



AIR QUALITY ASSESSMENT READING METROPOLITAN, READING

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MANAGEMENT**

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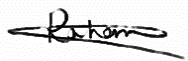


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EXECUTIVE SUMMARY

Resource and Environmental Consultants Limited was commissioned by Hermes Investment Management to undertake an Air Quality Assessment in support of a proposed residential and commercial development at Reading Metropolitan, Reading.

The proposal comprises the demolition of existing onsite structures and the construction of residential and commercial units, alongside associated parking and infrastructure

The site is located in an area designated by Reading Borough Council as experiencing elevated pollutant concentrations. Additionally, due to the scale of the development there is potential for impacts at nearby sensitive receptor locations as a result of increased road vehicle exhaust and construction dust emissions generated by the development. An Air Quality Assessment is therefore required in order to determine baseline conditions at the site, assess site suitability for the proposed end-use and assess the potential impacts as a result of the proposed development in accordance with the requirements of the National Planning Policy Framework.

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

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and assess potential exposure of future users. Results were subsequently verified using local monitoring results obtained from the RBC.

Exceedances of the air quality objective were predicted across the development site at ground to second floor level, and as such specific mitigation techniques will be required to protect future users from elevated concentrations at specific locations across the ground and first floor locations.

Additionally, the assessment concluded that impacts on pollutant levels as a result of operational phase vehicle exhaust emissions were predicted to be not significant at any nearby sensitive locations. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results based on the assessment results the site is considered suitable for the proposed end use subject to the inclusion of relevant mitigation measures.





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1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Limited was commissioned by Hermes Investment Management to undertake an Air Quality Assessment in support of a proposed residential and commercial development at Reading Metropolitan, Reading.

1.2 Site Location and Context

The proposed development is located adjacent to Reading station at approximate National Grid Reference (NGR) 471350, 174010. Reference should be made to Figure 1 within Appendix I for a location plan.

The proposal comprises the demolition of existing onsite structures and the construction of residential and commercial units, alongside associated parking and infrastructure

The development is located within an Air Quality Management Area (AQMA) situated along the A329, declared by the Reading Borough Council (RBC) due to 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 NO₂ concentrations as well as causing impacts at existing sensitive receptor locations within the AQMA. Impacts could arise as a result of fugitive dust emissions during construction or additional traffic associated with the operation of the development. An Air Quality Assessment was therefore required to quantify pollutant levels across the site, consider its suitability for the proposed end-use and consider potential effects in the vicinity of the site. 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 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
PM _{2.5}	25	Annual Mean

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 (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 Framework³ (NPPF) was published on 24th July 2018 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. Developments 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

³ National Planning Policy Framework, Department for Communities and Local Government, 2018.





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 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 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 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.

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





2.6 Local Planning Policy

Reading Borough Council's (RBC) Local Development Framework⁵ (LDF) consists of a portfolio of documents of which the Core Strategy, which was adopted with alterations in January 2015, is the principal overarching part. The Core Strategy sets out the strategic policy framework for the city until 2020.

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

"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.

[...]."

"Policy CS11: Employment Land for Alternative Uses

Factors which may be taken into account in assessing these criteria include:

[...]

(iv) effects on neighbouring uses of noise, pollution and air quality, intensity of activity

The draft Local Plan was submitted in March 2018 and aims to guide development within Reading up to 2036. A review of this local plan indicated the following policy in relation to air quality

"Policy CC9: Securing infrastructure

Proposals for development will not be permitted unless infrastructure, services, resources, amenities or other assets lost or impacted upon as a result of the development or made necessary by the development will be provided through direct provision or financial contributions at the appropriate time. Employment development should provide mitigation measures in line with its impacts on the demand for housing (including affordable housing), labour and skills and on the transport network.

⁵ Reading Borough Council Local Development Framework 2015





[...]

Other measures, as follows, should also be considered where a specific need is identified and justified:

[...]

Measures to tackle poor air quality or for on-going air quality monitoring;”

[...].”

“Policy 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:*

[...]

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

- ii. *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: 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”*

“Policy CR6 Living in Central Reading

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

[...]

ii) 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. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable levels of noise and disturbance to the occupiers of the new scheme,





unless this can be mitigated.”

“Policy CR14: Other Sites For Development in Central Reading

The following sites will be developed according with the principles set out in this policy:

[...]

Address air quality impacts on residential use;”

Reference has been made to these policies during the undertaking of this Air Quality Assessment by assessing pollutant concentrations across the proposed development.





