



AIR QUALITY ASSESSMENT GEORGE STREET, READING

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A CONCEPT LIFE SCIENCES COMPANY





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EXECUTIVE SUMMARY

Resource and Environmental Consultants Ltd was commissioned Blast Away Ltd to undertake an Air Quality Assessment in support of a proposed development at George Street, Reading.

The proposals comprise the redevelopment of the site to provide several residential apartments with associated infrastructure.

The site is located within an area identified by Reading Borough Council as experiencing elevated pollutant concentrations. Subsequently, there is the potential for the proposals to introduce future site users to poor air quality. Additionally, the development may have the potential to cause adverse impacts at nearby sensitive locations. An Air Quality Assessment was required to quantify pollutant levels across the site, consider its suitability for the proposed end-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. 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 quantify pollutant concentrations at the proposed site and to assess the potential for future users to be exposed to poor air quality. Results were subsequently verified using monitoring results obtained from Reading Borough Council.

The dispersion modelling results indicated that pollutant concentrations across the site did not exceed the relevant air quality standards at the proposed residential units. The location is therefore considered suitable for the proposed end-use without the inclusion of mitigation methods to protect future users from poor air quality.

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





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1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Ltd was commissioned by Blast Away Ltd to undertake an Air Quality Assessment in support of a proposed development at George Street, Reading.

1.2 Site Location and Context

The proposals comprise the redevelopment of the site on George Street located at the approximate National Grid Reference (NGR): 470600, 173650 to provide several residential apartments and associated infrastructure. Reference should be made to Figure 1 for a location plan.

The development site is located within the Reading Air Quality Management Area (AQMA) which has been declared for exceedances of the annual mean Air Quality Objective (AQO) for nitrogen dioxide (NO₂). As such, there is the potential for the proposals to expose future site users to elevated pollution levels, as well as to cause air quality impacts at sensitive receptor locations within the AQMA; as a result of emissions associated with the construction and operational phases. An Air Quality Assessment was therefore required to quantify pollutant levels across the site, consider its suitability for the proposed end use and assess potential impacts 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 (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 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 6 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 2007. 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.





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
PM _{2.5}	25	Annual Mean

Table 2 summarises the advice provided in DEFRA guidance LAQM (TG16)¹ 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 Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, 2016.





Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
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

2.3 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 (2018) are those 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 Framework² (NPPF) was published on 24th July 2018 (updated in 19th February 2019) 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:

"Planning policies and decisions 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality.

Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

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

2.5.2 National Planning Practice Guidance

The National Planning Practice Guidance³ (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 relevant air quality sections are highlighted below:

Paragraph 001 states that: "Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values" and "It is important that the potential impact of new development on air quality is taken into account, where the national assessment indicates that relevant limits have been exceeded or are near the limit". The role of Local Authorities under LAQM are stated and that Air Quality Action Plans should "identify measures that will be introduced in pursuit of the objectives"

Paragraph 005 states that "Whether or not air quality is relevant to a planning decision will

² National Planning Policy Framework, Department for Communities and Local Government, 2018.

³ <http://planningguidance.planningportal.gov.uk/>





depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation

Paragraph 007 states that "Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality". In terms of mitigation, it states that "Mitigation options where necessary will be location specific, will depend on the proposed development and should be proportionate to the likely impact".

Paragraph 009 shows a flow chart highlighting how the assessment of air quality impacts should fit into the development management process. It makes it clear that air quality impact risks, AQLVs and AQOs should be considered in the decision-making process.

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

2.6 Local Planning Policy

The Reading Borough Council (RBC) Local Development Framework⁴ contains several documents that were adopted in January 2008/2009. It sets out the overall planning strategy and planning principles for Reading.

A review of RBC's Local Development Framework indicated that the Core Strategy had the below policies:

"Policy CS34: Pollution and Water Resources:

Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution; where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development. Proposals for development that are sensitive to the effects of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution."

. RBC's Central Area Action Plan showed the following relevant policy:

"RC9 – Living in the Centre (CR6: Living in Central Reading in New Local Plan⁵)

Proposals for residential development within the central area will be assessed against the following criteria:

[...]

⁴ Reading Borough Council, Planning Policy - <http://www.reading.gov.uk/readingldf>

⁵ Draft Reading Borough Local Plan, 2017 - <http://www.reading.gov.uk/newlocalplan>





Proposals for new residential development within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated."

RBC are developing a New Local Plan⁵ that will set out how Reading will develop up to 2036. Although the new Local Plan is still under consultation, consideration has been taken to review future policies. As such, the New Local Plan indicated the following policy in relation to air quality that is relevant to this assessment:

"EN15: AIR QUALITY

Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

- i. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:*
 - *Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would significantly worsen air quality;*
 - *Whether the development is within, or accessed via, an Air Quality Management Area; and*
 - *Whether it can be demonstrated that a local worsening in air quality would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.*
- ii. Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused.*
- iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring."*

And;

"CC8: SAFEGUARDING AMENITY

Development will not cause a significant detrimental impact to the living environment of existing or new residential properties, in terms of:

[...]

- *Dust and fumes;"*

Reference has been made to these policies during the preparation of this Air Quality Assessment by assessing pollutant concentrations across the site and determining potential air quality impacts as a result of the proposed development.





3 METHODOLOGY

The proposed development has the potential to expose future site users to elevated pollution levels as well as causing air quality impacts during the construction and operational phases. 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:

- ▶ The scale and nature of the works, which determines the magnitude of dust arising as: small,

⁶ Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016.





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
	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 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 9 outlines the risk category from Earthworks and construction activities.

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'.

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

The proposed development includes sensitive land use located with an AQMA. As such, the proposals have the potential to introduce new receptors into an area of existing poor air quality. Detailed dispersion modelling using ADMS-Roads was therefore undertaken to quantify NO₂, PM₁₀ and PM_{2.5} concentrations across the site to determine suitability for the proposed use, using the following scenarios:

- ▶ 2017 Verification;
- ▶ Opening year (predicted traffic flows in 2020 should the proposals be completed).

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

3.2.1 Road Traffic Exhaust and Combustion Emissions Impacts

In the interest of robustness, a screening assessment was undertaken using the criteria contained the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) 'Land-Use





Planning & Development Control: Planning for Air Quality (2017)⁷ guidance documents to determine the potential for impacts generated by the development upon local air quality.

The EPUK and IAQM guidance⁶ document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- ▶ Proposals that will cause a change in Light Duty Vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 elsewhere;
- ▶ Proposals that will cause a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 elsewhere;
- ▶ Proposals that would realign roads within an AQMA by more than 5m;
- ▶ Proposals that will introduce new junctions or remove existing junctions near relevant receptors;
- ▶ Proposals that will introduce or change a bus station or change flows of buses by more than 25 AADT within an AQMA or more than 100 AADT elsewhere;
- ▶ Proposals which will include an underground car park with extraction system which will be within 20m of a relevant receptor and have more than 100 movements per day;
- ▶ Proposals which include either a centralised plant using biofuel, a combustion plant with single or thermal input >300KWh or a standby emergency generator associated with a centralised energy centre; and,
- ▶ Proposals which include combustion processes of any size.

Should these criteria not be met, then the EPUK and IAQM guidance⁸ documents consider air quality impacts associated with a scheme to be **negligible** and no further assessment is required.

Should screening of the traffic data indicate that any of the above criteria are met, then potential impacts at sensitive receptor locations can be assessed by calculating the predicted change in pollutant concentrations as a result of the proposed development. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the EPUK and IAQM guidance⁸.

