37 Grays Inn Road,
London, WC1X 8PQ

Air Quality Assessment

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Entran Limited
7 Greenway Farm
Bath Road
Wick
Bristol
BS30 5RL

T: 0117 937 4077
www.entranltd.co.uk

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1 INTRODUCTION

1.1 Entran Limited has been commissioned to undertake an air quality assessment in support of the planning application for a proposed redevelopment of 37 Grays Inn Road, London, WC1X 8PQ The Site location is identified in Figure 1.1.

1.2 The London Borough of Camden (LBC) declared a Borough-wide Air Quality Management Area (AQMA) in 2002, due to exceedances of the air quality objectives for nitrogen dioxide (NO_2) and particulate matter (as PM_{10}). Consequently, the Site falls within the designated AQMA.

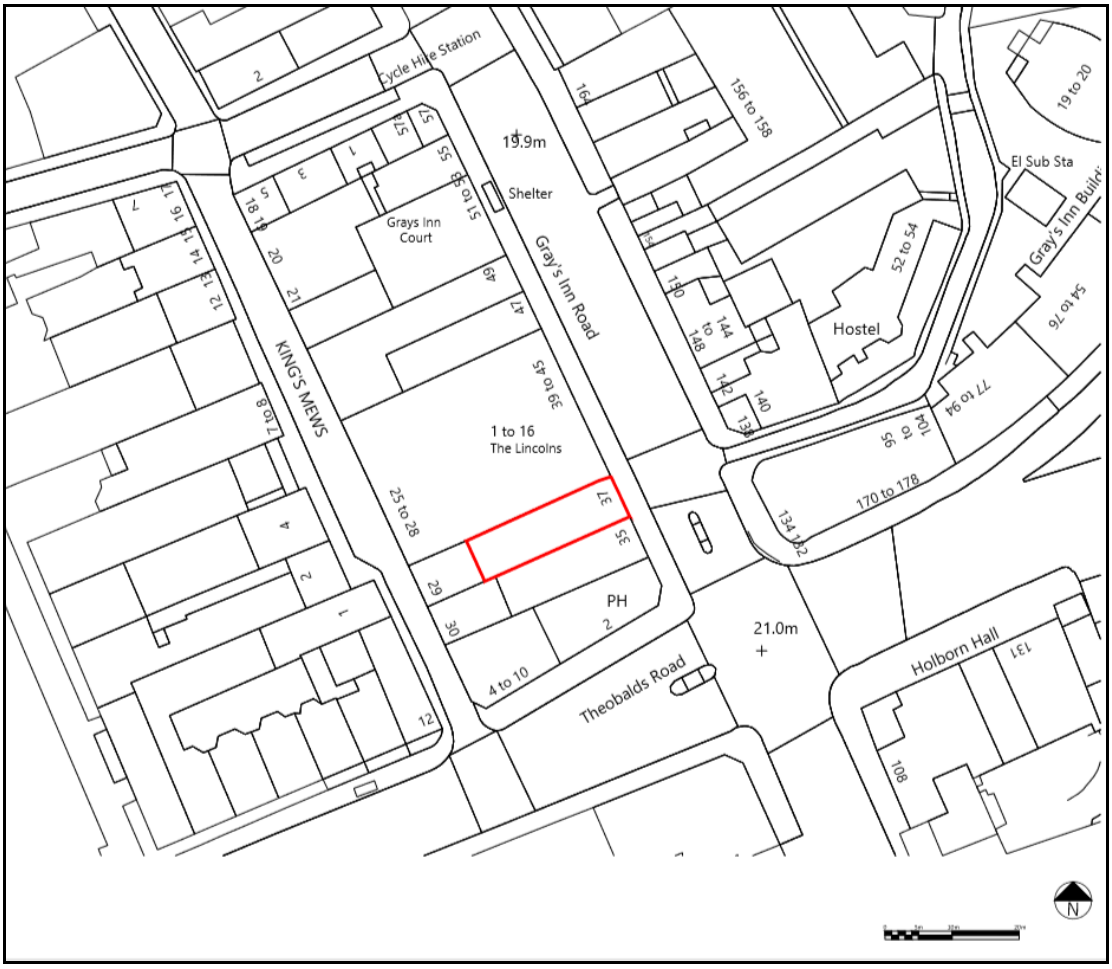
1.3 The proposals are for the redevelopment of the existing building into retail accommodation at ground and basement level and four residential units at the upper levels. The rear of the existing building will be demolished and rebuild.

1.4 This report presents the findings of a detailed air quality assessment of the potential impacts of the Proposed Development on local air quality during construction and the suitability of the site for residential purposes with regards to the exposure of future occupants to elevated pollution concentrations.

1.5 For both the construction and operational phases of the development the type, source and significance of potential impacts are identified and the measures that should be employed to minimise any identified impacts and exposure to elevated pollution are described.

1.6 A glossary of common air quality terminology is provided in **Appendix A.**

Figure 1.1: Site Location Plan



2 LEGISLATION AND POLICY

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

2.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1], pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

2.2 The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

2.3 The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

2.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedences of the standard over a given period.

2.5 For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

2.6 The AQS also contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$'. Local Authorities are required to work towards reducing emissions /

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – July 2007.

concentrations of $PM_{2.5}$, but there is currently no statutory objective incorporated into UK law at this time.