3. METHODOLOGY

There are concerns that the proposed development may have the potential expose future site users to elevated pollution concentrations. Additionally, concerns have been raised by RBC in regard to the potential impact of additional road vehicle exhaust emissions generated by the development. These have been assessed in accordance with the following methodology, as agreed with Ross Jarvis the Environmental Protection Officer, at RBC.

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 three 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 and PM_{2.5}.

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, 2016.





- ▶ 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
	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 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'.

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 and is 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 was therefore undertaken to quantify NO₂, PM₁₀ and PM_{2.5} concentrations across the site and determine suitability for the proposed use, using the following scenarios:

- ▶ 2017 Verification;
- ▶ Opening year do-minimum (DM) (predicted traffic flows in 2025 should the proposals not proceed); and
- ▶ Opening year do-something (DS) (predicted traffic flows in 2025 should the proposals be completed, with the addition of traffic generated by the proposed development).

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2025. The DS (i.e. with development) scenario is representative of anticipated traffic data for 2025 with the addition of predicted variations in traffic flow patterns as a result of the proposals.





It should be noted that 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 2025 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 assessment input data details of the verification process.

Receptors potentially sensitive to changes in NO₂, PM₁₀ and PM_{2.5} concentrations were identified within 200m of the affected highway network in accordance with the guidance provided within the IAQM guidance⁷ on the likely limits of pollutant dispersion from road sources. LAQM (TG16)² provides the following examples of where annual mean AQOs should apply:

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

The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in

Table 11. These are based upon the guidance provided within the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance 'Land-Use Planning and Development Control: Planning for Air Quality'⁷.

Table 11 Operational Traffic Exhaust Emissions – Assessment of Impacts

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

The criteria shown in

Table 11 Table 11 is adapted from the EPUK and IAQM guidance 'Land-Use Planning and Development Control: Planning for Air Quality'⁷ with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance.

Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 11

Table 11, the EPUK and IAQM⁷ document states that this framework is to be used as a starting point

⁷ Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management, 2017.





to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- ▶ Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- ▶ Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- ▶ The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- ▶ Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- ▶ The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less significance than an annual mean of 51µg/m³.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.





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

"Reading AQMA (annual mean NO₂ exceedances) - An area encompassing all the main arterial routes in and out of Reading and central areas."

The proposed development is located within the Reading AQMA. As such there could be potential for the development to introduce future residents to elevated pollutant concentrations. 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

A review of the most recent Air Quality Annual Status Report Indicated that RBC monitors pollutant concentrations using continuous methods throughout their area of administration. There are four automatic analysers operated by RBC, the closest of which is RD1, Caversham Road, located approximately 500m north-west of the proposed development, at the NGR 471153, 174429. Monitoring results at these locations for NO₂ from recent years are shown in Table 10. Exceedances of the AQO are highlighted in bold.

Table 12 NO₂ Automatic Monitoring Results

Site ID	Location	NGR (m)		Type	Annual Mean NO ₂ Concentration (µg/m ³)		
		X	Y		2015	2016	2017
RD1	Caversham Road	471153	174429	Roadside	38.00	39.00	36.00

As indicated in Table 12, the annual mean AQO for NO₂ was not exceeded at RD1, in recent years. Reference should be made to Figure 2 within Appendix I for a graphical representation of the diffusion tube monitoring locations.

Caversham Road automatic monitoring station also monitors annual mean PM₁₀ concentration. Recent monitoring results for PM₁₀ are shown in shown in Table 13.





Table 13 Automatic PM₁₀ Monitoring Results

Site ID	Location	NGR (m)		Type	Annual Mean PM ₁₀ Concentration (µg/m ³)		
		X	Y		2014	2015	2017
RD1	Caversham Road	471153	174429	Roadside	28.00	20.00	22.00

As indicated in Table 13 there were no exceedances of the annual mean AQO for PM₁₀ at any location in recent years.

RBC utilise passive diffusion tubes to monitor NO₂ concentrations throughout the city. A review of the most recent monitoring data available indicated that there are nine suitable diffusion tubes located in the vicinity of the proposed development. Recent NO₂ monitoring results from this location are shown in Table 14. Exceedances of the AQO are shown in **bold**.

