackout Dust Sensitive Receptors

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

Reference should be made to Figure 4 for a graphical representation of trackout dust buffer zones.

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

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 15.

Table 15 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a residential area which is experiencing regeneration. There is likely to have been a history of dust generating activities due to development in the locality
The likelihood of concurrent dust generating activity on nearby sites	A review of the RBC planning portal indicated no major planning applications in the vicinity of the site. As such, there is no risk of concurrent dust generation
Pre-existing screening between the source and the receptors	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south-east of the development, as shown in Figure 5. As such, properties to the north-west would be most affected by dust emissions
Conclusions drawn from local topography	The topography of the area appears to be predominantly flat. As such, there are no constraints to dust dispersion





Guidance	Comment
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is unlikely to extend over one year
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities identified during the baseline

Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was considered to be **high**. This was because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1.2, is shown in Table 16.

Table 16 **Sensitivity of the Surrounding Area**

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





5. ASSESSMENT

There is the potential for air quality impacts as a result of the construction and operation of the proposed development in addition to the exposure of future site users to elevated pollution levels. 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.

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

Demolition

Demolition will involve the removal of existing buildings on the site. It is anticipated that the volume of buildings to be demolished is likely to be less than 20,000m³. As such, the magnitude of potential dust emissions from demolition activities is **small**, in accordance with the criteria outlined in Table 3.

Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for dust soiling as a result of demolition activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **negligible** risk site for human health as a result of demolition activities.

Earthworks

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

The proposed development site is estimated to cover a total area of less than 2,500m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **small**.





Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of earthworks activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health as a result of earthwork activities.

Construction

Due to the size of the development site the total building volume is likely to be less than 25,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **small**.

Table 16 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for dust soiling as a result of construction activities.

Table 16 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it is anticipated that the unpaved road length is likely to be less than 50m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **small**.

Table 16 indicates the sensitivity of the area to dust soiling effects to people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **low** risk site for dust soiling as a result of trackout activities.

Table 16 indicates the sensitivity of the area to human health is **small**. In accordance within the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health as a result of trackout activities.





Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in 17.

Table 17 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Low
Human Health	Negligible	Negligible	Negligible	Negligible

As indicated in 17, the potential risk of dust soiling is **low** from all construction phase processes considered. Similar to the predicted impacts from dust soiling the potential risk of human health impacts is **negligible** from all construction phase processes.

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

5.1.3 Step 3

The IAQM⁶ guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the development site as summarised in Table 18. A Construction Management Plan (CMP), Dust Management Plan (DMP) and Construction Logistics Plan (CLP) will be implemented during the construction phase. The mitigation measures outlined in Table 18 can be reviewed prior to the commencement of construction works incorporated into the existing the strategies as applicable.

Table 18 Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	• Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary • Display the head or regional office contact information
Site Management	• Record all dusty and air quality complaints and make the complaints log available to the LA when asked • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation
Monitoring	• Carry out regular site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out





Issue	Control Measure
Preparing and Maintaining the Site	• Plan site layout so that machinery and dust causing activities are located away from receptors • Avoid site runoff of water or mud
Operating Vehicle/ Machinery and Sustainable Travel	• All vehicles to switch off engines - no idling vehicles • Avoid the use of diesel or petrol powered generators where practicable
Operations	• Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Ensure adequate water supply on the site for effective dust/particulate matter suppression/mitigation • Use enclosed chutes and covered skips • Minimise drop heights
Waste Management	• No bonfires
Demolition	• Ensure effective water suppression is used during demolition operations • Avoid explosive blasting • Remove any biological debris before demolition
Earthworks and Construction	• Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process
Trackout	• Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving sites are covered to prevent escape of materials • Implement a wheel washing system at a suitable location near site exit.

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 18 are implemented, the residual effect from all dust generating activities is predicted to be not significant, in accordance with the IAQM guidance⁶.

5.2 Operational Phase Assessment

5.2.1 Future Exposure

The proposed development has the potential to expose future users to elevated pollution levels. This was assessed through dispersion modelling, with the results presented in the following Sections.





5.2.2 Nitrogen Dioxide

Figure 7 to Figure 11 display the contour plots for the predicted annual mean NO₂ concentrations at 8.0m, 11m, 14.3m, 17.3m and 20.3m to represent exposure across the second, third, fourth, fifth and sixth floor levels of the proposed development.

Predicted annual mean NO₂ across the development site during 2019 are summarised below in Table 19.

Table 19 Modelling Results - Annual Mean NO₂

Floor	Predicted 2019 Annual Mean NO ₂ Concentration Range (µg/m ³)
Second (8m)	36.19 - 41.52
Third (11m)	35.47 - 41.03
Fourth (14.3m)	35.29 - 40.89
Fifth (17.3m)	35.02 - 40.45
Sixth (20.3m)	32.60 - 35.32

Table 19 indicates there were predicted exceedances of the AQO throughout the modelling extents.

Exceedances of the annual mean AQO were predicted at the second, third, fourth and fifth floors of the development.

Based on the dispersion modelling results, the site requires the implementation of mitigation measures to protect future residents from poor air quality. These are detailed in Section 6.

Predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. However, as stated in LAQM (TG16)² if annual mean NO₂ concentrations are above 60µg/m³ then it is likely that the 1-hour AQO will be exceeded. As such based on the results in Table 19 it is not predicted that concentration will exceed the 1 hour mean AQO for NO₂ across the development site.

5.2.3 Particulate Matter - Annual Mean

Figures 12 displays the contour plots for predicted annual mean PM₁₀ concentrations at 8m to represent exposures across the second floor level of the proposed development. This does not indicate any exceedances of the AQO at locations of relevant exposure, with concentrations ranging from 18.84µg/m³ to 19.21µg/m³.

Based on the dispersion modelling it is considered that PM₁₀ levels at the development should not be viewed as a constraint to development.

5.2.4 Particulate Matter - 24 Hour Mean

The number of days with 24-hour mean PM₁₀ concentrations greater than 50µg/m³ was predicted





across the development, as shown in Figure 14. This does not indicate any exceedances of the AQO at locations of relevant exposure, with the number of days exceeding $50\mu\text{g}/\text{m}^3$ ranging from 2.1 to 2.5. This indicated the predicted number of days is below the permitted number of 35 at all locations on the development site.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future users from elevated PM_{10} concentrations.





6. MITIGATION

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

Detailed dispersion modelling undertaken at heights equivalent to the proposed second, third, fourth and fifth floor of the development indicated that the residential units located at the south-east corner of the proposed building, closest to Station Road may be exposed to concentrations of NO₂ above the relevant AQO. Therefore, the inclusion of appropriate mitigation measures at these units is recommended in order to reduce the potential for exposure of future site users to elevated pollutant concentrations.

Mechanical ventilation should be included for all habitable rooms of the proposed residential units located closest to Station Road at the south-east corner of the development on the second, third, fourth and fifth floor. The air inlet should either be located on the second floor at the rear façade of the building (facing away from Station Road) or at any location on the sixth floor. This should ensure the supply of clean air for future development users.

Additionally, a high specification of air tightness on the windows and doors should be incorporated within the development so that when they are closed, the units will be ventilated by clean air from the mechanical system. This provides freedom of choice over whether natural ventilation is preferable during certain periods. The key to reducing exposure using this method is to ensure occupants are informed over the potential impacts associated with prolonged exposure to elevated pollution levels. As such, it may also be possible to provide residents with a welcome pack containing air quality information which will allow them to follow appropriate advice on protection against high concentrations during certain periods.





7. CONCLUSION

Resource and Environmental Consultants (REC) Ltd was commissioned by Titan Property Developments Limited to undertake an Air Quality Assessment in support of a proposed development at 29-35 Station Road, Reading.

A planning permission is sought for a residential-led development comprising the construction of a 23-storey building to provide C3 residential apartments, A1/A3 retail floorspace on the ground and first floor levels and associated infrastructure.

The site is located within an Air Quality Management Area (AQMA), declared by RBC due to exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). Additionally, the development has the potential to cause air quality impacts at sensitive locations. These may include fugitive dust emissions from construction works and road vehicle exhaust emissions associated with traffic generated by the proposals. As such, an Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for residential use and assess potential impacts as a result of the development.

During the construction phase of the development there is the potential for air quality impacts as a result of fugitive dust emissions from the site. These were assessed in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by demolition, earthworks, construction and trackout activities was predicted to be **negligible**.

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and assess potential exposure of future users. Concentrations of nitrogen dioxide and particulate matter were predicted across the second, third, fourth, fifth and sixth floor levels and were subsequently verified using local monitoring results. Exceedances of the annual mean AQO for NO₂ were predicted at second, third, fourth, fifth levels across the development. Exceedances of the annual mean AQO for PM₁₀ were not predicted across the development.

In order to protect residents from poor air quality, mechanical ventilation should be included for all habitable rooms of the proposed residential units located closest to Station Road at the south-east corner of the development on the second, third, fourth and fifth floor. The air inlet should either be located on the second floor at the rear façade of the building (facing away from Station Road) or at any location on the sixth floor. This will provide a supply of clean air to rooms affected by high pollution levels. Mitigation of this type is considered suitable for a development of this size and nature.

Based on the assessment results the site is considered suitable for the proposed use in regards air quality, subject to the inclusion of relevant mitigation measures.