2.7 Of the pollutants included in the AQS, NO_2, PM_{10} and $PM_{2.5}$ will be particularly relevant to this project as these are the primary pollutants associated with road traffic.

2.8 The current statutory standards and objectives for NO_2, PM_{10} and $PM_{2.5}$ are set out in the table presented in **Appendix B.**

Local Air Quality Management (LAQM)

2.9 Part IV of the Environment Act 1995 also requires local authorities to periodically Review and Assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

2.10 Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

2.11 For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

2.12 The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work[2]. This guidance, referred to in this chapter as LAQM.TG(09), has been used where appropriate in the assessment.

National Planning Policy Framework

2.13 The National Planning Policy Framework (NPPF)[3] sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with

[2] Department for Environment, Food and Rural Affairs (DEFRA), (2009): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09).

[3] Ministry of Housing, Communities and Local Government: *National Planning Policy Framework* (February 2019).

the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

2.14 The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to *'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'*

2.15 Under Section 15: Conserving and Enhancing the Natural Environment, the NPPF (paragraph 170) requires that *'planning policies and decisions should contribute to and enhance the natural local environment by …preventing new and existing development from contributing to, 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.'*

2.16 In dealing specifically with air quality the NPPF (paragraph 181) states that *'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.'*

Paragraph 183 states that *'the focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively.'*

Control of Dust and Particulates associated with Construction

2.17 Section 79 of the *Environmental Protection Act (1990*) states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as:

- *'Any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance', and*
- *'any accumulation or deposit which is prejudicial to health or a nuisance'.*

2.18 Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.19 In the context of the Proposed Development, the main potential for nuisance of this nature will arise during the construction phase – potential sources being the clearance, earthworks, construction and landscaping processes.

2.20 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist – 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates.

The London Plan

2.21 Policy 7.14 of The London Plan[4] sets out the Mayor of London's commitment to improving air quality and public health. It states that development proposals should "*minimise increased exposure to poor air quality*" by:

- promoting sustainable transport;
- promoting sustainable design and construction; and
- being "*at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas*"

2.22 The Mayor of London's Sustainable Design and Construction Supplementary Planning Guidance (SPG)[5] was published in April 2014 and sets out the requirements for undertaking impact assessments in accordance with the policies set out in the London Plan and the Mayor of London's Air Quality Strategy[6].

[4] The London Plan Spatial Development Strategy for Greater London, July 2011.

[5] Sustainable Design and Construction Supplementary Planning Guidance, Mayor of London, London Plan 2011 Implementation Framework, April 2014

[6] Clearing the Air, The Mayor's Air Quality Strategy, December 2010.

2.23 An additional planning support document was issued in April 2014[7], which provides guidance on the implantation of the 'air quality neutral' policy for 'major developments' (over 10 residential dwellings or 1000m^2 floor space). The policy focusses on emissions of NO_2 and PM_{10}, since actions to mitigate PM_{10} emissions will also control emissions of $PM_{2.5}$ to a large extent.

2.24 Air quality neutral Transport Emissions Benchmarks (TEB) have been derived for a series of land-use classes. The TEBs are in units of g/m^2/annum or g/dwelling/annum and represent the total annual NO_x or PM_{10} emission per unit area or per dwelling of a proposed development. Where the emissions for a proposed development are below the relevant TEBs, the development may be considered 'air quality neutral' and is unlikely to result in a significant impact on local air quality.

The Mayor of London's Draft Supplementary Planning Guidance on the Control of Dust and Emissions during Construction and Demolition

2.25 The Mayor of London's Draft Supplementary Planning Guidance was published for public consultation in September 2013. It replaces the Best Practice Guidance, published by the London Councils and Mayor of London in 2006[8].

2.26 The guidance describes the methodology for undertaking assessments of construction phase dust impacts, in accordance with the policies set out in the London Plan[9,10] and Mayor of London's Air Quality Strategy[11].

Camden Local Plan

2.27 Camden's Local Plan[12] was adopted on 3rd July 2017 and is the basis for planning decisions and future development in the borough. The following policy relevant to air quality and the Proposed Development is contained within this document:

2.28 Policy CC4 Air Quality, which states

[7] Air Quality Neutral Planning Support Update, GLA 80371, April 2014

[8] The control of dust and emissions from construction and demolition Best Practice Guidance, Greater London Authority and London Council's, November 2006.

[9] The London Plan Spatial Development Strategy for Greater London, July 2011.

[10] The London Plan – Revised Early Minor Amendments, August 2013.

[11] Clearing the Air, The Mayor's Air Quality Strategy, December 2010.

[12] London Borough of Camden. (2017). Camden Local Plan.

'The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.'

EPUK & IAQM Land Use Planning and Development Control

2.29 Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) published the Land Use Planning and Development Control Air Quality guidance in January 2017[13] to provide guidance on the assessment of air quality in relation to planning proposals and ensure that air quality is adequately considered within the planning control process.

2.30 The main focus of the guidance is to ensure all developments apply good practice principles to ensure emissions and exposure are kept to a minimum. It also sets out criteria for identifying when a more detailed assessment of operational impacts is required, guidance on undertaking detailed assessments and criteria for assigning the significance of any identified impacts.