Table 14 Diffusion Tube Monitoring Results

Site Name		Type	NGR (m)		Annual Mean NO ₂ Concentration (µg/m ³)		
			X	Y	2014	2015	2016
T1	33 Caversham Road	Roadside	471123	173734	48	43	45
T2	59a Caversham Road	Roadside	471169	173869	42	41	43
T3	197 Caversham Road	Roadside	471161	174379	39	35	36
T4	Caversham Co-location	Roadside	471156	174424	38	37	38
T5	Caversham Co-location	Roadside	471156	174424	37	38	36
T6	Caversham Co-location	Roadside	471156	174424	37	36	37
T7	108 Caversham Road	Roadside	471293	174236	41	41	40
T10	Caversham Café	Roadside	471401	174790	42	42	37
T11	31a Vastern Road (lamppost)	Roadside	471420	174129	36	37	38

As indicated in Table 14, the annual mean AQO for NO₂ was exceeded at four diffusion tubes in recent years. Again, this is likely due to their roadside locations within the Reading AQMA. Reference should be made to Figure 2 within Appendix I for a graphical representation of diffusion tube monitoring locations.





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 and is summarised in Table 15 for the verification year (2017), the predicted development opening year (2025).

Table 15 Background Pollutant Concentrations

Pollutant	Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)	
	2017	2025
NO _x	45.32	33.20
NO ₂	28.47	22.08
PM ₁₀	15.64	14.80
PM _{2.5}	9.89	9.19

As shown in Table 15, background pollutant concentrations do not 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 Construction Phase 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 construction dust impacts in the following Sections.

Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 16.

Table 16 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	0	0
20 - 50	1-10	0
50 - 100	1-10	-
100 - 350	More than 100	-

Reference should be made to Figure 3 within Appendix I for a graphical representation of earthworks

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





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 17. 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, to assume a robust scenario it was assumed construction traffic would access the site from Troopers Potts Way via Vastern Road. Notwithstanding this, any variations in the routes are unlikely to cause any significant changes to the conclusions of this assessment.

Table 17 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 18.

Table 18 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located in a predominantly residential location. There is likely to have been a history of dust generating activities due to regeneration in the locality, and commuting
The likelihood of concurrent dust generating activity on nearby sites	A review of the RBC planning portal indicated that there are several large scale developments within 500m of the vicinity of the proposed development. As such there is risk of concurrent dust occurrences.
Pre-existing screening between the source and the receptors	Vegetation is sparse in the vicinity of the development. As such, pre-existing screening to receptors is 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 east of the site would be most affected by dust emissions





Guidance	Comment
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	It is proposed that the construction will be phased and take place over a 6 year period, as such there is potential for receptor to become more sensitive over time.
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 19.

Table 19 Sensitivity of the Surrounding Area

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

4.5 Operational Phase Sensitive Receptors

A desk-top study was undertaken in order to identify any sensitive receptor locations in the vicinity of the site that require specific consideration during the assessment. These were modelled at a height of 1.5m and 4.5m in order to represent ground and first floor level and are summarised in Table 20.





Table 20 Existing Sensitive Human Receptors

Receptor		NGR (m)	
		X	Y
R1	Above 97 Caversham Road	4.5	471289
R2	17 Vastern Road	1.5	471380
R3	31 Vastern Road	1.5	471424
R4	121 Caversham Road	1.5	471283
R5	106 Caversham road	1.5	471296
R6	153 Caversham Road	1.5	471262
R7	199 Caversham Road	1.5	471161
R8	182 Caverhsam Road	1.5	471191
R9	12 Bridge Street	4.5	471155
R10	Malcolm Place Apartments	1.5	471160
R11	29 Caversham Road	1.5	471122
R12	Caversham Road	1.5	471091
R13	2-19 Sackville Street	1.5	471150
R14	Hunsaker Apartments	1.5	470960
R15	Hunsaker Apartments	1.5	471011
R16	Cheriton Court	1.5	471157
R17	New Bright Street Apartments	1.5	471339
R18	29 Caverhsam Road	1.5	471107
R19	21 Weldale Street	1.5	471116

The sensitive receptors identified in Table 20 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the proposed development that have not been individually identified above. Reference should be made to Figure 9 within Appendix I for a graphical representation of operational phase emission sensitive human receptor locations.





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 hardstanding. As such, it is anticipated that the demolition activities will be greater than 50,000m³. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from demolition is therefore **large**.

Table 19 indicates the sensitivity of the area to dust soiling effects on people and property is **low**. 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 19 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 **medium** 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 greater than 10,000m². In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.





Table 19 indicates the sensitivity of the area to dust soiling effects on people and property is **low**. 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 19 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 **low** risk site for human health impacts as a result of earthwork activities.