8. ABBREVIATIONS

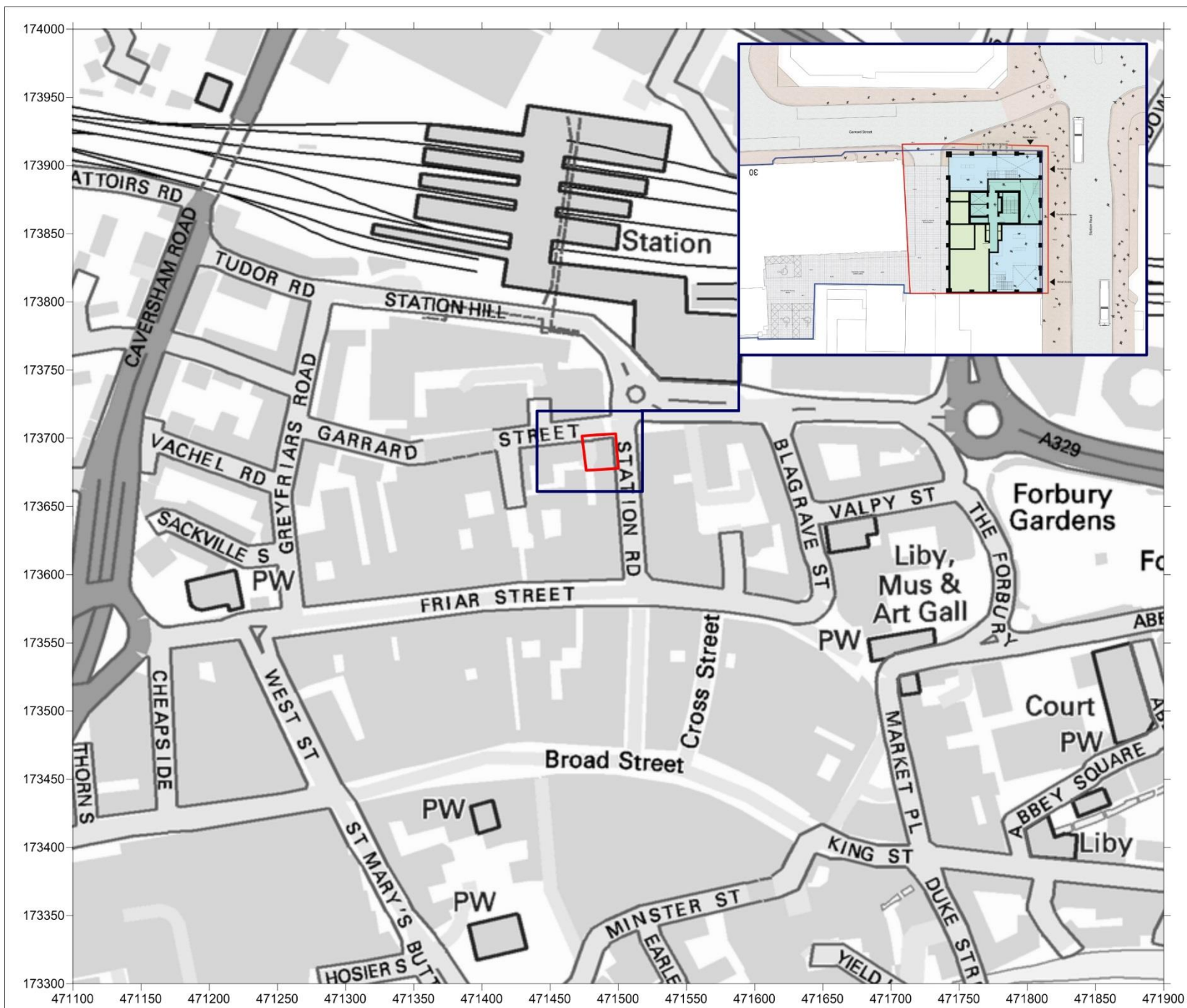
AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
CLP	Construction Logistics Plan
CMP	Construction Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DS	Do Something
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
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
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
RBC	Reading Borough Council
REC	Resource and Environmental Consultants
TEMPRO	Trip End Model Presentation Program
Z ₀	Roughness Length