7 Land-Use Planning & Development Control: Planning for Air Quality, EPUK and IAQM, 2017.





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 concentrations of NO₂ are above the annual AQO within the area. As such, one AQMA has been declared which is described as:

"Reading AQMA - 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 site is located within the Reading AQMA. As such, there is the potential for the development to introduce future site users to elevated pollutant concentrations as well as cause adverse impacts to air quality within this area. 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 designated.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by RBC using continuous and periodic methods throughout their area of administration. There are no automatic analysers operated by RBC within the vicinity of the site.

RBC also utilise passive diffusion tubes to monitor NO₂ concentrations throughout their area of administration. There are 7 diffusion tube 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 shown in **bold**.

Table 11 Diffusion Tube Monitoring Results

Site Name	Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
		X	Y	2015	2016	2017
4 Tilehurst Road	Roadside	470628	173076	29.14	30.39	29.86
162a Castle Hill	Roadside	470835	172992	35.75	36.71	34.86
Cow Lane Bridges	Roadside	470230	173818	32.44	34.93	34.38
327 Oxford Road	Roadside	470057	173489	45.11	43.64	44.83
281 Oxford Road	Roadside	470294	173445	31.36	31.00	28.94





Site Name	Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
		X	Y	2015	2016	2017
165 Oxford Road	Roadside	470717	173373	29.74	32.23	29.92
10 Trinity Place	Roadside	470738	173433	40.26	37.15	36.67

As indicated in Table 11 the annual mean AQO for NO₂ was exceeded at the 2 monitoring locations during recent years. This may be due to their roadside locations within an AQMA. Reference should be made to Figure 2 within Appendix I for a graphical representation of the diffusion tube monitoring location.

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: 470500, 173500. Data for this location was downloaded from the DEFRA website⁹ for the purpose of this assessment for the verification year (2017) and the predicted development opening year (2020) and is summarised in Table 12.

Table 12 Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)	
	2017	2020
NO _x	40.90	35.12
NO ₂	25.98	23.03
PM ₁₀	15.00	14.28
PM _{2.5}	9.29	8.85

As shown in Table 12, background concentrations of NO₂ did not exceed the relevant AQOs. Comparison between 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.

4.4.1 Construction Phase Sensitive Receptors

Receptors sensitive to potential dust impacts during earthworks and construction were identified from

⁹ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>.





a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 13.

Table 13 Demolition, Earthworks and Construction Dust Sensitive Receptors

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

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

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 the north and south of George Street to ensure the maximum potential trackout distance was considered.

Table 14 Trackout Dust Sensitive Receptors

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

Reference should be made to Figure 4 within Appendix I 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 within a residential area. As such, historical dust generation may have occurred as a result of regeneration





Guidance	Comment
The likelihood of concurrent dust generating activity on nearby sites	A review of the RBC planning portal indicated that there are no large scale planning applications within 500m of the proposed development. As such, there is little risk of concurrent dust generation from nearby developments.
Pre-existing screening between the source and the receptors	There is no vegetation present along the site boundary. Pre-existing screening to receptors is therefore limited
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 and south-west of the development, as shown in Figure 5 within Appendix I. As such, properties to the north and north-east 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
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, given the 2020 opening year it is not likely 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	High	High	High	High
Human Health	Low	Low	Low	Medium





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 the existing buildings. It is anticipated that the volume of buildings to be demolished is likely to be under 20,000m³. 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 **high**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** 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 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 **high**. 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 impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health impacts 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 **high**. 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 impacts is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **negligible** risk site for human health impacts 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 impacts is **medium**. In accordance within the criteria outlined in Table 10, the development is considered to be a **negligible** risk site for human health impacts 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 Table 17.





Table 17 Summary of Potential Unmitigated Dust Risks

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

As indicated in Table 17, the potential risk of dust soiling is **medium** from demolition and **low** from construction, earthworks and trackout activities. The potential risk of human health impacts is **negligible** for demolition, construction, earthworks and trackout activities.

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

5.1.3 Step 3

The 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. 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 • Develop and implement a stakeholder communications plan that includes community engagement • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	• Record all dusty and air quality complaints • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation • Make complaints log available to LA when asked
Monitoring	• Undertake daily on-site and off-site inspection, where receptors are nearby, to monitor dust, record inspection results, and make the log available to the LA when asked • 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 • Fully enclose site or specific operations where there is a high potential for dust production and the site as active for an extensive period • Avoid site runoff of water or mud • Use water as dust suppressant where applicable • Keep site fencing, barriers and scaffolding clean using wet methods • Remove materials that have a potential to produce dust from site as soon as possible • Cover, seed or fence stockpiles to prevent wind whipping
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 • Impose a signpost a maximum-speed limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas • Produce a Construction Logistics Plan to manage sustainable deliveries • Implement a travel plan that supports and encourages sustainable travel
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 • Ensure equipment is readily available on site to clean any spillages
Waste Management	• No bonfires
Demolition	• Soft strip inside buildings before demolition • Ensure effective water suppression is used • Avoid explosive blasting • Bag and remove any biological debris or damp down
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

Additional vehicle movements associated with the operation of the proposed development will generate exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5}, on the local and regional road networks. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations in the vicinity of the site.

The assessment considered the following scenarios:

- ▶ 2017 Verification;
- ▶ 2020 DS.

For the purpose of this assessment traffic data was supplied for 2020, the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2017 were utilised within the dispersion model. The use of 2020 traffic data and 2017 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

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

5.2.1 Future Exposure

During the operational phase of the proposed development there is the potential for future residents to be exposed to elevated pollutant concentrations. This has been assessed through dispersion modelling, with the results presented in the following Sections.

5.2.1.1 Nitrogen Dioxide

Annual mean NO₂ concentrations were predicted across the development at a height of 1.5m above the road height to represent exposure in 2020 across the ground floor levels, as shown in Figure 7 within Appendix I.

Predicted annual mean NO₂ concentrations across the development site for the opening year scenario are summarised in Table 19.

Table 19 Modelling Results - Annual Mean NO₂

Floor	Predicted 2020 Annual Mean NO ₂ Concentration Range (µg/m ³)
Ground (1.5m)	27.56 – 27.96

Table 19 indicates there were no predicted exceedances of the AQO at the proposed development site. As such, it is considered that annual mean NO₂ levels at the development site should not be





viewed as a constraint to development.

It should be noted that the residential units are also located above ground level and it is considered that background NO₂ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as the local road network. Therefore, predicted concentrations at heights above ground floor level (at the residential units) are deemed to be acceptable in relation to pollutant exposure and have not been considered further.

Predictions of 1-hour mean NO₂ concentrations were also not produced as part of the dispersion modelling assessment. As stated in LAQM.TG (16)², if annual mean NO₂ concentrations are below 60µg/m³ then it is unlikely that the 1-hour mean AQO will be exceeded. As such, based on the results in Table 19, it is not predicted that concentrations will exceed the 1-hour mean AQO for NO₂ across the development site.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for the proposed end use without the implementation of mitigation techniques to protect future residents from elevated NO₂ concentrations.

5.2.1.2 Particulate Matter (PM₁₀)

Annual mean PM₁₀ concentrations were predicted across the development at a height of 1.5m to represent exposure across the ground floor level, as shown in Figure 8 within Appendix I.

Predicted annual mean PM₁₀ concentrations across the development site for the opening year scenario are summarised in Table 20.

Table 20 Modelling Results - Annual Mean PM₁₀

Floor	Predicted 2020 Annual Mean PM ₁₀ Concentration Range (µg/m ³)
Ground (1.5m)	15.14 – 15.18

As indicated in Table 20, there are no predicted exceedances of the annual mean AQO for PM₁₀ across the proposed development. As such, it is considered that annual mean PM₁₀ levels at the development site should not be viewed as a constraint to development.