Construction

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

Table 19 indicates the sensitivity of the area to dust soiling effects on people and property is **low**. 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 19 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 **low** 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 more than 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

Table 19 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 **high** risk site for dust soiling as a result of trackout activities.

Table 19 indicates the sensitivity of the area to human health impacts is **medium**. In accordance with the criteria outlined in Table 10, the development is considered to be a **medium** risk site for human health impacts as a result of trackout activities.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 21.





Table 21 Summary of Potential Unmitigated Dust Risks

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

As indicated in Table 21, the potential risk dust soiling is **medium** for demolition activities, **low** for earthworks and construction and **high** for trackout activities. The potential risk of human health is **low** for earthworks and construction activities and **medium** for demolition 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 IAQM guidance⁶ 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 22. The mitigation measures outlined in Table 22 can be reviewed prior to the commencement of construction works incorporated into the existing strategies as applicable.

Table 22 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 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 • Make complaints log available to LA when asked • Hold regular liaison meetings with other high-risk construction sites that are within 500m of the site boundary. Ensuring plans are co-ordinated and dust and particulate matter emission are minimised





Issue	Control Measure
Monitoring	• Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust • 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
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 • 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 Use water as dust suppressant where applicable
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 and signpost a maximum-speed-limit of 15mph on surfaced and 10mph in unsurfaced haul roads • 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	• Avoid bonfires and burning of waste material
Earthworks and Construction	• Re-vegetate earthworks and exposed areas • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate • Only remove the cover in small areas during work and not all at once • Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out, unless it is required for a specific process • Ensure bulk cement and other fine powder materials are delivered and stored to prevent escape





Issue	Control Measure
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 • Inspect on-site routes for integrity, instigate necessary repairs and record in site log book • Install hard surfaced haul routes which are regularly damped down • Implement a wheel washing system at a suitable location near site exit • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits • Access gates to be located at least 10m from receptors, where possible

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 22 are implemented, the residual effect from all dust generating activities is predicted to be **negligible**, 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;
- ▶ 2025 DM; and
- ▶ 2025 DS.

The DM (i.e. without development) scenario is representative of anticipated traffic data for 2025. The DS (i.e. with development) scenarios are representative of anticipated traffic data for 2025 with the addition of predicted variations in traffic flow patterns as a result of the proposals.

For the purpose of this assessment traffic data was supplied for 2025, 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 2025 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 Nitrogen Dioxide

Predicted Concentrations at the Development Site

Annual mean NO₂ concentrations were predicted across the proposed development site for the DS scenarios at the following building heights to represent exposure in 2025 across the ground to third floor levels of the Proposed Development:

- ▶ Ground Floor (1.5m);
- ▶ First Floor Townhouse (4.5m);
- ▶ First Floor Apartments(6.5m);
- ▶ Second Floor (9.5m); and
- ▶ Third Floor (12.5m)

References should be made to Figures 7 to 11 within Appendix I. It should be noted that ground floor concentrations were also used to represent basement or lower ground levels. Predicted annual mean NO₂ concentrations across the development site during the DS scenario are summarised in Table 23. Exceedance of the annual mean AQO are highlighted in **bold**.

Table 23 Modelling Results - Annual Mean NO₂

Elevation (m)	Predicted 2025 Annual Mean NO ₂ Concentration Range (µg/m ³)
Ground Floor (1.5m)	36.10 – 56.30
Town House First Floor(4.5m)	35.77 – 52.83
First Floor (6.5m)	35.38 – 50.04
Second Floor (9.5m)	34.13 – 44.83
Third Floor (12.5m)	32.57 – 38.71

The predicted concentrations shown in Table 23 predicted NO₂ concentrations exceeded the annual mean AQO across the ground to second floors of buildings B,D, F and J, and the ground to second floor levels of buildings A and H and ground to first floor of TH01 and TH02.

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 below 60µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such based on the results in Table 23 it is not predicted that concentrations will exceed the 1-hour mean AQO for NO₂ across the development site in the 2025 opening year scenario.

Based on the results of the dispersion modelling the implementation of appropriate mitigation measures is required to protect future residents from elevated pollutant concentrations across affected floor levels. Further details are listed in Section 6.

Predicted Concentrations at Sensitive Receptors

Annual mean NO₂ concentrations were predicted for the 2025 DM and DS scenarios and are





summarised in Table 24.