APPENDIX I FIGURES





Legend



Title

Figure 1
Site Location

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

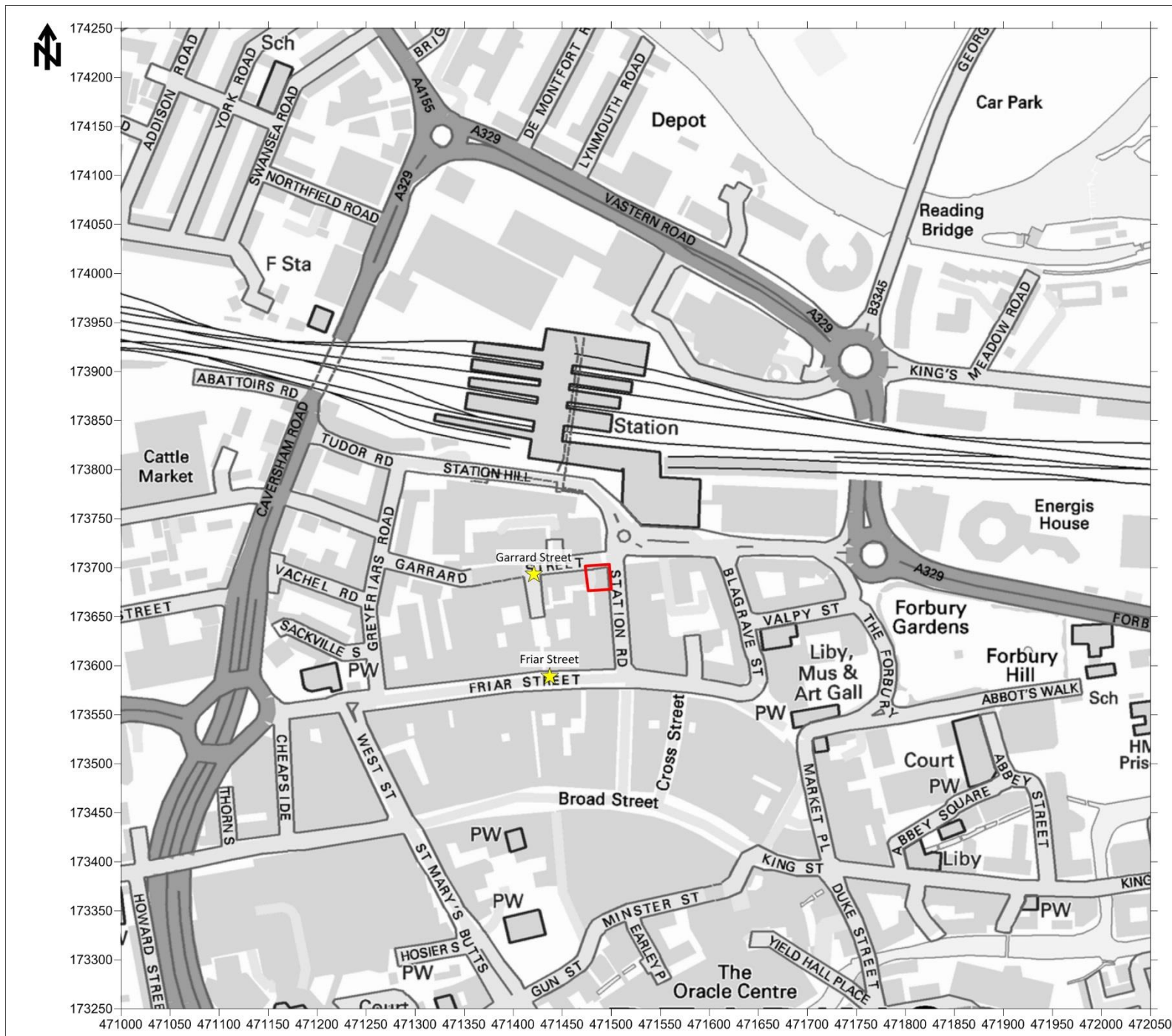
Client

Titan Property Developments

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010



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



Legend



Site Boundary



Diffusion Tube
Monitoring Location

Title

Figure 2
Diffusion Tube Monitoring Locations

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

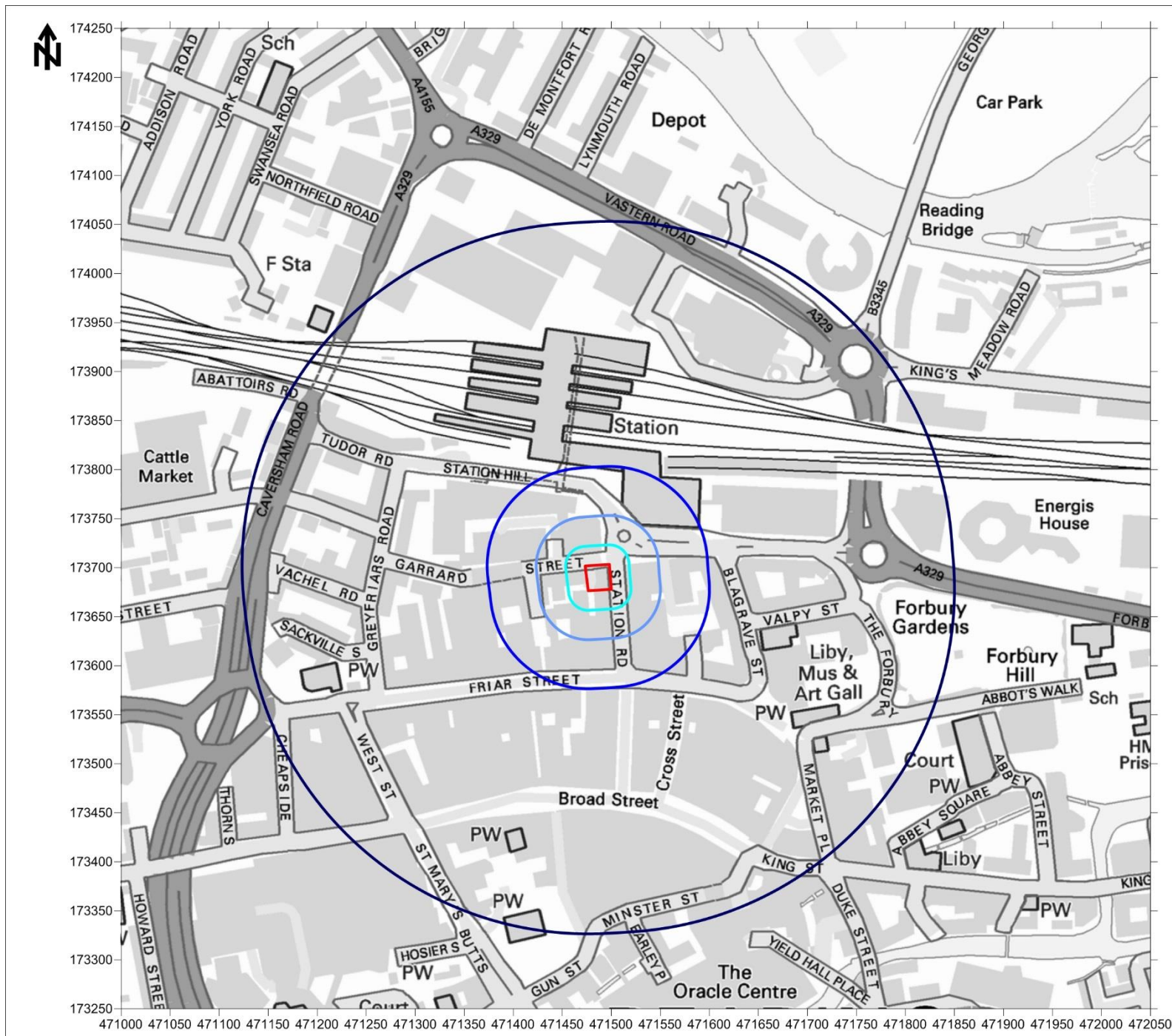
Client

Titan Property Developments

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010



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



Legend

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

Title

Figure 3
Earthworks and Construction Dust
Buffer Zones

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