2.31 This guidance has been used within this assessment.

Assessment of Dust from Demolition and Construction

[13] EPUK & IAQM. Land-use Planning and Development Control: Planning for Air Quality, January 2017

2.32 The IAQM published guidance in 2014 on the assessment of emissions from demolition and construction activities[14]. The guidance sets out an approach to identifying the risk of impacts occurring at nearby sensitive receptors from dust generated during the construction process and sets out recommended mitigation measures based on the identified risk.

2.33 This guidance has been used within this assessment.

[14] Guidance on the assessment of dust from demolition and construction (version 1.1), IAQM, February 2014.

3 METHODOLOGY

Scope of Assessment

3.1 The scope of the assessment has been determined in the following way:

- Review of air quality data for the area surrounding the Site and background pollutant maps;
- Review of the proposals; and
- an assessment of the impact of the Proposed Development in accordance with the Mayor of London's 'air quality neutral' policy.

3.2 Guidance provided by the EPUK & IAQM provides threshold criteria for establishing when significant impacts on local air quality may occur during the operation of a development and when a detailed assessment of potential impacts is required. At locations inside an AQMA, a change in light duty vehicles (LDV) of more than 100 per day and / or a change in heavy duty vehicles (HDV) of more than 25 per day is considered to result in potentially significant impacts on air quality.

3.3 Due to the size of the Proposed Development, it is unlikely that the above thresholds will be exceeded. An assessment of the impact of road vehicles generated by the operation of the Proposed Development has therefore not been included in the assessment. The assessment of the operational phase therefore comprises consideration of exposure of future occupants to the existing pollutant concentrations and the suitability of the Site for its proposed end use.

3.4 During construction of the development there is the potential for impacts to occur as a result of dust and PM_{10} emissions. Guidance provided by the IAQM recommends that an assessment is undertaken where there are human receptors within 350m of the Site boundary or within 50m of the routes used by construction vehicles up to 500m from the site entrance; and where there are dust sensitive ecological receptors within 50m of the Site boundary or within 50m of the routes used by construction vehicles up to 500m from the site entrance. Human receptors are located within 350m of the Site, but there are no dust sensitive ecological habitats in the vicinity of the Site. An assessment of the impacts of the construction of the Proposed Development on human receptors has therefore been included in the assessment. An assessment of the impacts on ecological receptors has not been considered further.

3.5 Since the proposed development will contain less than 10 residential dwellings and the floor space is less than 1,000m^2, an Air Quality Neutral Assessment is not required and has been scoped out of this assessment.

3.6 Details of the assessment methodology and the specific issues considered are provided below.

Construction Phase Methodology

3.7 To assess the potential impacts associated with dust and PM_{10} releases during the demolition and construction phase and to determine any necessary mitigation measures, an assessment based on the latest guidance from the IAQM has been undertaken.

3.8 This approach divides construction activities into the following four categories:

- demolition;
- earthworks;
- construction; and
- trackout (the transport of dust and dirt from the construction site onto the public road network).

3.9 The assessment methodology then considers three separate dust effects:

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in exposure to PM_{10}.

3.10 The assessment of the risk of dust effects is determined by:

- the scale and nature of the works, which determine the risk of dust arising; and
- the proximity of sensitive receptors.

3.11 Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities. This assessment is based on both IAQM criteria and professional judgement.

3.12 Mitigation measures are identified where necessary and significance of dust effects determined following such mitigation. The significance of the dust effects is based on professional judgement, taking into account the sensitivity of the surrounding area and the existing air quality.

Dust Emission Magnitude

3.13 The magnitude of the dust impacts for each source is classified as Small, Medium or Large depending on the scale of the proposed works. Table 3.1 summarises the IAQM criteria that may be used to determine the magnitude of the dust emission. These criteria are used in combination with site specific information and professional judgement.

Table 3.1: Dust Emission Magnitude Criteria

Source	Large	Medium	Small
Demolition	• Total building volume >50,000m^3 • Potentially dusty material (e.g. concrete) • Onsite crushing and screening • Demolition activities >20m above ground level.	• Total building volume 20,000 - 50,000m^3 • Potentially dusty material • Demolition activities 10 - 20m above ground level.	• Total building volume <20,000m^3 • Construction material with low potential for dust release • Demolition activities <10m above ground level • Demolition during wetter months
Earthworks	• Total site area >10,000m^2 • Potentially dusty soil type (e.g. clay) • >10 heavy earth moving vehicles active at any one time • Formation of bunds >8m in height • Total material moved >100,000 tonnes	• Total site area 2,500 - 10,000m^2 • Moderately dusty soil type (e.g. silt) • 5 - 10 heavy earth moving vehicles active at any one time • Formation of bunds 4 - 8m in height • Total material moved 20,000 - 100,000 tonnes	• Total site area <2,500m^2 • Soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • Formation of bunds <4m in height • Total material moved <20,000 tonnes • Earthworks during wetter months
Construction	• Total building volume >100,000m^3 • On site concrete batching • Sandblasting	• Total building volume 25,000 - 100,000m^3 • Potentially dusty construction material (e.g. concrete) • On site concrete batching	• Total building volume <25,000m^3 • Material with low potential for dust release (e.g. metal cladding or timber)
Trackout	• >50 HGV movements in any one day (a) • Potentially dusty surface material (e.g. high clay content) • Unpaved road length >100m	• 10 - 50 HGV movements in any one day (a) • Moderately dusty surface material (e.g. silt) • Unpaved road length 50 - 100m	• <10 HGV movements in any one day (a) • Surface material with low potential for dust release • Unpaved road length <50m
(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes.			