Table 24 Predicted Annual Mean NO₂ Concentrations

Sensitive Receptor		Predicted Annual Mean NO ₂ Concentration (µg/m ³)		
		DM	DS	Change
R1	Above 97 Caversham Road	35.94	35.99	0.050
R2	17 Vastern Road	37.71	37.79	0.080
R3	31 Vastern Road	36.49	36.56	0.070
R4	121 Caversham Road	33.88	33.91	0.030
R5	106 Caversham road	34.88	34.92	0.040
R6	153 Caversham Road	32.65	32.67	0.020
R7	199 Caversham Road	30.88	30.89	0.010
R8	182 Caversham Road	31.60	31.63	0.030
R9	12 Bridge Street	28.41	28.43	0.020
R10	Malcolm Place Apartments	39.77	39.81	0.040
R11	29 Caversham Road	36.09	36.14	0.050
R12	Caversham Road	31.89	31.92	0.030
R13	2-19 Sackville Street	33.48	33.52	0.040
R14	Hunsaker Apartments	31.39	31.40	0.010
R15	Hunsaker Apartments	28.35	28.36	0.010
R16	Cheriton Court	27.93	27.94	0.010
R17	New Bright Street Apartments	31.47	31.48	0.010
R18	29 Caverhsam Road	32.52	32.56	0.040
R19	21 Weldale Street	34.49	34.54	0.050

As indicated in Table 24, predicted annual mean NO₂ concentrations did not exceeded the annual mean AQO at any sensitive receptor location.

Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 25.





Table 25 Predicted NO₂ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Above 97 Caversham Road	0.20	76-94% of the AQO	Negligible
R2	17 Vastern Road	0.18	95-102% of the AQO	Negligible
R3	31 Vastern Road	0.07	76-94% of the AQO	Negligible
R4	121 Caversham Road	0.10	76-94% of the AQO	Negligible
R5	106 Caversham road	0.05	76-94% of the AQO	Negligible
R6	153 Caversham Road	0.03	76-94% of the AQO	Negligible
R7	199 Caversham Road	0.07	76-94% of the AQO	Negligible
R8	182 Caversham Road	0.05	76-94% of the AQO	Negligible
R9	12 Bridge Street	0.10	75% or Less of the AQO	Negligible
R10	Malcolm Place Apartments	0.12	95-102% of the AQO	Negligible
R11	29 Caversham Road	0.08	76-94% of the AQO	Negligible
R12	Caversham Road	0.10	76-94% of the AQO	Negligible
R13	2-19 Sackville Street	0.02	76-94% of the AQO	Negligible
R14	Hunsaker Apartments	0.02	76-94% of the AQO	Negligible
R15	Hunsaker Apartments	0.03	75% or Less of the AQO	Negligible
R16	Cheriton Court	0.03	75% or Less of the AQO	Negligible
R17	New Bright Street Apartments	0.10	76-94% of the AQO	Negligible
R18	29 Caversham Road	0.12	76-94% of the AQO	Negligible
R19	21 Weldale Street	0.20	76-94% of the AQO	Negligible

As indicated in Table 25, the significance of impacts on annual mean NO₂ concentrations as a result of the development was predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development on NO₂ concentration are **not significant**. Further justifications are discussed in Section 5.2.3.

5.2.2 Particulate Matter (PM₁₀)

Predicted Concentrations at the Development Site

Annual mean PM₁₀ concentrations were predicted across the development for the DS scenario at a height of 1.5m to represent exposure across the ground floor level, as shown in Figure 12 within Appendix I. Predicted annual mean PM₁₀ concentrations across the development site during the DS



scenario are summarised in Table 26.

Table 26 Modelling Results - Annual Mean PM₁₀

Elevation (m)	Predicted 2025 Annual Mean PM ₁₀ Concentration Range (µg/m ³)
Ground (1.5m)	21.43 – 25.32

The predicted concentrations shown in Table 26 indicate that there were no exceedances of the AQO throughout the proposed development area. 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, background PM₁₀ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as roads. Therefore, predicted concentrations at heights above ground floor level across the residential aspects of the developments are considered acceptable in regards to future exposure and have not been assessed further.

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 site users from elevated PM₁₀ concentrations.

Predicted Concentrations at Sensitive Receptors

Annual mean PM₁₀ concentrations were predicted for 2025 DM and DS scenarios and are summarised in Table 27.