Similar to NO₂ concentrations, PM₁₀ predictions above ground floor were not included within this report as predicted concentrations at ground floor were deemed acceptable. This is because pollutant concentrations are considered to be lower at elevated heights due to increased distance from emission sources, such as the local highway network.

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

5.2.1.3 Particulate Matter (PM_{2.5})

PM_{2.5} has not been modelled within the assessment as the predicted concentrations relating to annual mean PM₁₀ remain below the AQO for PM_{2.5} (25µg/m³).





Since PM_{10} contains all particulate matter with an aerodynamic diameter of less than $10\mu m$, $PM_{2.5}$ is effectively accounted for within these predictions; and at worst could be considered that $PM_{2.5}$ concentrations would be equal to the predicted PM_{10} concentrations.

5.2.2 Road Traffic Exhaust Emissions

The development will be car-free. As such, the development will not result in a change of AADT flows of more than 500, produce over 100 HDV movements per day or significantly affect average speeds on the local road network. It is not considered that the proposed development will generate or increase traffic congestion, give rise to a significant change in AADT or peak traffic flows or vehicle speeds.

Additionally, it is unlikely that the proposed development will not significantly alter the traffic composition on local roads or include significant new car parking. As such, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **not significant** in accordance with the EPUK and IAQM⁷ screening criteria shown in Section 3.2.1.





6 CONCLUSION

REC Ltd was commissioned by Blast Away Ltd to undertake an Air Quality Assessment in support of a proposed development at George Street, Reading.

The site is located within the Reading AQMA which has been declared by RBC for exceedances of the annual mean AQO for NO₂. As such, there are concerns that the proposals could expose future site users to elevated pollution levels. An Air Quality Assessment was therefore required to quantify baseline conditions, consider the suitability of the site for the proposed end-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 **not significant**.

Dispersion modelling was undertaken utilising ADMS software in order to quantify pollutant concentrations at the site. Results were subsequently verified using monitoring results obtained from RBC. The dispersion modelling results indicated that pollutant levels across the site were below the relevant AQOs. The location is therefore considered suitable for the proposed end-use without the inclusion of mitigation methods to protect future users from poor air quality.

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. An assessment was therefore undertaken using the EPUK and IAQM⁷ screening criteria to determine the potential for trips generated by the development to affect local air quality. This indicated that impacts are likely to be **not significant** throughout the operational phase.

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





7 ABBREVIATIONS

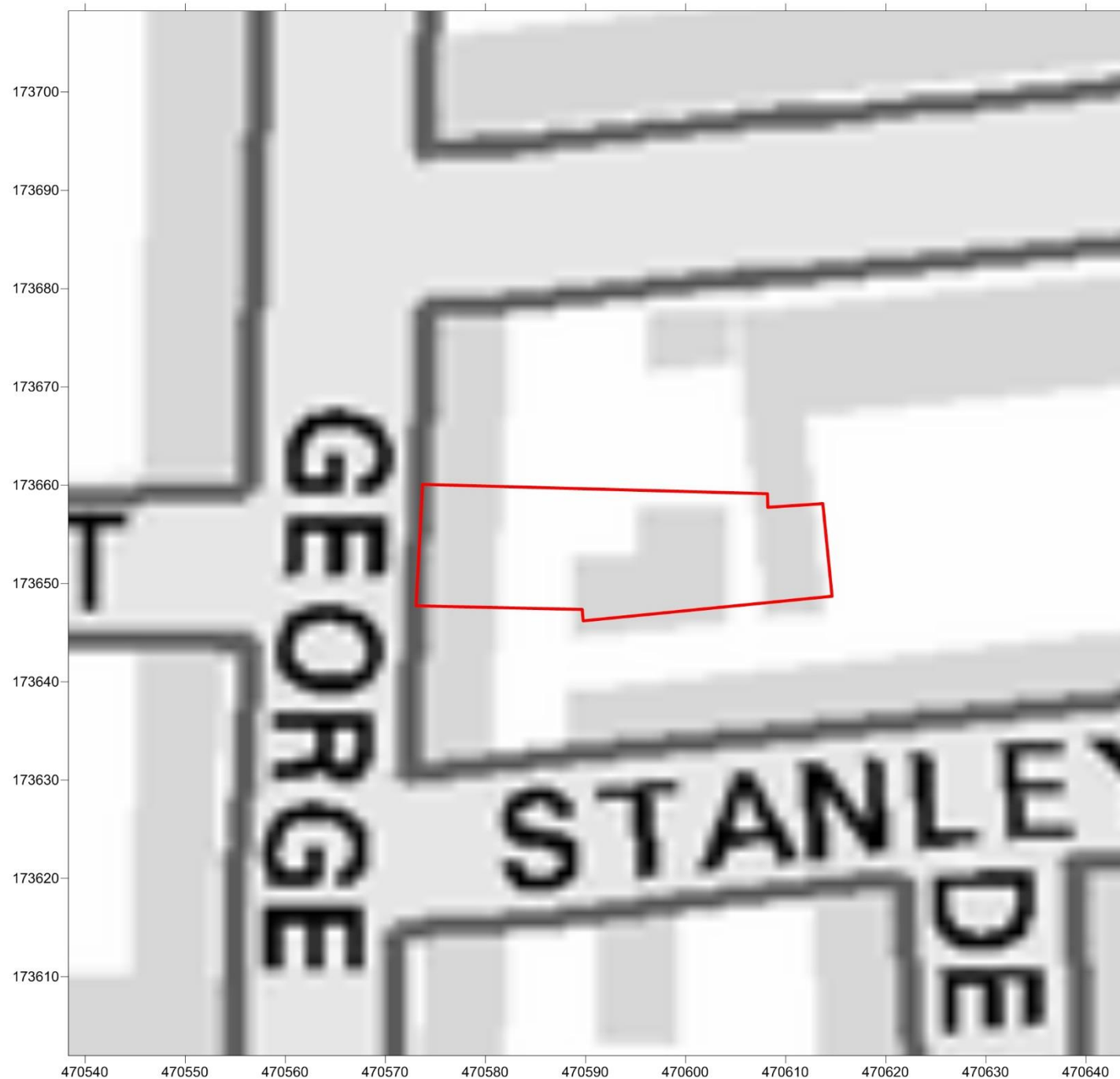
AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
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
George Street, Reading