Receptor Sensitivity

3.14 Factors defining the sensitivity of a receptor are presented in Table 3.2.

Table 3.2: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human (health)	Human (dust soiling)	Ecological
High	• Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include residential dwellings, hospitals, schools and residential care homes.	• Regular exposure • High level of amenity expected. • Appearance, aesthetics or value of the property would be affected by dust soiling. • Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	• Nationally or Internationally designated site with dust sensitive features (b) • Locations with vascular species (c)
Medium	• Locations where workers are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include office and shop workers (d)	• Short-term exposure • Moderate level of amenity expected • Possible diminished appearance or aesthetics of property due to dust soiling • Examples include parks and places of work	• Nationally designated site with dust sensitive features (b) • Nationally designated site with a particularly important plant species where dust sensitivity is unknown
Low	• Transient human exposure • Examples include public footpaths, playing fields, parks and shopping streets	• Transient exposure • Enjoyment of amenity not expected. • Appearance and aesthetics of property unaffected • Examples include playing fields, farmland (e), footpaths, short-term car parks and roads	• Locally designated site with dust sensitive features (b)

(a) In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day.

(b) Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).

(c) Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

(d) Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.

(e) Except commercially sensitive horticulture.

3.15 The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

Area Sensitivity

3.16 The sensitivity of the *area* to dust soiling and health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. Tables 3.3 and 3.4 summarise the criteria for determining the overall sensitivity of the area to dust soiling and health impacts respectively.

Table 3.3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the source (a)			
		<20m	<50m	<100m	<350m
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

Table 3.4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} ($\mu g/m^3$)	Number of Receptors	Distance from the source (a)				
			<20m	<50m	<100m	<200m	<350m
High	> 32	> 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32	> 100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28	> 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	< 24	> 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	>32	> 10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28-32	> 10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	<28	-	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

3.17 For each dust emission source (demolition, construction, earthworks and trackout), the worst-case area sensitivity is used in combination with the dust emission magnitude to determine the risk of dust impacts.

Risk of Dust Impacts

3.18 The risk of dust impacts prior to mitigation for each emission source is presented in Tables 3.5, 3.6 and 3.7.

Table 3.5: Risk of Dust Impacts – Demolition

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

Table 3.6: Risk of Dust Impacts – Earthworks and Construction

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

Table 3.7: Risk of Dust Impacts - Trackout

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

Mitigation and Significance

3.19 The IAQM guidance provides a range of mitigation measures which are dependent on the level of dust risk attributed to the site. Site specific mitigation measures are also included where appropriate.

3.20 The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity following the application of appropriate mitigation measures. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effects will normally be negligible.

Construction Traffic

3.21 Construction traffic will contribute to existing traffic levels on the surrounding road network. The greatest potential for impacts on air quality from traffic associated with this phase of the Proposed Development will be in the areas immediately adjacent to the principal means of access for construction traffic.

3.22 Based on the size of the Proposed Development, construction related traffic flows are not predicted to be significant in terms of total emissions or construction duration.

Operational Phase Methodology

3.23 As discussed in the scoping section, the impact of the traffic associated with the operation of the Proposed Development is considered to be negligible and therefore the assessment of operational phase considers only the likely exposure of future residents to existing pollutant levels and the suitability of the Site for its proposed end use.

3.24 Air quality at the Site has been predicted using the ADMS Roads dispersion model (Version 4.1.1, January 2018). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process.

3.25 The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from London City Airport from 2017 has been used for the assessment.

3.26 The model has been used to predict road specific concentrations of oxides of nitrogen (NO_x) and Particulate Matter (PM_{10} and $PM_{2.5}$) at selected receptors. The predicted

concentrations of NO_x have been converted to NO_2 using the NO_x to NO_2 calculator available on the Defra air quality website[15].

3.27 Traffic data for road links adjacent to the Site has been sourced from Department for Transport traffic counts[16]. A summary of the traffic data used in the assessment can be found in **Appendix C**. The data includes details of annual average daily traffic flows (AADT), vehicle speeds and percentage Heavy Duty Vehicles (HDV) for the assessment years considered. Low traffic speeds have been assigned to appropriate road links to account for congestion and queuing vehicles.

3.28 The emission factors released by Defra in November 2017, provided in the emissions factor toolkit EFT2017_8.0 have been used to predict traffic related emissions in 2017. This is considered to represent a worst-case prediction of future concentrations.

3.29 To predict local air quality, traffic emissions predicted by the model must be added to local background concentrations. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been taken from the nearby automatic monitoring site, London Bloomsbury. The data used for the modelling assessment are set out in Tables 4.1, 4.2 and 4.3. Background concentrations for 2017 have been used to predict concentrations. Again, this is considered to represent a worst-case prediction of future concentrations.

3.30 To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process aims to minimise modelling uncertainty and systematic error by correcting the modelled results by an adjustment factor to gain greater confidence in the final results. This process was undertaken using the methodology outlined in Chapter 7, Section 4 of LAQM.TG(16).