Table 27 Predicted Annual Mean PM₁₀ Concentrations

Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	Above 97 Caversham Road	17.750	17.765	0.015
R2	17 Vastern Road	18.418	18.444	0.026
R3	31 Vastern Road	18.119	18.143	0.024
R4	121 Caversham Road	17.522	17.532	0.010
R5	106 Caversham road	18.010	18.021	0.011
R6	153 Caversham Road	17.276	17.285	0.009
R7	199 Caversham Road	17.056	17.063	0.007
R8	182 Caversham Road	17.305	17.312	0.007
R9	12 Bridge Street	16.552	16.557	0.005
R10	Malcolm Place Apartments	18.663	18.683	0.020





Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m³)		
		DM	DS	Change
R11	29 Caversham Road	18.154	18.193	0.039
R12	Caversham Road	17.454	17.502	0.048
R13	2-19 Sackville Street	17.940	17.994	0.054
R14	Hunsaker Apartments	16.303	16.311	0.008
R15	Hunsaker Apartments	16.510	16.526	0.016
R16	Cheriton Court	15.844	15.846	0.002
R17	New Bright Street Apartments	16.963	16.967	0.004
R18	29 Caversham Road	17.515	17.570	0.055
R19	21 Weldale Street	17.962	18.029	0.067

As indicated in Table 27, annual mean PM₁₀ concentrations were below the relevant AQO at all sensitive receptor locations for both scenarios considered.

Predicted impacts on annual mean PM₁₀ concentrations are summarised in Table 28.

Table 28 Predicted PM₁₀ Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Above 97 Caversham Road	0.038	75% or Less of AQO	Negligible
R2	17 Vastern Road	0.065	75% or Less of AQO	Negligible
R3	31 Vastern Road	0.060	75% or Less of AQO	Negligible
R4	121 Caversham Road	0.025	75% or Less of AQO	Negligible
R5	106 Caversham road	0.027	75% or Less of AQO	Negligible
R6	153 Caversham Road	0.023	75% or Less of AQO	Negligible
R7	199 Caversham Road	0.017	75% or Less of AQO	Negligible
R8	182 Caversham Road	0.018	75% or Less of AQO	Negligible
R9	12 Bridge Street	0.012	75% or Less of AQO	Negligible
R10	Malcolm Place Apartments	0.050	75% or Less of AQO	Negligible
R11	29 Caversham Road	0.098	75% or Less of AQO	Negligible





Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R12	Caversham Road	0.120	75% or Less of AQO	Negligible
R13	2-19 Sackville Street	0.135	75% or Less of AQO	Negligible
R14	Hunsaker Apartments	0.020	75% or Less of AQO	Negligible
R15	Hunsaker Apartments	0.040	75% or Less of AQO	Negligible
R16	Cheriton Court	0.005	75% or Less of AQO	Negligible
R17	New Bright Street Apartments	0.010	75% or Less of AQO	Negligible
R18	29 Caversham Road	0.137	75% or Less of AQO	Negligible
R19	21 Weldale Street	0.168	75% or Less of AQO	Negligible

As indicated in Table 28, impacts on annual mean PM₁₀ concentrations as a result of road vehicle exhaust emissions associated with the development were predicted to be **negligible** at all receptor locations. It is therefore considered that the overall impacts as a result of the proposed development are **not significant**. Further justifications are discussed in Section 5.2.3.

5.2.3 Particulate Matter (PM_{2.5})

Predicted Concentrations at the Development Site

Annual mean PM_{2.5} concentrations were predicted across the development for DS Scenarios were predicted across the ground floor of the proposed development for the DS scenarios, as shown within Figure 13 within Appendix I.

Predicted annual mean PM_{2.5} concentrations for the DS scenario are summarised in Table 29.

Table 29 Predicted Annual Mean PM_{2.5} Concentrations at the Development Site

Floor	Predicted 2025 Annual Mean PM _{2.5} Concentration Range (µg/m ³)
Ground (1.5m)	13.92 – 16.91

The predicted concentrations shown in Table 29 indicates that there were no exceedances of the AQO throughout the modelling area.

Similar to PM₁₀ concentrations, background PM_{2.5} levels are likely to be lower at elevated heights due to increased distance from emission sources, such as roads. Therefore, predicted concentrations at heights above ground floor level across the residential aspects of the developments are considered acceptable in regards to future exposure and have not been assessed further.





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_{2.5} concentrations.

Annual mean PM_{2.5} concentrations were predicted for the 2025 DM and DS scenarios and are summarised in Table 30.