Project Number

AQ107008

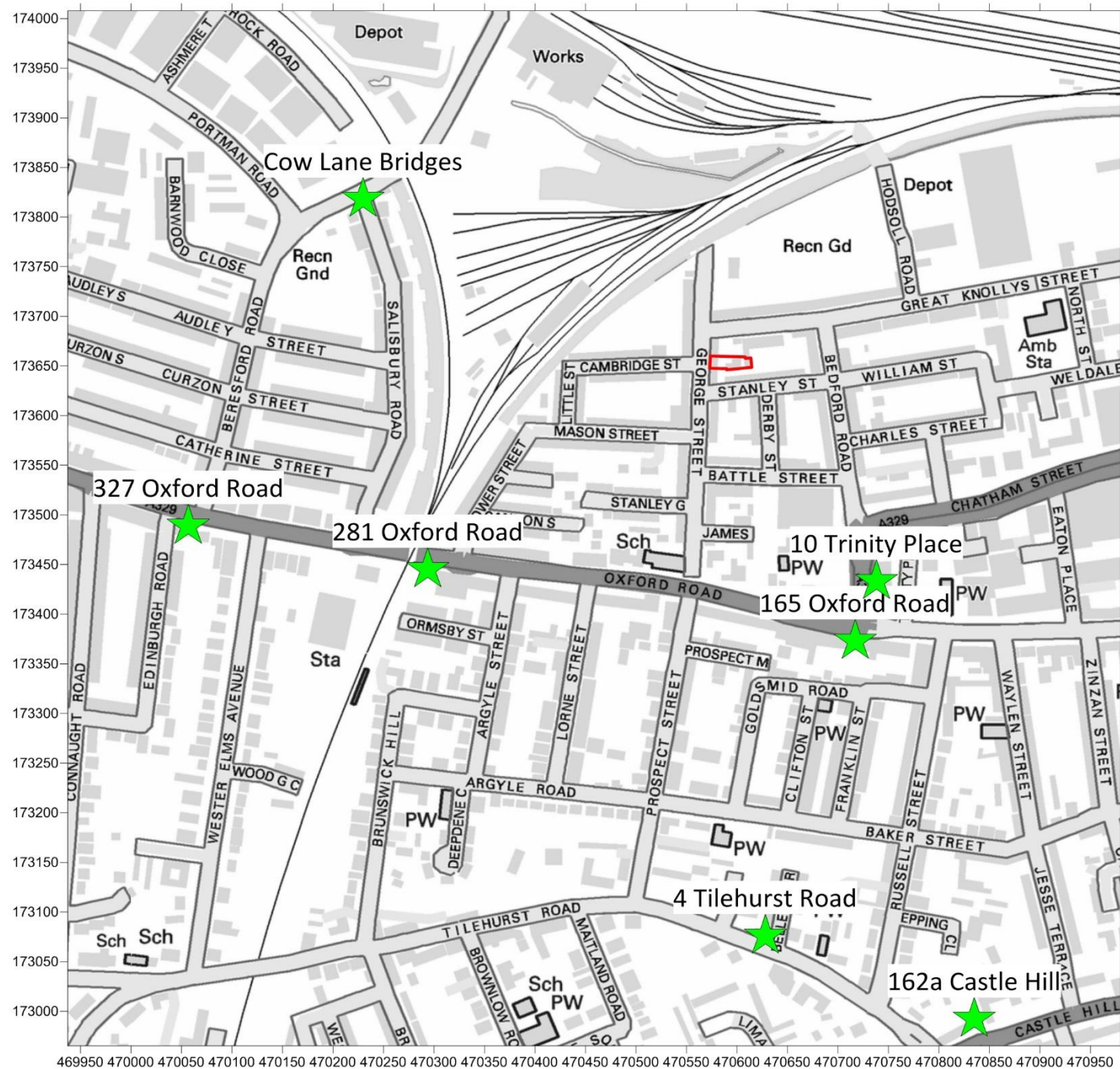
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www.recltd.co.uk



Legend

-  Site Boundary
-  Diffusion Tube Monitoring Locations

Title

Figure 2
Diffusion Tube Monitoring Locations

Project

Air Quality Assessment
George Street, Reading

Project Number

AQ107008

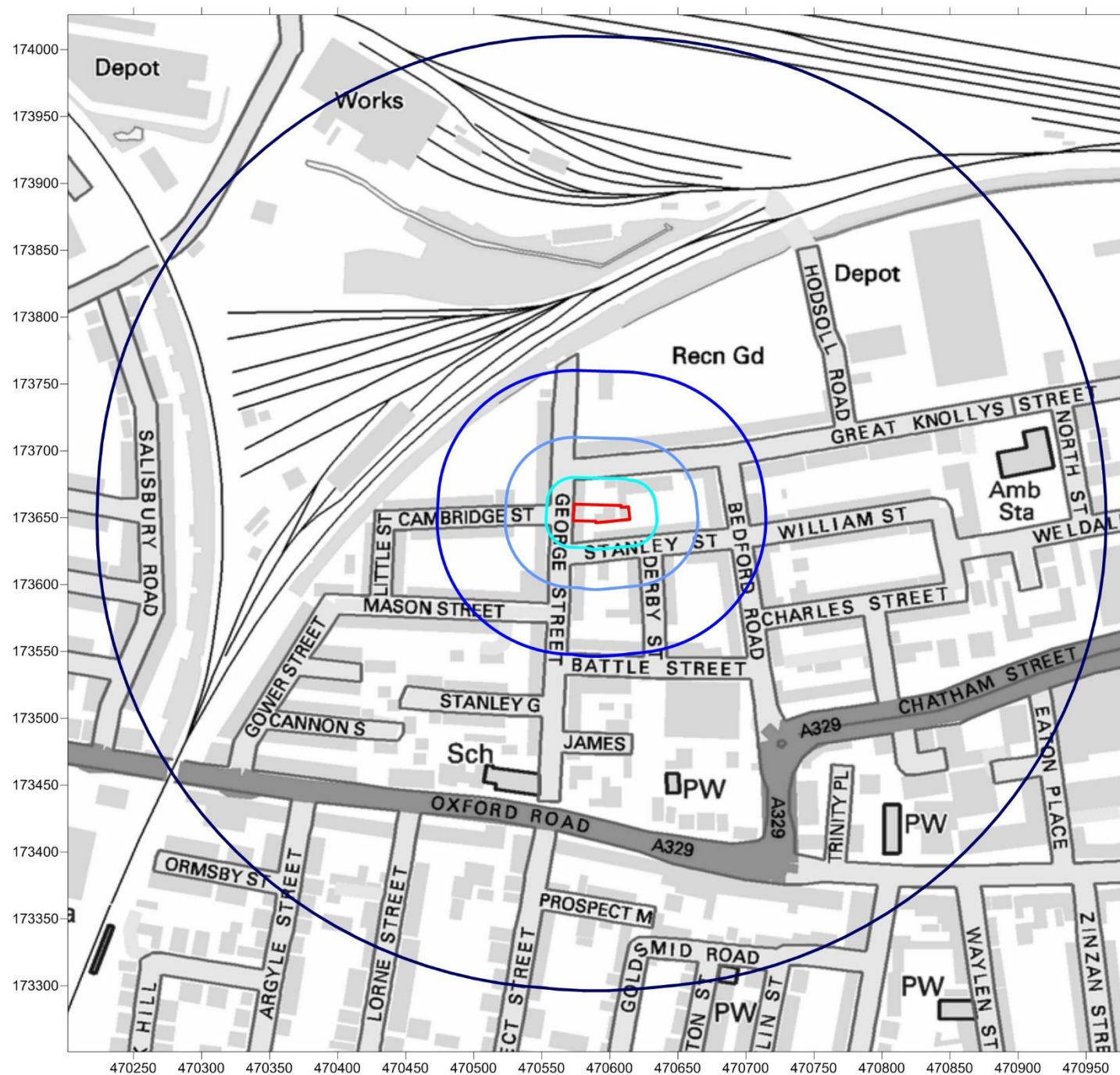
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Legend