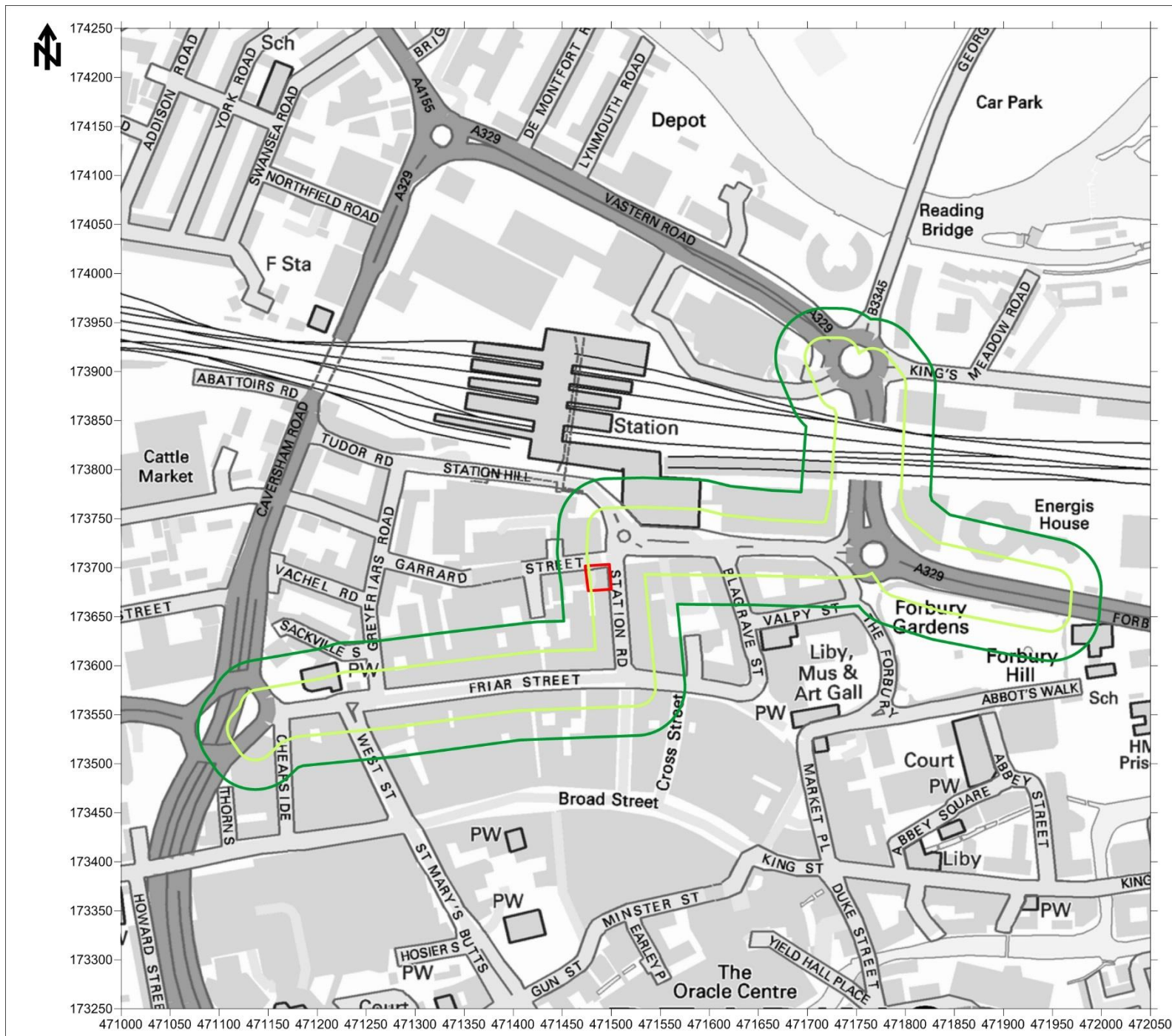
Client

Titan Property Developments

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010



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



Legend

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

Title

Figure 4
Trackout Dust Buffer Zones

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

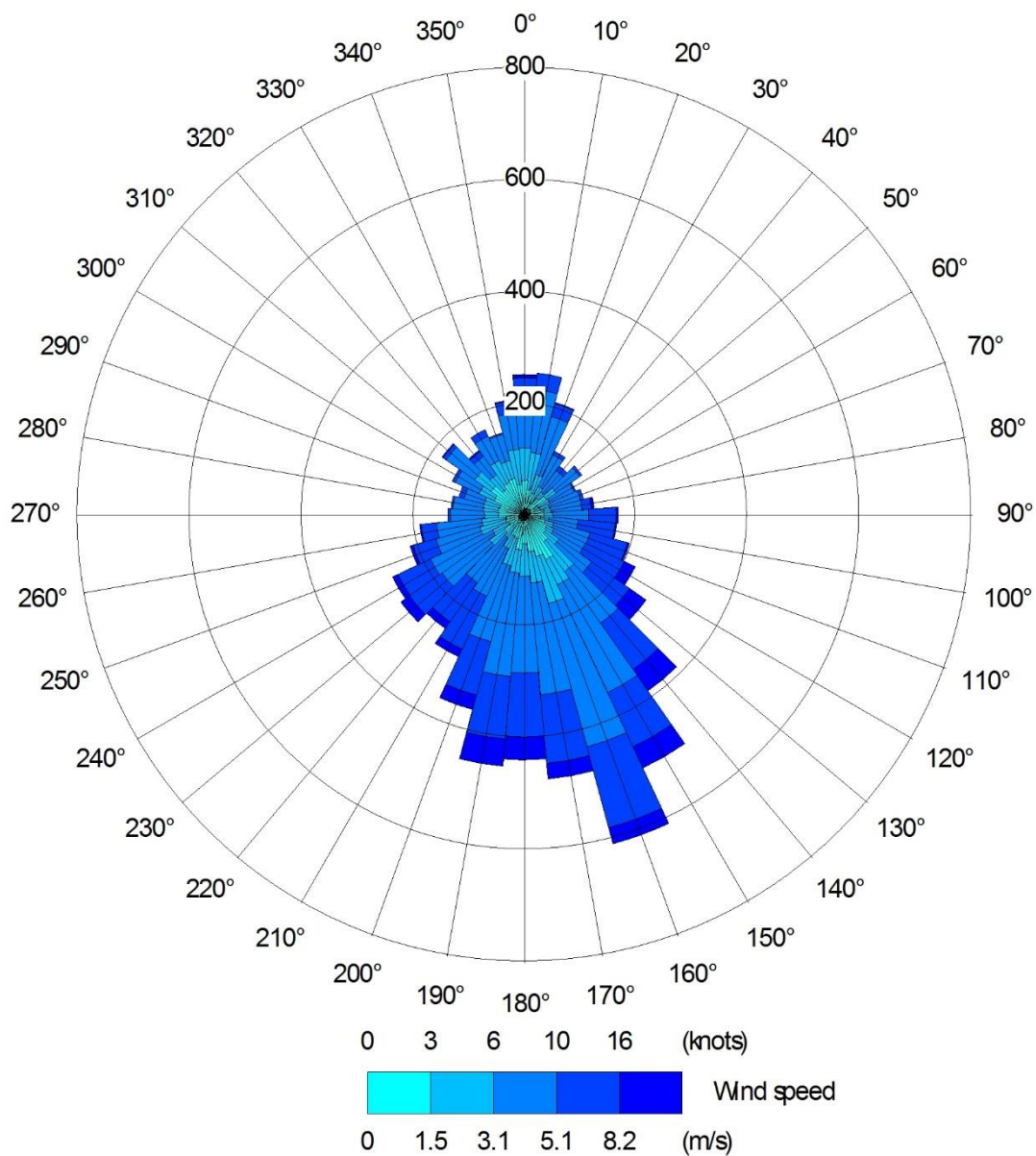
Client

Titan Property Developments

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010



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



Legend

Title

Figure 5
Wind Rose of 2014 RAF Benson
Meteorological Data

Project

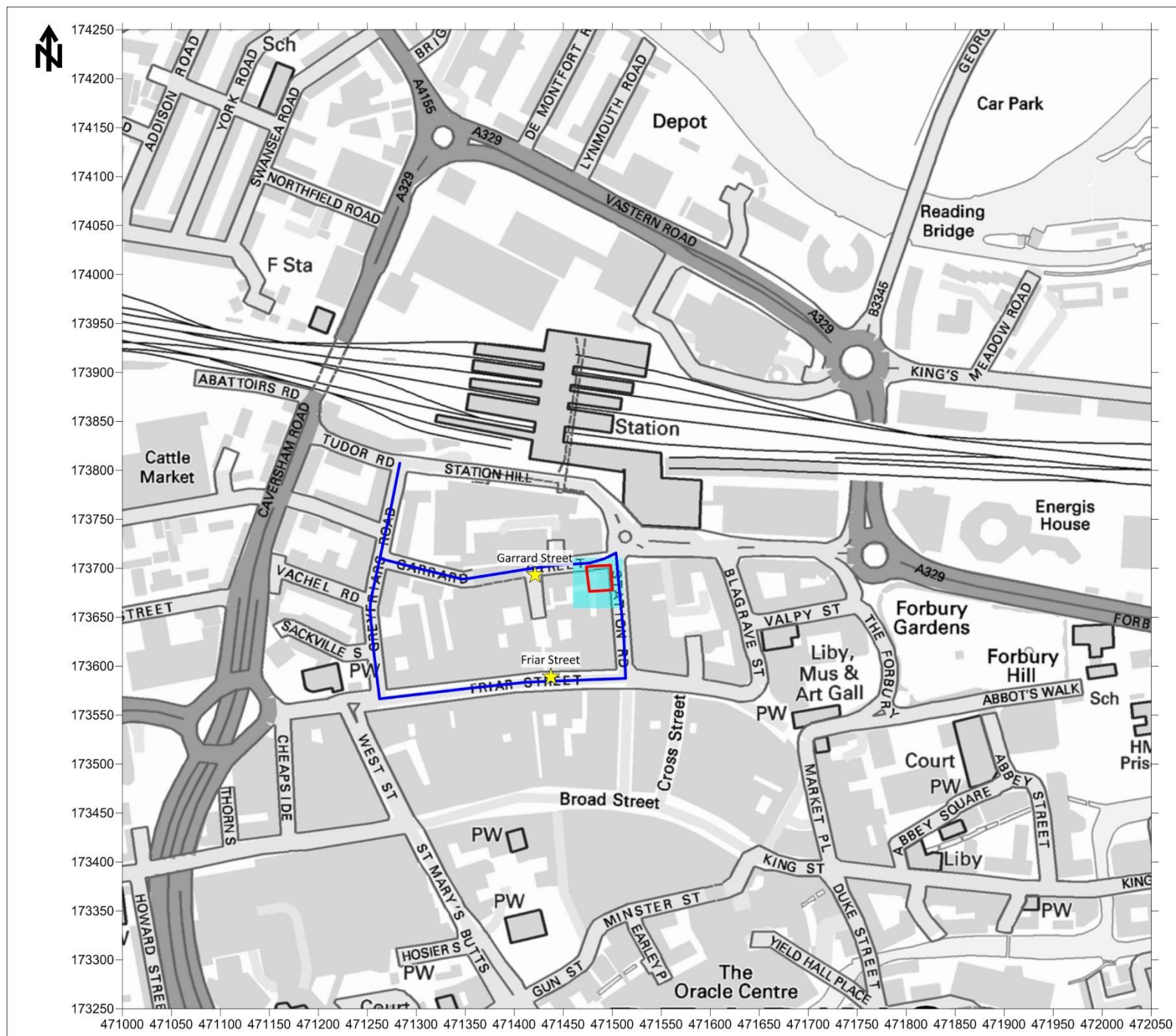
Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

Client

Titan Property Developments



Legend

-  Site Boundary
-  Modelled Road Link
-  Cartesian Grid
-  Diffusion Tube Monitoring Location