Table 30 Predicted Annual Mean PM_{2.5} Concentrations

Sensitive Receptor		Predicted Annual Mean PM ₁₀ Concentration (µg/m ³)		
		DM	DS	Change
R1	Above 97 Caversham Road	11.273	11.279	0.006
R2	17 Vastern Road	11.560	11.573	0.013
R3	31 Vastern Road	11.425	11.436	0.011
R4	121 Caversham Road	11.103	11.108	0.005
R5	106 Caversham road	11.306	11.312	0.006
R6	153 Caversham Road	10.970	10.973	0.003
R7	199 Caversham Road	10.817	10.820	0.003
R8	182 Caversham Road	10.929	10.932	0.003
R9	12 Bridge Street	10.543	10.546	0.003
R10	Malcolm Place Apartments	11.578	11.587	0.009
R11	29 Caversham Road	11.191	11.210	0.019
R12	Caversham Road	10.793	10.816	0.023
R13	2-19 Sackville Street	11.033	11.058	0.025
R14	Hunsaker Apartments	9.933	9.937	0.004
R15	Hunsaker Apartments	10.332	10.340	0.008
R16	Cheriton Court	9.977	9.978	0.001
R17	New Bright Street Apartments	10.617	10.619	0.002
R18	29 Caversham Road	10.845	10.872	0.027
R19	21 Weldale Street	11.072	11.104	0.032

As indicated in Table 30 predicted annual mean PM_{2.5} concentrations did not exceed the AQO at any sensitive receptor location.

Predicted impacts on annual mean PM_{2.5} concentrations at the sensitive receptor locations are





summarised in Table 31.

Table 31 Predicted PM_{2.5} Impacts

Sensitive Receptor		% Change in Concentration Relative to AQO	Long Term Average Concentration	Impact
R1	Above 97 Caversham Road	0.024	75% or Less	Negligible
R2	17 Vastern Road	0.052	75% or Less	Negligible
R3	31 Vastern Road	0.044	75% or Less	Negligible
R4	121 Caversham Road	0.020	75% or Less	Negligible
R5	106 Caversham road	0.024	75% or Less	Negligible
R6	153 Caversham Road	0.012	75% or Less	Negligible
R7	199 Caversham Road	0.012	75% or Less	Negligible
R8	182 Caversham Road	0.012	75% or Less	Negligible
R9	12 Bridge Street	0.012	75% or Less	Negligible
R10	Malcolm Place Apartments	0.036	75% or Less	Negligible
R11	29 Caversham Road	0.076	75% or Less	Negligible
R12	Caversham Road	0.092	75% or Less	Negligible
R13	2-19 Sackville Street	0.100	75% or Less	Negligible
R14	Hunsaker Apartments	0.016	75% or Less	Negligible
R15	Hunsaker Apartments	0.032	75% or Less	Negligible
R16	Cheriton Court	0.004	75% or Less	Negligible
R17	New Bright Street Apartments	0.008	75% or Less	Negligible
R18	29 Caversham Road	0.108	75% or Less	Negligible
R19	21 Weldale Street	0.128	75% or Less	Negligible

As indicated in Table 31 the impacts on annual mean PM_{2.5} concentrations as a result of the development was predicted to be **negligible** at all sensitive receptor locations considered. As such, the overall significance of operational phase road traffic emission impacts on annual mean PM_{2.5} was determined as **not significant**.

5.2.4 Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **not significant**. This was based on the predicted impacts at discrete receptor locations and the





considerations outlined in Section 5.2. Further justification is provided in Table 32.

Table 32 Overall Road Emissions Impact Significance

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Impacts on NO ₂ , PM ₁₀ and PM _{2.5} concentrations were predicted to be negligible at all sensitive receptors considered. These represent worst-case locations and therefore it is unlikely that any other receptors would be significantly affected by the proposed development
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	There are predicted exceedances at proposed sensitive locations across the first and second floors on the development site. Given that new exposure has been introduced mitigation measures will be required to ensure that future on-site exposure is not significant.
The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors	The change in concentration relative to the AQO was predicted to range from: ▶ 0.05% to 0.18% for NO₂; ▶ 0.005% to 0.168 for PM₁₀, and ▶ 0.008% to 0.128% for PM_{2.5}. Therefore, resultant impacts were predicted to be negligible at all receptor locations.
Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease	There were exceedances of the annual mean AQO for across the local road networks and within the proposed development extents. There were no exceedances of the relevant AQOs for NO₂, PM₁₀ or PM_{2.5} at any existing sensitive locations throughout the modelling extents. Additionally, associated impacts at these locations were deemed not-significant
The extent to which an objective is exceeded e.g. an annual mean NO ₂ concentration of 41µg/m ³ should attract less significance than an annual mean of 51µg/m ³	There were no exceedances of the AQOs at any existing sensitive receptors in the vicinity of the site





6. MITIGATION

There are a number of air quality mitigation options available to reduce potential exposure of future users to elevated pollutant concentrations or off-set wider impacts associated with the Proposed Development. However, all techniques have financial implications and may therefore affect scheme viability.