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

Title

Figure 3
Demolition, Earthworks and Construction
Dust Buffer Zones

Project

Air Quality Assessment
George Street, Reading

Project Number

AQ107008

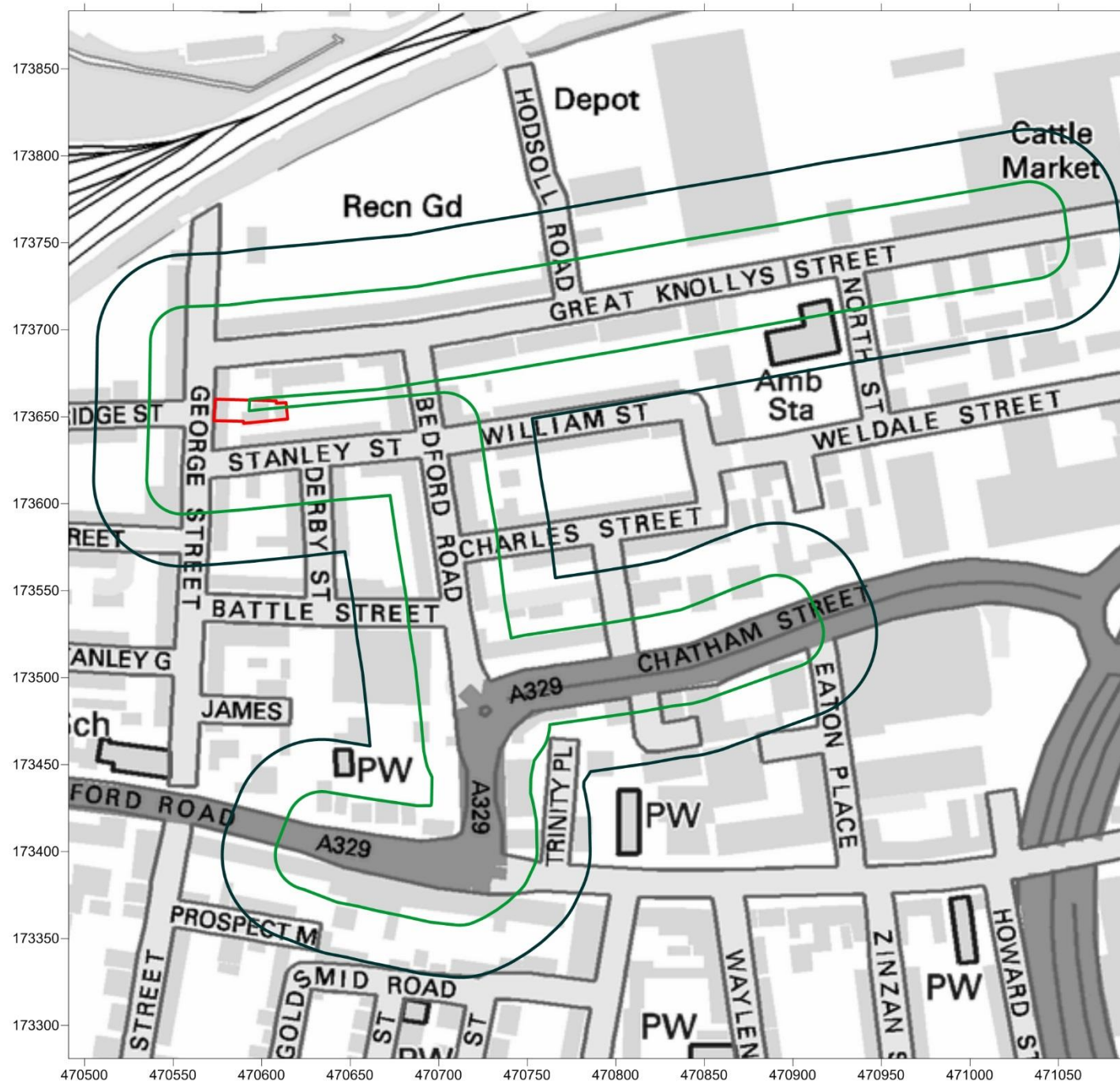
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Legend

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

Title

Figure 4
Trackout Dust Buffer Zones

Project

Air Quality Assessment
George Street, Reading

Project Number

AQ107008

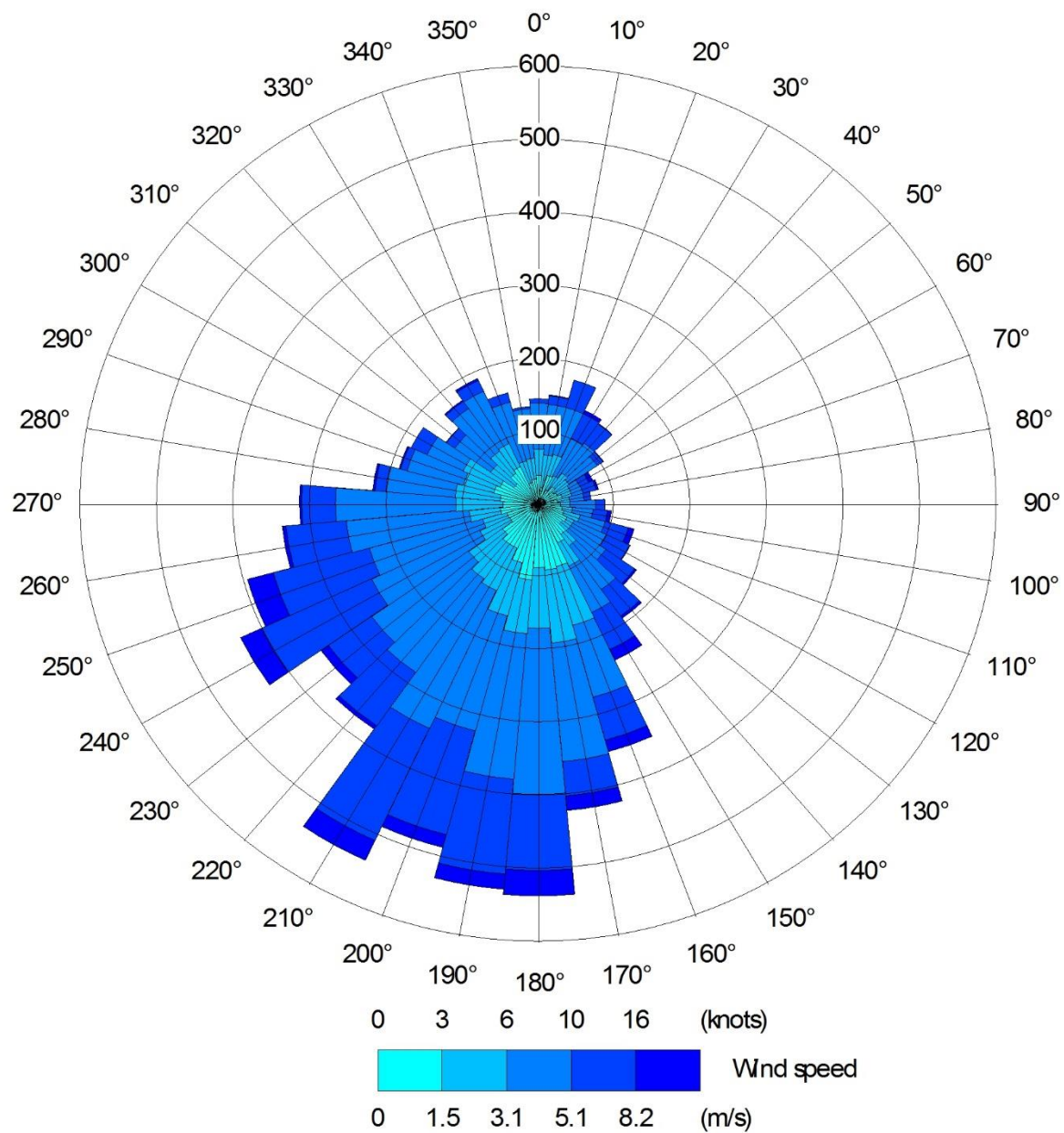
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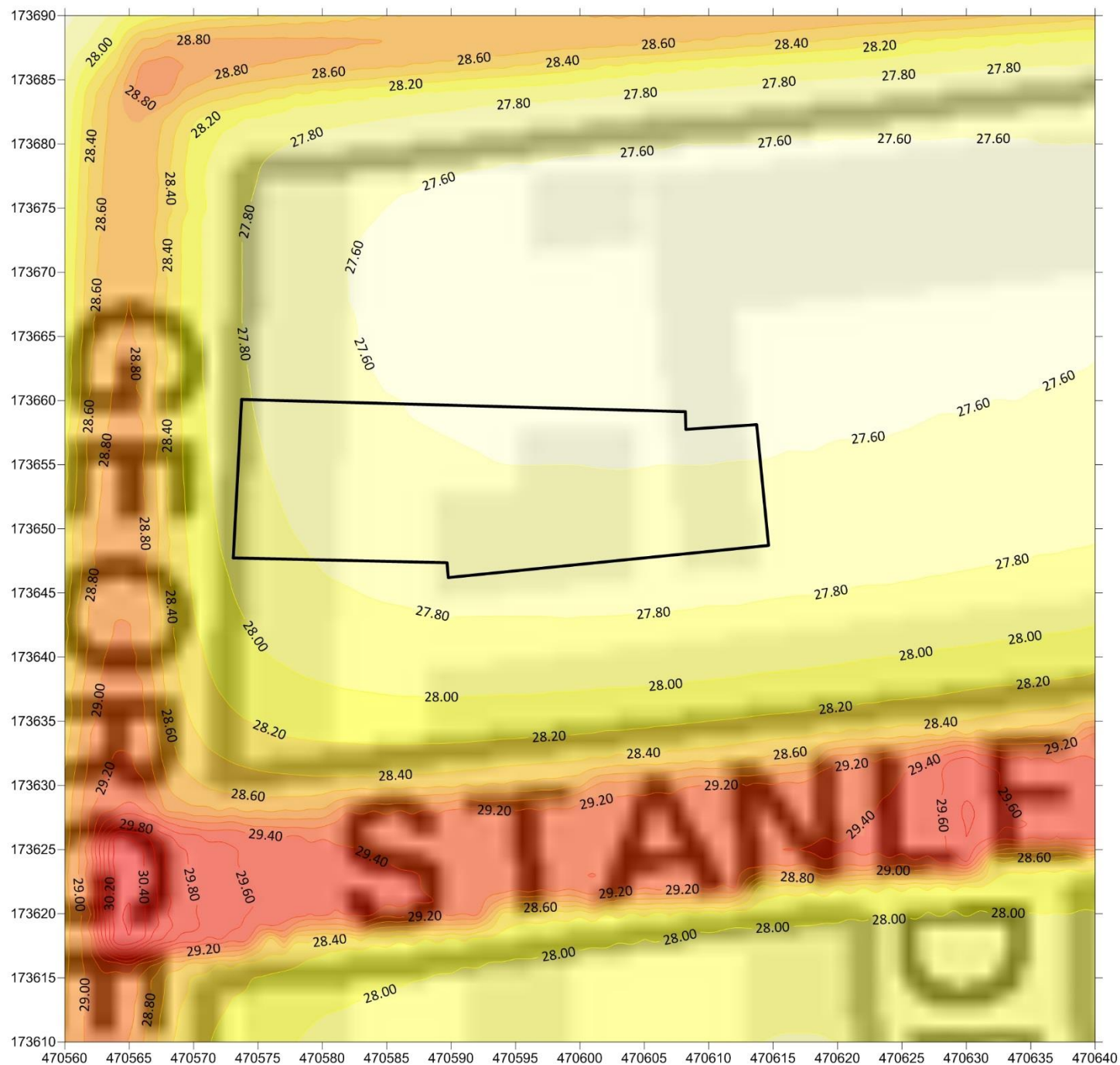