Title

Figure 6
ADMS-Roads Input

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

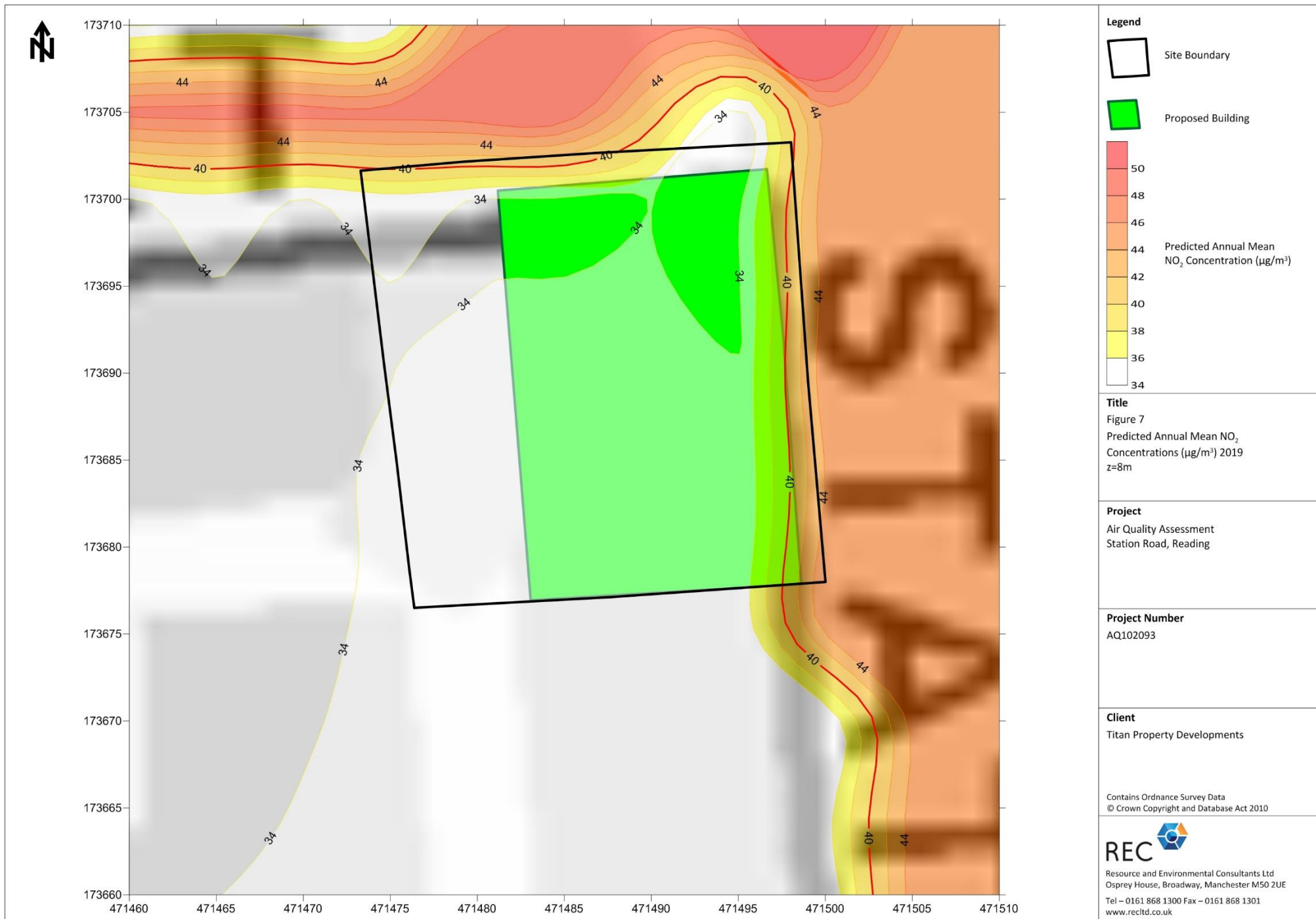
Client

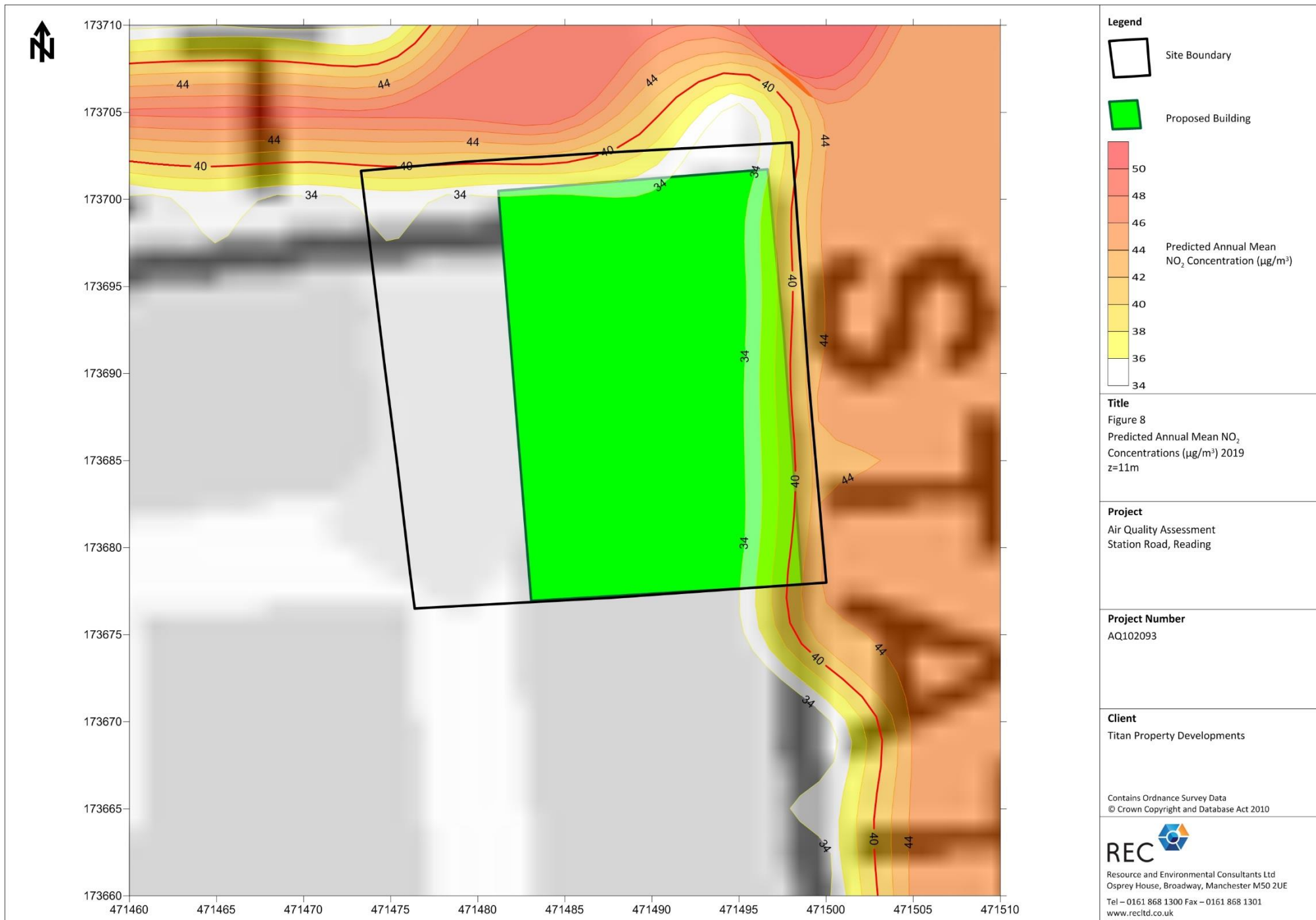
Titan Property Developments

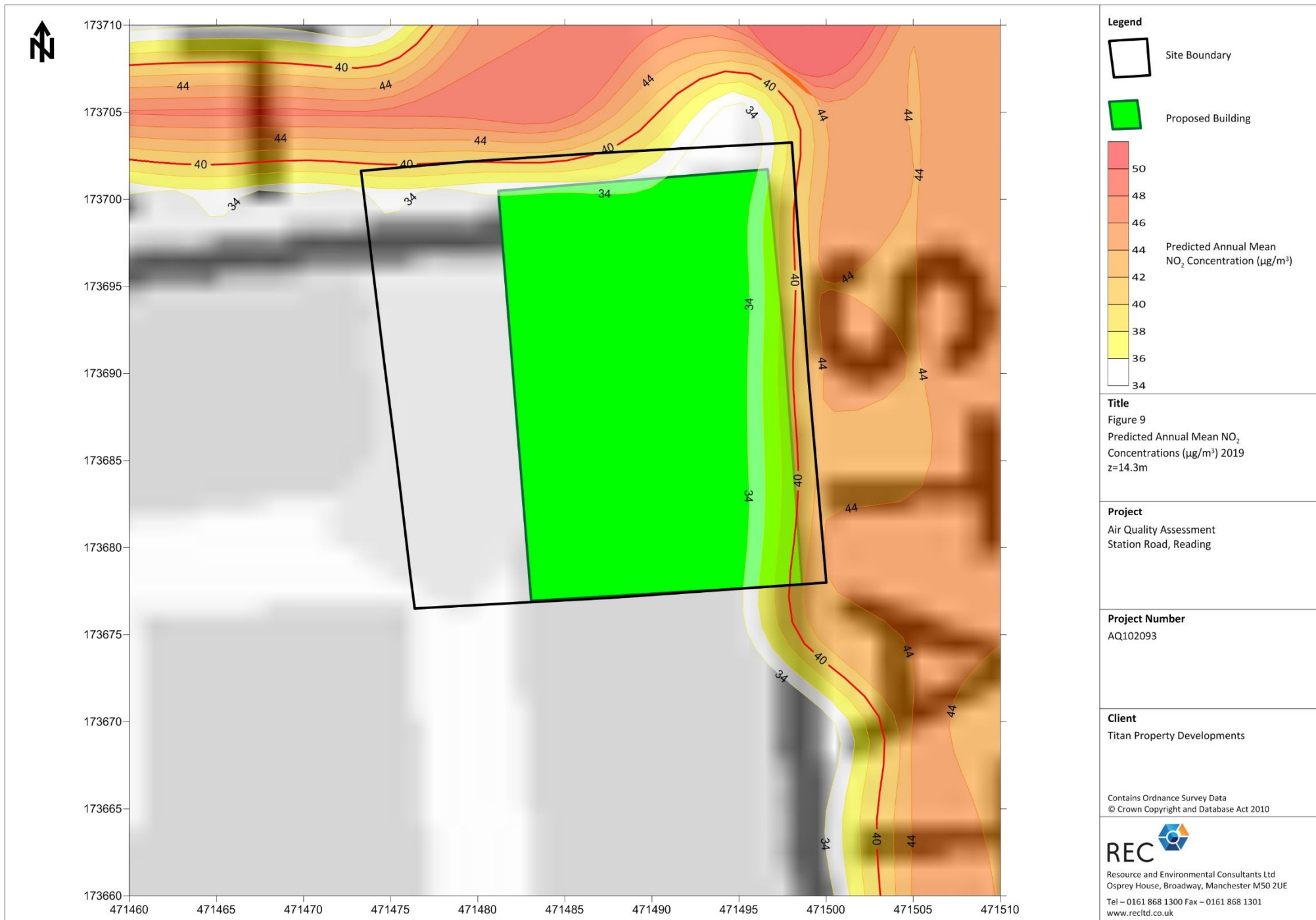
Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