3.31 Local roadside monitoring data was not available for concentrations of PM_{10} and $PM_{2.5}$, the modelled pollutant road-contributions for PM_{10} and $PM_{2.5}$ were therefore adjusted using the verification factor obtained for NO_x as recommended in the guidance provided in LAQM.TG(16).

3.32 A verification factor of 3.88 was determined which indicates that the model is under-predicting in this area. This factor was applied to the modelled road-NO_x concentrations prior to conversion to annual mean NO_2 concentrations using the NO_x to NO_2 calculator. Further details of the determination of the verification factor are provided in **Appendix D**.

[15] http://uk-air.defra.gov.uk

[16] https://www.dft.gov.uk/traffic-counts/cp.php?la=Camden

3.33 A quantitative assessment of air quality at the Proposed Development has been completed against the Air Quality Strategy objectives set out in **Appendix B** for NO_2, PM_{10} and $PM_{2.5}$.

Sensitive Receptors

3.34 LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations '*where members of the public are regularly present'* should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

3.35 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. For private dwellings, however; where exposure may be for longer periods, comparison with long-term (such as 24-hour mean or annual mean) standards may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

3.36 The modelling assessment predicted concentrations at two locations at the facades of the Proposed Development and are presented in Table 3.8 below.

Table 3.8 Location of Sensitive Receptors

ID	Receptor	Type	Easting	Northing
R1	Façade of the Proposed Development	Proposed	530972.7	181995.3
R2	Façade of the Proposed Development	Proposed	530970.5	181999.9

4 BASELINE CONDITIONS

London Borough of Camden Review and Assessment of Air Quality

4.1 LBC has carried out detailed assessments of air quality and as a result has declared the whole borough an AQMA due to exceedances of the NO_2 and PM_{10} objectives. The Proposed Development therefore falls within an AQMA.

Automatic Local Monitoring Data

4.2 The closest automatic air quality monitoring site to the Proposed Development, London Bloomsbury, is located 850m to the northwest. Urban background NO_2, PM_{10} and $PM_{2.5}$ concentrations are measured at London Bloomsbury and are summarised in Tables 4.1, 4.2 and 4.3.

Table 4.1: Urban Background NO_2 Concentrations measured at the London Bloomsbury Automatic Monitor (µg/m^3)

Statistic	Year				
	2013	2014	2015	2016	2017
Annual Mean	44	45	48	42	38
Number of 1-Hour means >200 µg/m^3 (a)	0	0	0	0	0
Data obtained from LBC Air Quality Annual Status Report for 2017					

4.3 The data in Table 4.1 indicate that exceedances of the air quality objective for annual mean NO_2 concentrations have been recorded in every year apart from 2017.

4.4 Exceedences of the hourly objective have not been recorded during the five years of the monitoring presented, therefore the objective was met in all five monitoring years.

Table 4.2: Urban Background PM_{10} Concentrations measured at the London Bloomsbury Automatic Monitor (µg/m³)

Statistic	Year				
	2013	2014	2015	2016	2017
Annual Mean (µg/m³)	18	20	22	20	19
Number of 24-hour means > 50 µg/m³	4	11	6	9	6
Data obtained from LBC Air Quality Annual Status Report for 2017					

4.5 Annual mean PM_{10} concentrations recorded have been consistently below the 40 µg/m³ objective since 2013.

4.6 Exceedences of the 24-hour objective have been recorded at the monitoring station during the five years of the monitoring presented, however the objective allows for 35 exceedences of the 50 µg/m³ limit in any given year. Therefore, the objective was met in all five monitoring years.

4.7 Based on the data recorded at this site, PM_{10} concentrations are expected to meet the annual mean and 24-hour objectives at the Proposed Development.

Table 4.3: Urban Background $PM_{2.5}$ Concentrations measured at the London Bloomsbury Automatic Monitor (µg/m³)

Statistic	Year				
	2013	2014	2015	2016	2017
Annual Mean (µg/m³)	-	-	11	12	13
Data obtained from LBC Air Quality Annual Status Report for 2017					

4.8 Annual mean $PM_{2.5}$ concentrations recorded at the urban background monitor have been consistently below the 25 µg/m³ objective between 2015 and 2017.

Non-Automatic Local Monitoring Data

4.9 NO_2 diffusion tube monitoring is also carried out at 14 locations in the borough. None of these diffusion tubes are located in the vicinity of the Proposed Development. Bias adjusted data from the closest diffusion tube is presented in Table 4.4 below.

Table 4.4: NO_2 Concentrations recorded at the nearest Diffusion Tube Monitor

Monitoring Site	Type	Distance to Kerb	2013	2014	2015	2016	2017
Wakefield Gardens	Urban Background	30	40.32	36.44	35.80	31.31	-
Data obtained from LBC Air Quality Annual Status Report for 2017							

4.10 At the Wakefield Gardens site, the AQS objective for annual mean NO_2 concentrations has been exceeded once over the five-year period.

Defra Background Maps

4.11 Additional information on background concentrations in the vicinity of the Proposed Development have been obtained from the Defra background pollutant maps. The pollutant concentrations from the grid square representing the assessment area (i.e. 530500, 181500) has been extracted from the maps which include the Proposed Development and road links included in the modelling assessment.