Title
Figure 5
Wind Rose 2017
Benson Meteorological Station

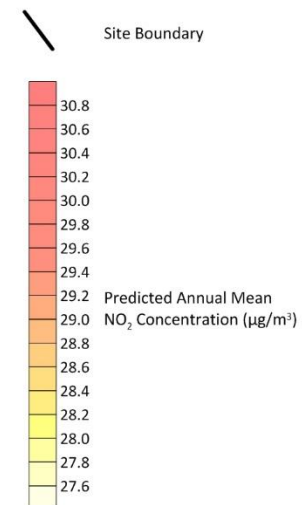
Project
Air Quality Assessment
George Street, Reading

Project Number
AQ107008

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Legend



Title

Figure 6
Predicted Annual Mean NO₂
Concentrations (µg/m³) 2020

Project

Air Quality Assessment
George Street, Reading

Project Number

AQ107008

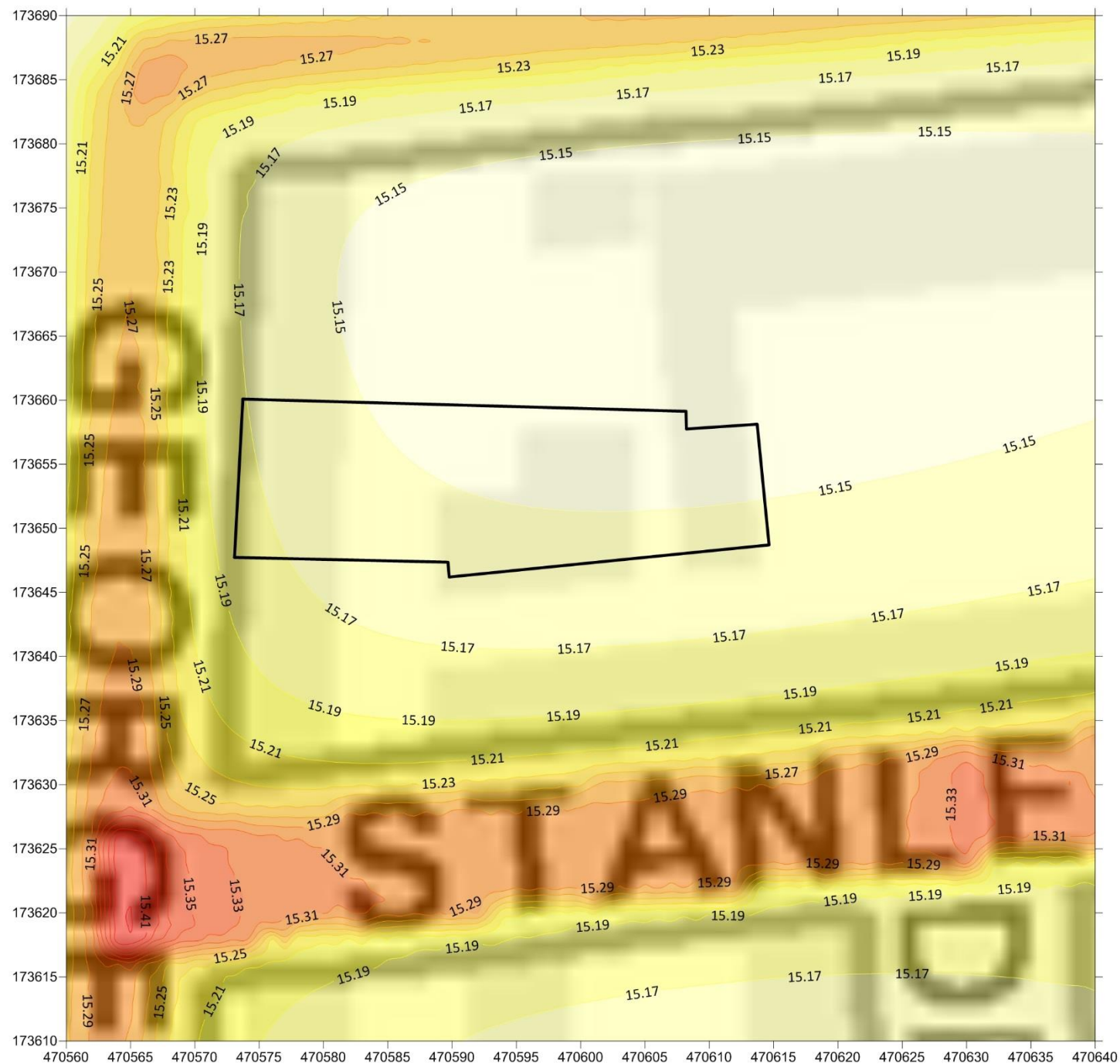
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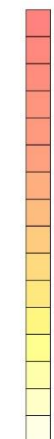
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Legend