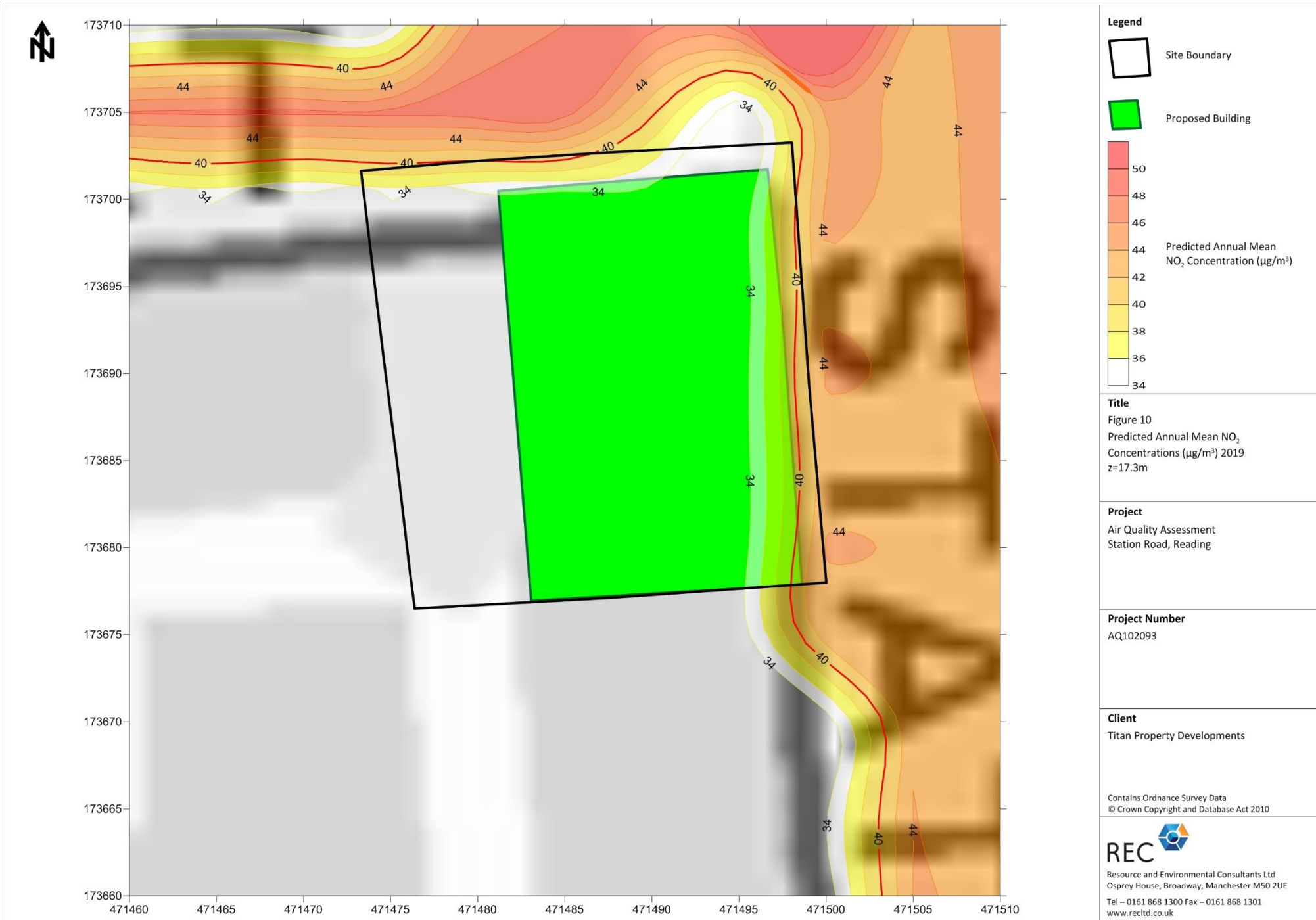


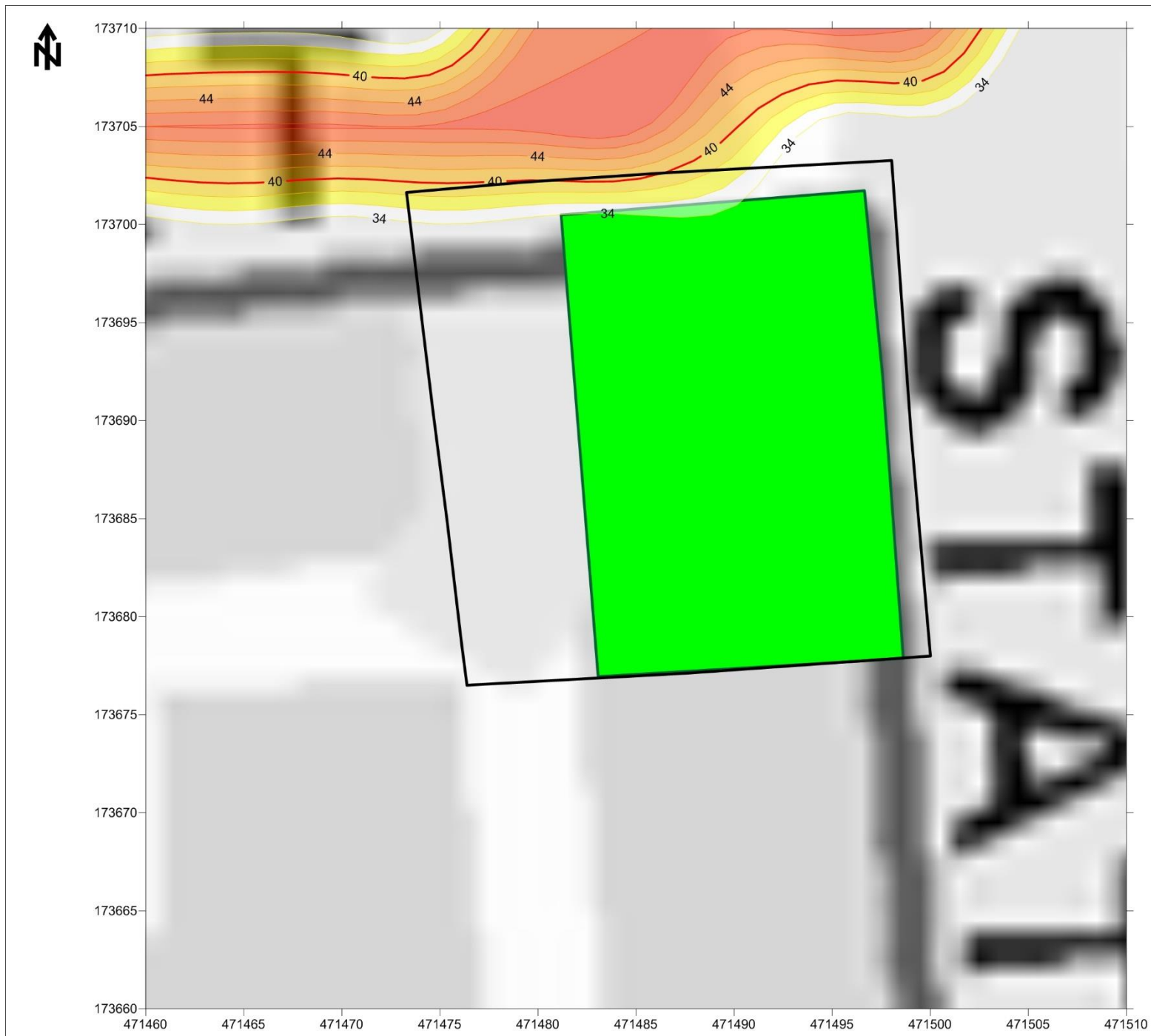
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recitd.co.uk