4.12 The 2015 Defra background maps, which provide estimated background concentrations between 2015 and 2030, have been used to obtain concentrations for 2017. The data is set out in Table 4.5.

Table 4.5: Estimated Annual Mean Background Concentrations from Defra Maps (µg/m^3)

Pollutant	Background Concentrations at Proposed Development	Air Quality Standard
NO_2	48.0	40
PM_{10}	21.0	40
$PM_{2.5}$	13.4	25

5 ASSESSMENT OF IMPACT

Construction Phase

5.1 The Proposed Development will occupy part of the existing building on Site. The rear of the building will be demolished.

5.2 The assessment of dust impacts is dependent on the proximity of the most sensitive receptors to the Site boundary. A summary of the receptor and area sensitivity to health and dust soiling impacts is presented in Table 5.1.

Table 5.1: Sensitivity of Receptors and the Local Area to Dust and PM_{10} Impacts

Receptor	Distance from Site Boundary (m)	Approx. Number of Receptors	Sensitivity to Health Impacts (a)		Sensitivity to Dust Soiling Impacts	
			Receptor	Area	Receptor	Area
Residential Properties	<20 m	10-100	High	Low	High	High
Overall Sensitivity of the Area			**Low**		**High**	
(a) Estimated background PM_{10} concentration is 21.0 µg/m^3.						

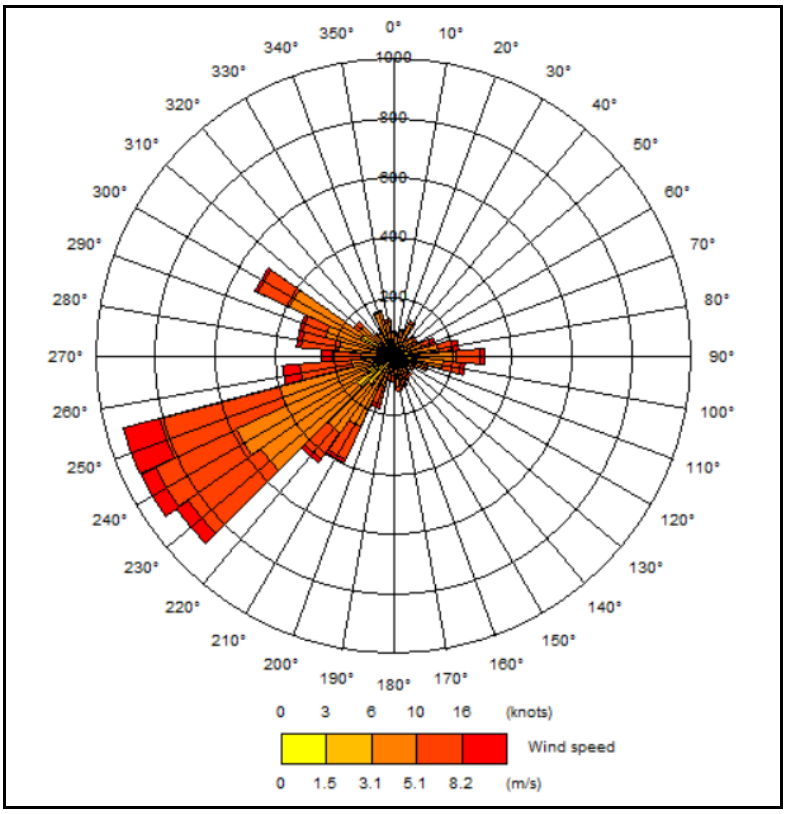
5.3 The route of the construction traffic is assumed to be Grays Inn Road. As the Site is small, the sensitivity of the area to impacts arising from track-out is considered within a distance of 50m from the Site entrance. There are several highly sensitive receptors along the roads within this distance, therefore the sensitivity of the area to impacts from trackout is considered to be high.

5.4 There are no dust-sensitive habitat sites within 50m of the Site, therefore the impact of dust and particulate matter emissions on ecologically sensitive receptors has not been considered further in this assessment.

5.5 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited will depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

5.6 A wind rose from London City Airport is provided below in Figure 5.1, which shows that the prevailing wind is from the southwest, therefore receptors to the northeast are the most likely to experience dust impacts from the Site.

Figure 5.1: Wind Rose for London City Airport Meteorological Station (2017)



Dust Emission Magnitude

5.7 Demolition works will involve the removal of the rear of the building. This has a volume of less than 20,000m^3 and demolition activities will be at a height of less than 10m above ground. The magnitude of dust emission for the demolition phase is therefore considered to be *small*.

5.8 Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling of the Site and landscaping. The area of the Site is approximately 0.02 Ha. During earthworks there is likely to be less than five heavy duty vehicles at work on Site at any given time. The magnitude of the dust emission for the earthworks phase is therefore considered to be *small*.

5.9 Dust emissions during construction will depend on the scale of the works, method of construction, construction materials and duration of build. The proposed construction works will

comprise refurbishment works and a rebuild of the rear, therefore the dust emission magnitude is considered to be *small*.