Site Boundary



Predicted Annual Mean
PM₁₀ Concentration (µg/m³)

Title

Figure 7

Predicted Annual Mean PM₁₀
Concentrations (µg/m³) 2020

Project

Air Quality Assessment
George Street, Reading

Project Number

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Client

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Air Quality Assessment
George Street, Reading
February 2019
AQ107008r1

APPENDIX II ASSESSMENT INPUT DATA





ASSESSMENT INPUTS

The proposed development has the potential to expose future site users to elevated pollutant levels. In order to assess NO₂, PM₁₀ and PM_{2.5} concentrations across the site, detailed dispersion modelling was undertaken in accordance with the following methodology which was agreed with the Environmental Health Officer at RBC.

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 proposed development site and surrounding highway network. One Cartesian grid was included in the model over the area NGR: 470560, 173610 to 470640, 173690 at 1.5m to represent ground level.

Results were subsequently used to produce contour plots within the Surfer software package. It should be noted that although the grid only covered the proposed site, road links were extended in order to ensure the impact of all relevant vehicle emissions in the vicinity of the development were considered.

Reference should be made to Figure 6 within Appendix I 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 Department for Transport (DfT).

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package





were utilised to allow for conversion from the obtained traffic flow year 2017 to 2020 which was used to represent the development opening year.

Traffic data was unavailable for George Street, Great Knolleys Street, Stanley Street and Bedford Road. As such, a traffic count from a similar road (Baker Street) was utilised across these roads thus providing a robust assessment.

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. Reference should be made to Figure 6 within Appendix I for a graphical representation of the road link locations. A summary of the traffic data used in the verification scenarios is provided in Table AII.1.

Table AII.1 2017 Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)	Canyon Height (m)
L1	Great Knolleys Street West of North Street	5.2	758	1.98	40	0.0
L2	Great Knolleys Street Slowdown	9.5	758	1.98	25	0.0
L3	Oxford Road before Prospect Street	7.2	13,721	6.39	30	0.0
L3a	A329 between Connaught Road and Edinburgh Road	22.5	13,721	6.39	30	6.4
L3b	Edinburgh Road	6.9	13,721	6.39	30	0.0
L3c	Canyon on Oxford Road	22	13,721	6.39	30	6.4
L3d	Oxford Road East of Beresford Road	7.2	13,721	6.39	30	0.0
L4	Oxford Road after Prospect Street	6.5	17,801	2.83	40	0.0
L5	A329 Wide	15.8	17,801	2.83	30	0.0
L6	A329 Towards Roundabout	13.7	17,801	2.83	40	0.0
L7	Oxford Road Slowdown	12.4	17,801	2.83	25	0.0
L8	Oxford Road Roundabout	7.7	13,351	1.88	25	0.0
L9	Chatham Street Eastbound	5.8	8,901	2.83	40	0.0
L10	Chatham Street Westbound	6.7	8,901	2.83	40	0.0
L11	Eaton Place Traffic Lights	7.1	8,901	2.83	25	0.0
L11a	Chatham Street West of Eaton Place Slowdown	7.1	8,901	2.83	25	0.0
L12	Chatham Street West of Eaton Place	6.6	8,901	2.83	40	0.0





Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)	Canyon Height (m)
L13	George Street	6.7	758	1.98	40	0.0
L14	Stanley Street	9.2	758	1.98	25	5.6
L15	Bedford Road	6.6	758	1.98	25	0.0
L16	Bedford Road Slowdown	11.7	758	1.98	15	0.0

The road width, height and mean vehicle speed shown in Table All.1 remained the same for 2020. A summary of the 2020 traffic data is shown in Table All.2.

Table All.2 2020 Traffic Data

Road Link		DS	
		24-hour AADT Flow	HDV Prop. (%)
L1	Great Knolleys Street West of North Street	783	1.98
L2	Great Knolleys Street Slowdown	783	1.98
L3	Oxford Road before Prospect Street	14,172	6.39
L3a	A329 between Connaught Road and Edinburgh Road	14,172	6.39
L3b	Edinburgh Road	14,172	6.39
L3c	Canyon on Oxford Road	14,172	6.39
L3d	Oxford Road East of Beresford Road	14,172	6.39
L4	Oxford Road after Prospect Street	18,387	2.83
L5	A329 Wide	18,387	2.83
L6	A329 Towards Roundabout	18,387	2.83
L7	Oxford Road Slowdown	18,387	2.83
L8	Oxford Road Roundabout	13,790	1.88
L9	Chatham Street Eastbound	9,193	2.83
L10	Chatham Street Westbound	9,193	2.83
L11	Eaton Place Traffic Lights	9,193	2.83





Road Link		DS	
		24-hour AADT Flow	HDV Prop. (%)
L11a	Chatham Street West of Eaton Place Slowdown	9,193	2.83
L12	Chatham Street West of Eaton Place	9,193	2.83
L13	George Street	783	1.98
L14	Stanley Street	783	1.98
L15	Bedford Road	783	1.98
L16	Bedford Road Slowdown	783	1.98

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 8.0.1) released in 2017, which incorporates updated COPERT 5 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, 2017 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year (2020) in order to provide a robust assessment.

Meteorological Data

Meteorological data used in this assessment was taken from Benson meteorological station over the period 1st January 2017 to 31st December 2017 (inclusive). Benson meteorological station is located at approximate NGR 462250, 191600, which is approximately 20km 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, woodlands'.

A z_0 of 0.3m was used in the dispersion modelling study. This value is considered appropriate for the morphology of the meteorological station location and is suggested within ADMS Roads as being suitable for 'Agricultural (max)'.





Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used 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 'cities and large towns'.

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

Background Concentrations

An annual mean NO_2 concentration of $25.98\mu\text{g}/\text{m}^3$, PM_{10} concentration of $15.00\mu\text{g}/\text{m}^3$ and $\text{PM}_{2.5}$ concentration of $9.29\mu\text{g}/\text{m}^3$ as predicted by DEFRA, was used in the dispersion modelling assessment to represent annual mean pollutant levels in the vicinity of the site. Similar to emission factors, background concentrations for 2017 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)¹.

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 2017, using traffic data, meteorological data and monitoring results from this year.

RBC undertakes monitoring of NO_2 concentrations at 6 locations for verification purposes within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM (TG16)¹.





Two of the monitoring locations within the vicinity of the site were not able to be used for verification purposes as traffic data was unavailable for the roads at tubesCow Lane Bridges and Tilehurst Road. Tube 162a Castle Hill was also not utilised due to the distance of the tube from the site.

The dispersion model was run with the traffic input data previously detailed for 2017 to predict the NO_x concentration at the monitoring location. The results are shown in Table AII.3.