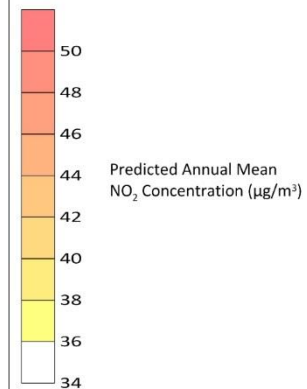






Legend

-  Site Boundary
-  Proposed Building



Title

Figure 11
Predicted Annual Mean NO₂
Concentrations (µg/m³) 2019
z=20.3m

Project

Air Quality Assessment
Station Road, Reading

Project Number

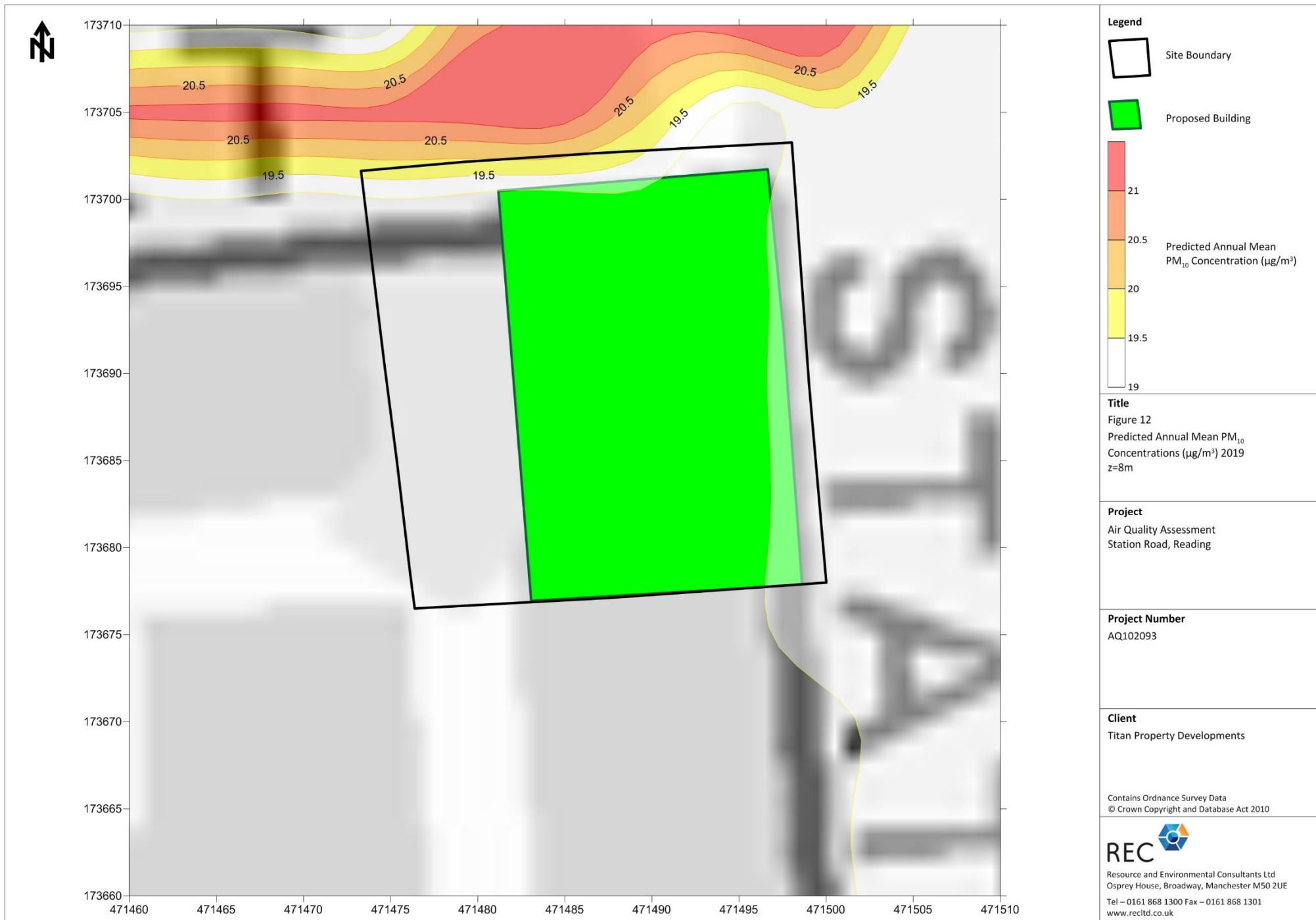
AQ102093

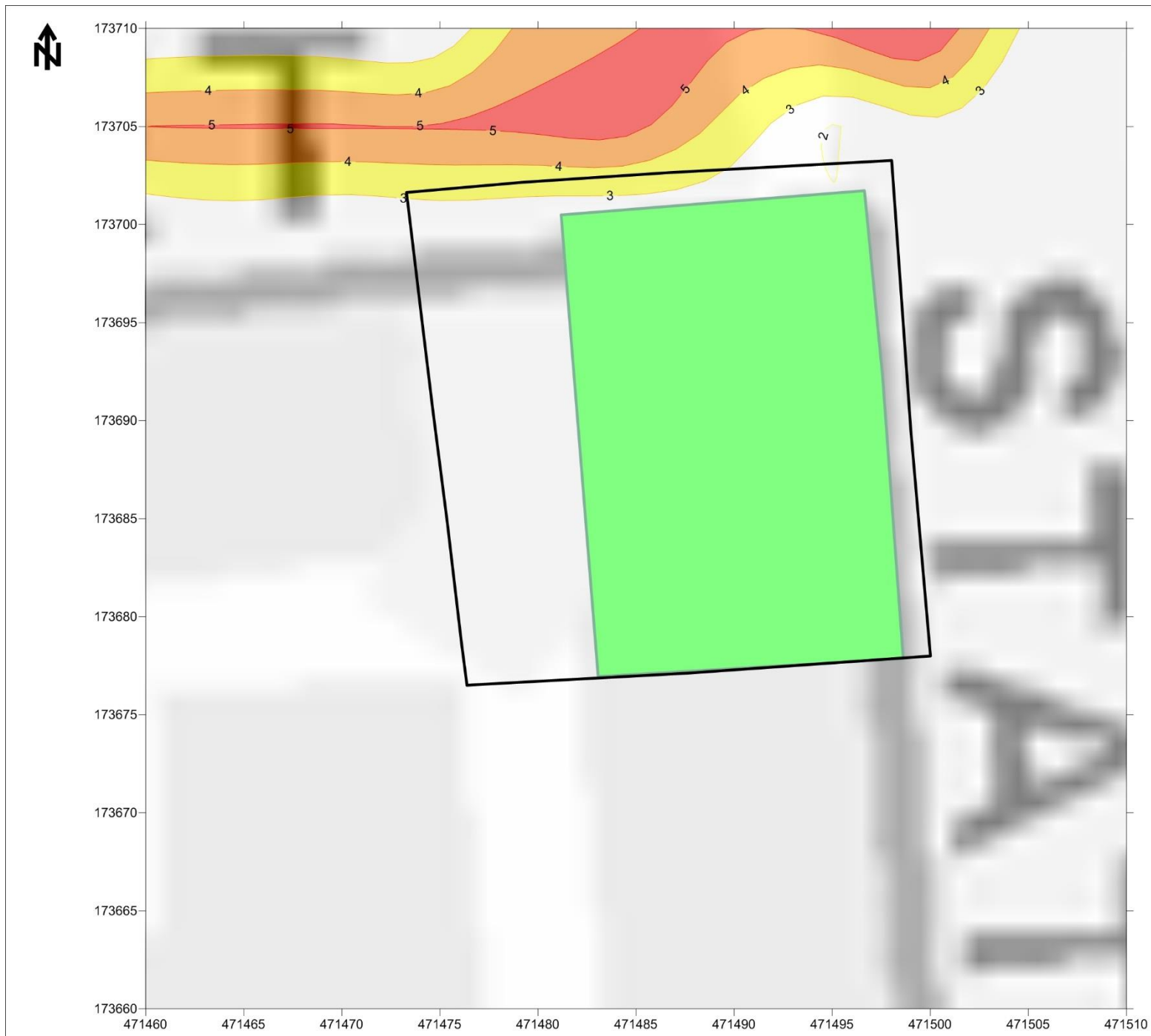
Client

Titan Property Developments

Contains Ordnance Survey Data
© Crown Copyright and Database Act 2010

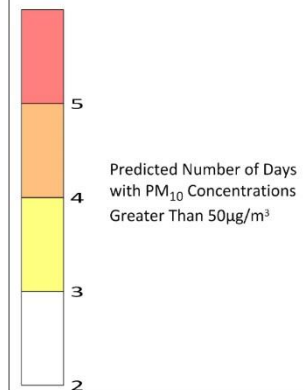
REC 
Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300 Fax – 0161 868 1301
www.recitd.co.uk





Legend

-  Site Boundary
-  Proposed Building



Title

Figure 13
Predicted Number of Days with PM_{10}
Concentrations Greater Than $50\mu g/m^3$
 $z=8m$

Project

Air Quality Assessment
Station Road, Reading

Project Number

AQ102093

Client

Titan Property Developments

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.recitd.co.uk



Air Quality Assessment
29-35 Station Road, Reading
August 2016
AQ102093r1

APPENDIX II ASSESSMENT INPUT DATA





ASSESSMENT INPUTS

The proposals are located within an AQMA and therefore there is the potential to expose future users to elevated pollution levels. Dispersion modelling using ADMS Roads was therefore undertaken to predict NO₂ and PM₁₀ 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 4.0.1.0). ADMS Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 471460, 173660 to 471510, 173710 at the following heights:

- ▶ 8m Second Floor;
- ▶ 11m Third Floor;
- ▶ 14.3m Fourth Floor;
- ▶ 17.3m Fifth Floor; and
- ▶ 20.3m Sixth Floor;

Results were subsequently used to produce contour plots within the Surfer software package.

Reference should be made to Figure 6 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 Heavy Duty Vehicle (HDV) proportion, was obtained from the Environmental





Statement for the Station Hill, Reading development⁹. The statement was published in 2013 for a large scale scheme close to the site and is considered representative of traffic flows in the local area.

Growth factors provided by the Trip End Model Presentation Program (TEMPO) software package were utilised to allow for conversion from the obtained 2014 traffic flow year to 2019, which was used to represent the development opening year.

Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 6 for a graphical representation of the road link locations. A summary of the traffic data used in the verification scenarios is provided in Table All.1.

Table All.1 2014 Traffic Data

Road Link		Road Width (m)	Canyon Height (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
1A	Garrard Street/Greyfriars	20.0	28.1	5,777	0	5
1B	Garrard Street/Carpark	33.0	27.5	5,777	0	10
1C	Garrard Street/Station Road	8.2	46.0	5,777	0	5
1D	End of Garrard Street/Station Road	8.2	74.0	5,777	0	5
2A	Greyfriars Road/Friar Street	15.0	28.1	4,159	4.2	10
2B	Greyfriars/Garrard Street	21.5	29.0	4,159	4.2	10
2C	Greyfriars/Tudor Road	7.8	0.0	4,159	4.2	10
3A	Friar Street	16.0	19.3	1,534	51.9	10
4A	Station Road/Friar Street	15.0	38.4	767	51.9	10
4B	Station Road	15.0	19.8	767	51.9	10

The road width and mean vehicle speed shown in Table All.1 remained the same for 2019. A summary of the 2019 traffic data is shown in Table All.2.

Table All.2 2019 Traffic Data

Road Link		24-hour AADT Flow	HDV Prop. (%)
1A	Garrard Street/Greyfriars	6,113	0
1B	Garrard Street/Carpark	6,113	0
1C	Garrard Street/Station Road	6,113	0

⁹ Appendix 11.1, Acoustic Assessment, Station Hill, Reading: Environmental Statement, Sackville Developments, 2013.





Road Link		24-hour AADT Flow	HDV Prop. (%)
1D	End of Garrard Street/Station Road	6,113	0
2A	Greyfriars Road/Friar Street	4,401	4.2
2B	Greyfriars/Garrard Street	4,401	4.2
2C	Greyfriars/Tudor Road	4,401	4.2
3A	Friar Street	1,623	51.9
4A	Station Road/Friar Street	812	51.9
4B	Station Road	812	51.9

Street Canyon

Sections of the local highway network including parts of Garrard Street, Greyfriars, Friar Street, and Station Road are flanked by tall buildings on both sides and was therefore considered street canyon for the purpose of the dispersion modelling assessment. This allows the additional turbulent flow patterns occurring within a street with high structures on either side to be considered within the predicted concentrations. The heights of the tallest buildings on each road were included in the model to provide robust assessment results.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 7.0) released in 2016, which incorporates updated COPERT4v11 vehicle emissions factors for NO_x and vehicle fleet information.

There is current uncertainty over NO₂ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2014 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

Meteorological Data

Meteorological data used in this assessment was taken from RAF Benson meteorological station over the period 1st January 2014 to 31st December 2014 (inclusive). RAF Benson meteorological station is located at approximate NGR: 462600, 191690, which is approximately 20.1km north-west of the proposed development.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 for a wind rose of utilised meteorological data.





Roughness Length

A roughness length (z_0) of 1m was used in this dispersion modelling study. 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 'cities, woodland'.

A z_0 of 0.2m was utilised to represent the morphology of the meteorological station location and is suggested as being suitable for 'agricultural areas (min)'

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and meteorological station location and is suggested within ADMS-Roads as being suitable for 'cities, large towns'.

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

Background Concentrations

An annual mean NO_2 concentration of $32.27\mu\text{g}/\text{m}^3$ and PM_{10} concentration of $18.66\mu\text{g}/\text{m}^3$, as predicted by DEFRA, was used in the dispersion modelling assessment to represent annual mean pollutant levels in the vicinity of the site.

Similarly to emission factors, background concentrations for 2014 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM (TG16)².

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.

For the purpose of this assessment model verification was undertaken for 2014, using traffic data, meteorological data and monitoring results from this year.