5.10 Factors influencing the degree of trackout and associated magnitude of effect include vehicle size, vehicle speed, vehicle numbers, geology and duration. Construction traffic will access the Site via Grays Inn Road. The number of HGV movements (leaving the Site) is likely to be less than 10 per day, therefore dust emission magnitude due to trackout is considered to be *small.*

Dust Risk Effects

5.11 A summary of the potential risk of dust impacts, based on the high sensitivity of the area to dust soiling impacts and low sensitivity to human health impacts, is presented in Table 5.2.

5.12 The risk of dust impacts has been assessed as medium, prior to mitigation.

Table 5.2: Risk of Dust Impacts Prior to Mitigation

Source	Impact Magnitude	Human Health Risk	Dust Soiling Risk
Demolition	Small	Negligible	Medium
Earthworks	Small	Negligible	Low
Construction	Small	Negligible	Low
Trackout	Small	Negligible	Low

Operational Phase

Nitrogen Dioxide (NO_2)

5.13 Predicted annual mean NO_2 concentrations at the Proposed Development are presented in Table 5.3. The concentrations include the background NO_2 concentration of 38 µg/m^3.

Table 5.3: Predicted Annual Mean Nitrogen Dioxide Concentrations at the Proposed Development (µg/m^3)

Receptor	First Floor	Second Floor	Third Floor	Fourth Floor
R1	53.2	46.8	43.2	41.1
R2	51.6	46.1	42.9	41.0

5.14 The dispersion modelling indicates that existing annual mean NO_2 concentrations at the Site are above the air quality objective of 40 µg/m^3. NO_2 concentrations at the façade of the Proposed Development will decrease with height as a result of increased dispersion and dilution with separation distance from road traffic sources.

5.15 Research has concluded[17] that exceedences of the 1-hour mean objective are unlikely to occur where annual mean concentrations are below 60 µg/m^3. The predicted concentrations at the Proposed Development are well within this level, therefore it is considered unlikely that an exceedence of the short-term objective will occur.

Particulate Matter (as PM_{10})

5.16 Predicted annual mean PM_{10} concentrations at the Proposed Development are presented in Table 5.4. The concentrations include the 2017 background PM_{10} concentration of 19 µg/m^3.

Table 5.4: Predicted Annual Mean PM_{10} Concentrations at the Proposed Development (µg/m^3)

Receptor	First Floor	Second Floor	Third Floor	Fourth Floor
R1	20.6	19.9	19.5	19.3
R2	20.4	19.8	19.5	19.3

5.17 The predicted annual mean PM_{10} concentrations are all well below (less than 75% of) the AQAL at all proposed receptors.

5.18 The number of exceedences of the 24-hour mean PM_{10} concentration of 50 µg/m^3 (N), has been calculated from the annual mean following the approach set out by Defra in LAQM.TG(09):

$$N = -18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean}).$$

5.19 The maximum predicted annual mean concentration at the Proposed Development site is just 51% of the air quality objective of 40 µg/m^3. The maximum number of days >50 µg/m^3 is 4, well below the 35 days permitted within the objective. The risk of an exceedence of the air quality objectives for PM_{10} at the Proposed Development is considered to be *negligible*.

[17] D Laxen and B Marner (July 2003), Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites.

Particulate Matter (as $PM_{2.5}$)

5.20 Predicted annual mean $PM_{2.5}$ concentrations at the Proposed Development are presented in Table 5.5. The concentrations include the 2017 background $PM_{2.5}$ concentration of 13 µg/m^3.

Table 5.5: Predicted Annual Mean $PM_{2.5}$ Concentrations at the Proposed Development (µg/m^3)

Receptor	First Floor	Second Floor	Third Floor	Fourth Floor
R1	14.0	13.6	13.3	13.2
R2	13.9	13.5	13.3	13.2

5.21 The predicted $PM_{2.5}$ concentrations are well within the EU limit value of 25 µg/m^3 at the Proposed Development, therefore the risk of an exceedence at the Proposed Development is considered to be *negligible*.

MITIGATION

Construction Phase

5.22 The control of dust emissions from construction site activities relies upon management provision and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, construction operations have been successfully undertaken without impacts to nearby properties.

5.23 Overall the Site is considered to be a medium risk of dust impacts, and a negligible risk to human health from particulate matter concentrations at nearby receptors during the construction phase. Appropriate mitigation measures for the Site have been identified following the IAQM guidance and based on the risk effects presented in Table 5.2. It is recommended that the 'highly recommended' measures set out in **Appendix E** are adhered to during the construction phase.

5.24 In addition to the 'recommended' measures, the IAQM guidance also sets out a number of 'desirable' measures which should also be considered. These are also set out in **Appendix E**.

5.25 Following implementation of the 'highly recommended' measures outlined in the IAQM guidance and reproduced in **Appendix E**, the impact of emissions during construction of the Proposed Development would be negligible.

Operational Phase

5.26 The results of the detailed modelling assessment predict PM_{10} and $PM_{2.5}$ concentrations are well below the relevant objectives at the Proposed Development. NO_2 concentrations are predicted to exceed the objective at all floors of the Proposed Development.