Table AII.3 **NO_x Verification Results**

Monitoring Location	Modelled Road NO _x Concentration (µg/m ³)	Monitored Road NO _x Concentration (µg/m ³)	Difference (%)
327 Oxford Road	14.05	40.82	65.58
281 Oxford Road	6.41	5.91	-8.38
165 Oxford Road	6.15	7.90	22.09
10 Trinity Place	12.22	22.17	44.89

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 **2.1871** was required to be applied to all modelling results, as shown in Graph 1.





Graph 1 – Verification Adjustment Factor

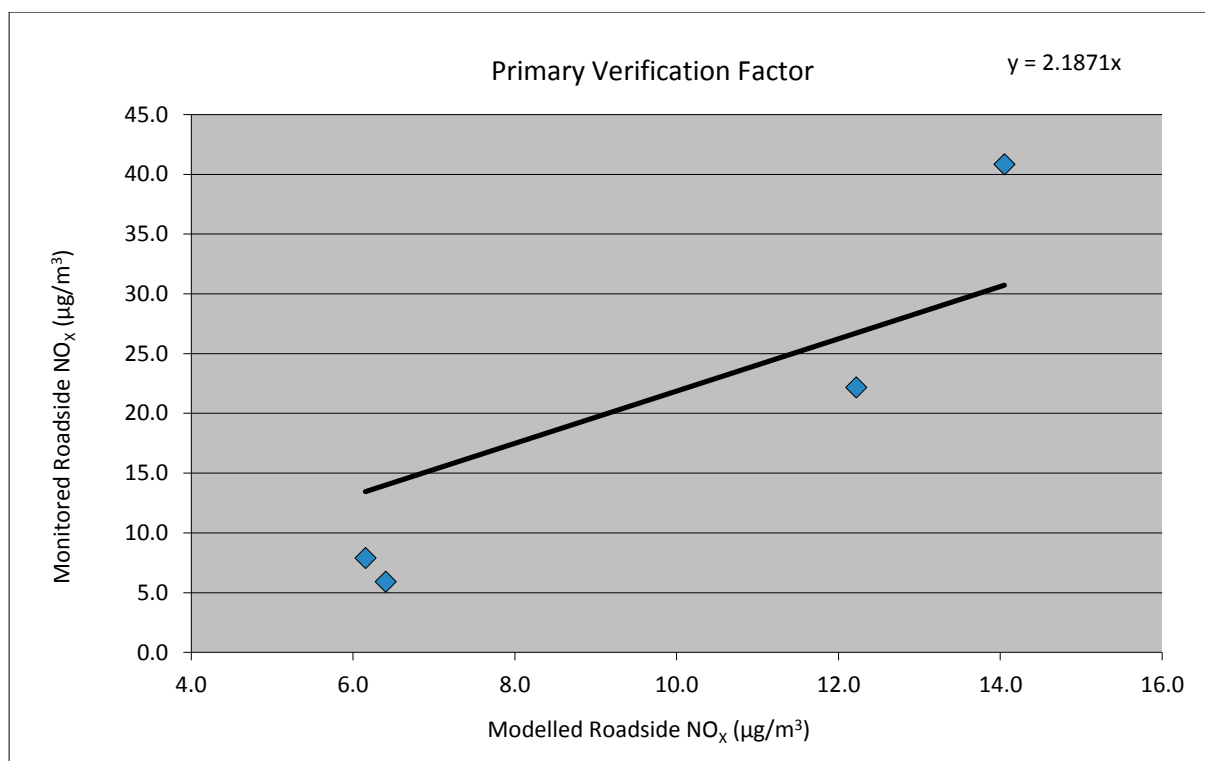


Table AII.4 presents the monitored annual mean NO₂ concentrations and the adjusted modelled total NO₂ concentration based on the above verification factor. Exceedances of the annual mean AQO for NO₂ are shown in **bold**.

Table AII.4 NO₂ Verification Results

Monitoring Location	Monitored NO ₂ Concentration (µg/m ³)	Adjusted Modelled Total NO ₂ Concentration (µg/m ³)	Difference (%)
327 Oxford Road	44.83	40.50	9.67
281 Oxford Road	28.94	32.87	-13.57
165 Oxford Road	29.92	32.61	-8.98
10 Trinity Place	36.67	38.73	-5.62

As PM₁₀ and PM_{2.5} monitoring is not undertaken within the assessment extents, the same verification factor was also utilised to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM (TG16)¹.





Air Quality Assessment
George Street, Reading
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AQ107008r1

APPENDIX III ASSESSOR'S CURRICULUM VITAE





CONAL KEARNEY

Head of Noise and Air

BEng(Hons), MSc, MIAQM, MIEEnvSc

KEY EXPERIENCE:

Conal is an Associate Director 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 and AIRVIRO.
- ▶ 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 Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) methodologies.
- ▶ Management and delivery of project work on key, land development and urban regeneration projects.
- ▶ 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.
- ▶ Dust and Odour impact assessments from minerals and waste sites
- ▶ Representing clients at public enquiries and planning hearings.

QUALIFICATIONS:

- ▶ Bachelor of Engineering
- ▶ Master of Science
- ▶ Member of Institute of Air Quality Management
- ▶ Member of the Institute of Environmental Science (IES)

SELECT PROJECTS SUMMARY:

Industrial Developments

Buck Park, Denholme - AQA and dust assessment for proposed mineral extraction and site restoration project.

Messingham Quarry, North Lincolnshire - AQA and dust impacts for proposed new sand extraction site.

Arden Quarry, Derbyshire - AQA for proposed mineral extraction and site restoration

Clayton Hall Landfill, Chorley - AQA and odour assessment for proposed landfill extension and mineral extraction.

Granta Park, Oxfordshire. Assessment of VOC fume emissions.

University of Birmingham. Permit application for CHP scheme.

Arbroath Road, Carnoustie. Odour and AQA for biogas CHP scheme.

Highways Developments

Alderley Edge Bypass, Cheshire - AQA for major new road scheme.

South Heywood – EIA for new link road and mixed use joint development

Residential Developments

Orchard Close, Knaresborough. AQA and public enquiry evidence.

Bredbury Curve, Stockport - AQA assessment for proposed residential development in AQMA.

Hollin Lane, Middlesbrough – AQA for large scale residential development.

Friars School, Southwark, London. School development for mixed use education and residential building in AQMA.

Abbotsford House, Bearsden, Scotland – AQA and dust assessment for residential development

Westcraig, Edinburgh - EIA chapter for residential development

Queensway, Lytham St Annes. Dust and odour assessment for development.

Craven Park, London. Mitigation statement and planning hearing expert opinion

Public Sector

Technical advisor on Manchester Airport Consultative Committee - advise members on environmental technical matters in relation to the airport's operations.

Cheshire County Council - compile AQ chapters for Local Transport Plan

Cheshire East Council - specialist AQ advice on highways, minerals and waste projects

Local Air Quality Management

Broughton Gyratory, Chester - dispersion model for City Centre detailed assessment report

Congleton town centre - dispersion modelling assessment for detailed and further assessment reports.

Disley - dispersion modelling assessment for detailed and further assessments

Holmes Chapel - dispersion modelling assessment for detailed and further assessment reports for road and rail sources.

Crewe - town centre dispersion modelling for detailed and further assessment reports.

Commercial Developments

Granta Park Daycare Centre, Oxfordshire. AQA for new build daycare centre adjacent to major road.

Curzon Cinema, Colchester. Air quality assessment for town centre new build cinema.

Newfoundland Circus, Bristol - AQA for hotel development in city centre

Salesians School, Chertsey - AQA for school extension near M25.

Cathedral Street and Thistle Street, Glasgow. University energy generation emission assessments.