RBC undertakes monitoring of NO₂ concentrations at two roadside locations within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO₂ result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM (TG16)². The monitored annual mean NO₂ concentration and calculated road NO_x concentration are summarised in Table AII.4.

Table AII.4 2014 Monitoring Results

Monitoring Location	Monitored NO ₂ Concentration (µg/m ³)	Calculated Road NO _x Concentration (µg/m ³)
Garrard Street	40	16.95
Friar Street	51	43.87

The dispersion model was run with the traffic input data previously detailed for 2014 to predict the NO_x concentration at the monitoring locations. The results are shown in Table AII.4. Exceedances of the AQO are highlighted in bold.

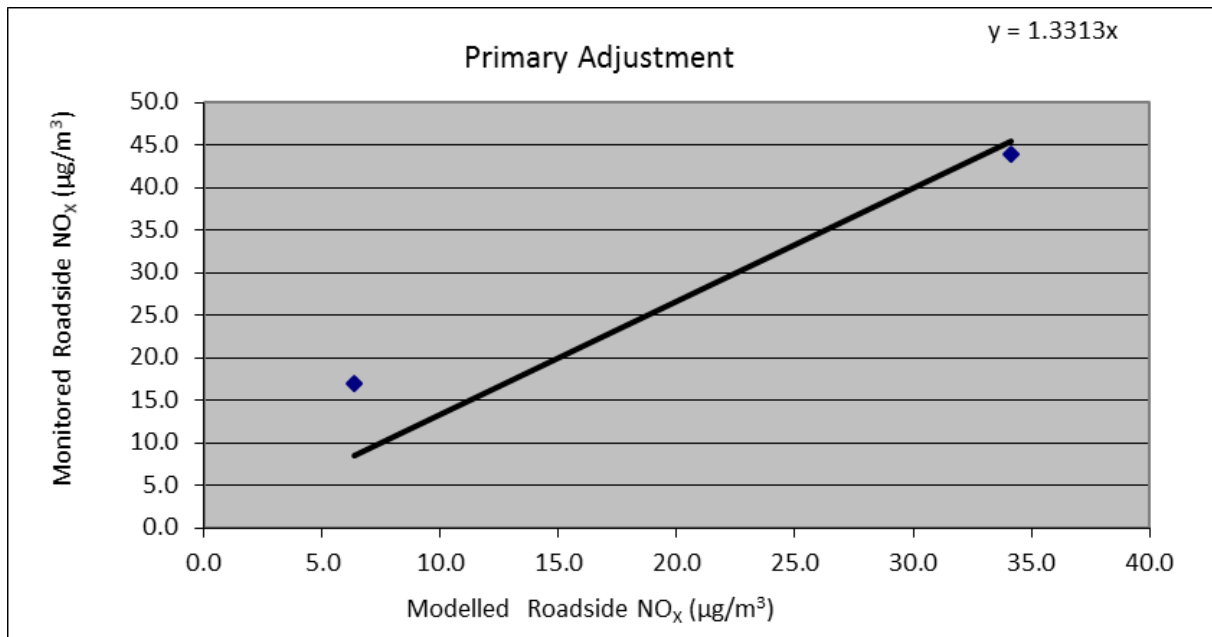
Table AII.5 Verification Results

Monitoring Location	Modelled Road NO _x Concentration (µg/m ³)
Garrard Street	6.38
Friar Street	34.12

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated. This indicated a verification factor of **1.3313** was required to be applied to all modelling results, as shown in Graph 1. This was followed by a comparison of modelled and monitored NO₂ concentrations which resulted in a secondary correction factor of **1.0081**.

As PM₁₀ monitoring is not undertaken within the assessment extents, a verification factor of **1.3313** was also used to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM (TG16)².







Air Quality Assessment
29-35 Station Road, Reading
August 2016
AQ102093r1

APPENDIX III ASSESSOR'S CURRICULUM VITAE





GABOR ANTONY

Principal Air Quality Consultant

MSc, MIAQM, MIEEnvSc

KEY EXPERIENCE:

Gabor is a Principal Consultant with specialist experience in the air quality and odour sector. His key capabilities include:

- ▶ Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS, ADMS-5, AERMOD-PRIME and BREEZE-ROADS.
- ▶ Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and EPUK methodologies.
- ▶ Management and delivery of project work on key, land development and urban regeneration projects.
- ▶ Multi-source industrial air emissions and stack emissions assessments using AERMOD-PRIME modelling software for IPPC Permit applications and stand-alone technical reports.
- ▶ Co-ordination and management of different emission and emission related measurements, and various monitoring programmes including construction dust; diffusion tube surveys and odour assessments in accordance with DEFRA and Environment Agency guidance.

QUALIFICATIONS:

- ▶ Master of Science degree
- ▶ Member, Institution of Environmental Sciences (MIEEnvSc)
- ▶ Member, Institute of Air Quality Management (MIAQM).

SELECT PROJECTS SUMMARY:

Residential Developments

- Boorley Green** - EIA undertaken for mixed use scheme.
- Vauxhall** - AQA for mixed use scheme within AQMA in London.
- Mapplewell** - AQA for residential development.
- Catford Stadium** - Low Emission Transport Strategy for mixed use development in London
- Lambeth Road** - AQA for mixed use scheme in AQMA in London.
- Thurmaston NEoLSUE** - EIA for Suburban extension
- Westferry Print works** - EIA for large mixed use development.
- Grange Farm, Doncaster** - AQA for residential development.
- Wadi Al Asla** - AQA as part of EIA for proposed urban extension in Saudi Arabia.
- Horndean** - AQA for residential development adjacent to A3.
- Derby** - Fire and Smoke assessment for residential development.
- Kirkby Muxloe** - AQA for residential development adjacent to M1.
- Ushaw Moor** - AQA for residential development in proximity of AQMA.

Commercial and Retail Developments

- Horfield, Bristol** - EIA for Mixed- use development in AQMA.
- Nottingham** - Biomass boiler assessment for retail facility.
- South Woodham Ferrers** - Biomass boiler and road traffic assessment.
- Widnes** - AQA for Shopping Centre Extension, adjacent to AQMA.
- Lancaster Science Park** - AQA for commercial development in proximity of AQMA.
- Haymarket** - AQA for Bus Station Redevelopment.

- Bath Western Riverside East** - AQA as part of EIA for mixed use development.
- Irvine, North Ayrshire** - AQA for Hospital redevelopment
- Derby** - biomass boiler emission assessment.
- Bristol & Bath Science Park** - AQA as part of EIA for commercial development.
- Sheffield Superstore** - AQA in support of new food superstore.
- Nuneaton** - AQA for mixed use development with biomass boiler.
- Thorp Arch**, - EIA for Urban extension.
- Reading Station** - AQA Highway Implementation Scheme.
- Ebbsfleet International Railway Station** - AQA for mixed use development.
- M4 Junction 11** - AQA for Motorway Scheme.
- Hook** - Biomass Boiler and road transport assessment for proposed food store.

Industrial Developments

- University of Birmingham** - Environmental Permit Variation Application for existing CHP facility.
- Sedalcol** - Environmental Permit Application for Alcohol and Starch production facility.
- Cotesbach** - AQA for Fully enclosed Waste composting Facility.
- Trent Foundry** - Environmental Permit Application for Existing foundry in Scunthorpe.
- Beddington** - AQA for Energy from Waste Plant.
- Thakeham** - AQA for mushroom production facility.
- Partington** - EIA for Liquid Natural Gas storage site demolition works in Trafford.
- South View Farm** - Ammonia dispersion modelling of broiler farm.
- Blackwater** - AQA for Asphalt plant Permit Application.





MARÍA LÓPEZ VERA

Graduate Air Quality Consultant

BSc, MSc

KEY EXPERIENCE:

María is a Graduate Environmental Consultant with specialist experience in the air quality, odour and waste sectors. Her key capabilities include:

- ▶ Drafting of construction works, reports and environmental monitoring plans.
- ▶ Writing transboundary guides on good practice measures for contamination reduction and landfill sustainability.
- ▶ Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- ▶ Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- ▶ Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- ▶ Production of air quality mitigation strategies for developments throughout the UK.
- ▶ Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- ▶ Bachelor of Science
- ▶ Master of Science degree

SELECT PROJECTS SUMMARY:

Landfill improvements

RECONVER: Cross-border Programme for Landfill Contamination Reduction

Cross-border Cooperation Programme Spain-External Borders, financed by the European Regional Development Fund (EDRF) for reduction of landfill contaminations and landscape impact in 4 landfills in the Spanish provinces of Málaga and Almería and the Moroccan city of Tétuan. Project involvement included initial evaluation for landfill sites embedded in a complete transboundary diagnostic, risk assessments, environmental audits, organisation of international workshops.

SUFALNET4EU: Sustainable Use of Former and Abandoned Landfills For You

Project involvement included the preparation and development of GIS maps and the drafting of reports for landfill sites in the province of Málaga (Spain).

Residential Developments

York Street, Radcliffe - AQA for residential development.

Ripon Cathedral Choir School, Ripon- AQA for residential development

Snow and Leisure Development, Middlehaven- AQA in support of a snow and leisure development

Littleport LIT2- AQA for residential development

Furness Quay, Salford- AQA for residential development

Great West Road, Chiswick- AQA for residential development

The Avenue, Egham- AQA for residential development

Wexham Park Hospital- AQA for a new Wexham Park Emergency Department

Nwecraighall, East Lothian- AQA for residential-led development

Huddersfield Road, Wyke, Bradford- AQA for residential development

Walton Road, Wetherby- Odour Assessment in support of a residential development.