6.1 Construction Phase

The IAQM⁶ guidance provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the Application Site as summarised in Table 21. The mitigation measures outlined can be reviewed prior to the commencement of construction works incorporated into the existing the strategies as applicable.

6.2 Operational Phase

Detailed dispersion modelling undertaken at heights equivalent to the proposed elevations of buildings A to J indicated that residential units across ground (1.5m), first (6.5m), second (9.5m) floor level were subjected to annual mean NO₂ concentrations above the relevant AQO. Additionally, the ground (1.5m) and first (4.5m) floor levels of the proposed town houses were also predicted to exceeded the relevant annual mean AQO.

It is therefore proposed that the inclusion of mechanical ventilation should be implemented to all habitable areas across the following areas;

- ▶ Throughout the habitable areas throughout ground to second floor levels of Building B, D, E, F;
- ▶ Throughout all habitable areas throughout the ground to first floor of Building H and E;
- ▶ Throughout all habitable areas throughout the first to second floor of Building J and;
- ▶ Including proposed townhouses to the ground floor level.

The effected residential units have been predicted to be subject to NO₂ concentrations exceeding the relevant annual mean AQO, and as such, the requirement of mitigation measure is necessary to reduce pollutant concentration to acceptable and safe levels. Mechanical ventilation could include a centralised system with an inlet and outlet positioned at highest feasible position on the northern façades. This positioning of the ventilation system should ensure the supply of clean air within all residential dwellings from the ground to second floor levels.

It should be noted that according to the IAQM and EPUK Guidance the annual mean objective does not apply at the proposed commercial floorspace within the buildings. This is due to the intermittent nature of access to the site, in which Site users are present for intermittent and irregular.

Additionally, a high specification of air tightness on the windows and doors should be incorporated at all habitable and commercial units on the ground to second floors of the affected units, so when these are closed, the units would be ventilated by clean air from the mechanical filtration systems. Additionally, 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.

These proposed mitigation options discussed above are considered a suitable solution for a Proposed Development this size and nature.





7. CONCLUSION

REC Ltd was commissioned by Hermes Investment Management to undertake an Air Quality Assessment in support of a proposed residential and commercial development at Reading Metropolitan, Reading.

The proposal comprises the demolition of existing onsite structures and the construction of residential and commercial units, alongside associated parking and infrastructure

The development is located within an AQMA situated along Caversham Road as such there is the potential for the proposals to expose future site users to elevated pollution levels as well as causing impacts at existing sensitive receptor locations within the AQMA. Due to the scale of the development impacts could arise as a result of fugitive dust emissions during construction and additional traffic associated with the operation of the development. An Air Quality Assessment was therefore required to quantify pollutant levels across the site, consider its suitability for the proposed end-use and consider potential effects in the vicinity of the site. This is detailed in the following report.

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

Dispersion modelling was undertaken in order to quantify pollutant concentrations at the site and assess potential exposure of future users. Concentrations of annual mean NO₂, PM₁₀ and PM_{2.5} were predicted across the development site and were subsequently verified using local monitoring results obtained from the RBC.

Exceedances of the annual mean AQO for NO₂ were predicted across the development site at ground to second floor level. As such specific mitigation techniques will be required to protect future users from elevated concentrations at specific locations across the ground and second floor locations. The annual mean AQO for PM₁₀ and PM_{2.5} was not exceeded at any location. Predicted impacts on NO₂, PM₁₀ and PM_{2.5} concentrations as a result of operational phase exhaust emissions were predicted to be **negligible** at all sensitive receptor locations considered.

The overall significance of potential impacts was therefore determined to be **not significant**, in accordance with the EPUK and IAQM guidance.

Based on the assessment results based on the assessment results the site is considered suitable for the proposed end use 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
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
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
REC	Resource and Environmental Consultants
RBC	Reading Borough Council
TEMPRO	Trip End Model Presentation Program
z ₀	Roughness Length