5.27 The exposure of future residents of the proposed development to elevated NO_2 concentrations could be reduced by installing a suitable mechanical ventilation system that would take in cleaner air from the top of the building, away from the road, and use this to ventilate the living spaces beneath. Alternatively, if mechanical ventilation inlets need to be positioned lower down the building and/or on the street-facing facades, an activated carbon filtration system could be employed to reduce occupants' exposure to elevated NO_2 concentrations. Such a system could reduce NO_2 concentrations to well below the objective for this pollutant.

5.28 It should be noted that the dispersion modelling assessment has adopted a number of worst case assumptions. Chief amongst these is the use of 2017 pollution data for the future scenario of when the Proposed Development is due to be occupied. It is therefore likely that future pollution concentrations will actually decrease due to the roll out of cleaner vehicles across London.

6 CONCLUSIONS

6.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the Proposed Development.

6.2 An assessment of the potential impacts during the construction phase has been carried out in accordance with the latest Institute of Air Quality Management Guidance. This has shown that for the Proposed Development, limited releases of dust and particulate matter are likely to be generated from on-site activities. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and particulate matter releases may be effectively mitigated and the resultant impacts are considered to be negligible.

6.3 There is no significant traffic associated with the Proposed Development, therefore the impact of existing traffic has been considered with respect to the suitability of the site for residential use only.

6.4 ADMS Roads dispersion modelling has been carried out to assess the suitability of the Site for its proposed end use with regards to local air quality. The results indicate that predicted concentrations of PM_{10} and $PM_{2.5}$ concentrations are below the relevant objectives within the Site.

6.5 In order to reduce exposure of future residents to annual mean NO_2 concentrations, it is recommended that mechanical ventilation should be provided to rooms along street-facing facades, with the air intakes situated on the top of the building away from the adjacent roads. If such an arrangement is untenable, then it is recommended that an activated carbon filtration system is used to provide filtered air to the units.

6.6 It is concluded that air quality does not pose a constraint to the development of the Site as proposed, either during demolition and construction or once operational.

APPENDIX A - AIR QUALITY TERMINOLOGY

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against

Term	Definition
	monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

APPENDIX B - AIR QUALITY STANDARDS AND OBJECTIVES

Table B1: Air Quality Standards and Objectives

Pollutant	Standard (µg/m^3)	Averaging Period	No. of Permitted Exceedences
NO_2	200 (a)	1-Hour	18 per annum (99.8th percentile)
	40 (a)	Annual	-
PM_{10}	200 (a)	24-Hour	35 per annum (90.4th percentile)
	50 (a)	Annual	-
$PM_{2.5}$	25 (a)	Annual	-
(a) Air Quality Standards Regulations (2010) (b) EU Directive Limit Value			

APPENDIX C - SUMMARY OF TRAFFIC DATA

Table C1: Traffic Data

Road Link	DfT Traffic Count ID	AADT (2017)	HGV (%) (a)	Average Speed (kph)
Grays Inn Road (N of Theobald's Road)	17688	12,686	7.5	20
Grays Inn Road (S of Theobald's Road)	47785	11,897	11.2	20
Theobald's Road	37827	19,436	16.2	20
Roseberry Avenue	38592	6,907	23.0	20
Clerkenwell Road	7717	15,947	7.7	20
Kentish Town Road	17007	14,110	11.9	20
(a) Including buses and coaches				

APPENDIX D – MODEL VERIFICATION

Nitrogen Dioxide (NO_2)

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(16).

The model has been run to predict annual mean road-NO_x concentrations at a nearby monitoring site, CA16.

The model output of road-NOx (i.e. the component of total NO_x coming from road traffic) has been compared to the 'measured' road-NO_x (Table D1). The 'measured' road NO_x has been calculated from the measured NO_2 concentrations by using the Defra NO_x to NO_2 calculator available on the UK-AIR website.

Table D1: Comparison of Modelled and Monitored NOx concentrations

Monitoring Location	Total Monitored NO_2	Background NO2	Monitored Road NOx	Modelled Road NOx	Ratio
CA16	74.9	38	104.7	27.0	3.88

The results in Table D1 indicate that the ADMS model under-predicted the road NO_x concentrations at the selected monitoring site. An adjustment factor was therefore determined as the ratio between the measured road-NO_x contribution and the modelled road-NO_x contribution (3.88). This factor has then been applied to the modelled road-NO_x concentration for each location to provide an adjusted modelled road-NO_x concentration.

The annual mean road-NO_2 concentration was determined using the Defra NO_x:NO_2 spread sheet calculation tool and added to the background NO_2 concentration to produce a total adjusted NO_2 concentration.

Particulate Matter (PM_{10} and $PM_{2.5}$)

There was insufficient roadside monitoring data available against which the modelling could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x

contribution has been applied to the predicted road-PM_{10} and road-$PM_{2.5}$ contributions, consistent with guidance provided in LAQM.TG(16).

APPENDIX E – CONSTRUCTION MITIGATION MEASURES

The following measures are detailed in the IAQM guidance as being 'highly recommended' for sites of the level of risk identified for the Proposed Development. It is therefore recommended that these measures are incorporated into a DMP and approved by LBC prior to commencement of any work on site:

- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off- site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to LBC when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary as necessary that are at least as high as any stockpiles;
- fully enclose site or specific operations where there is a high potential for dust production and the site is 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 unless being re-used on site.
- Cover, seed or fence stockpiles to prevent wind whipping;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;

- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- avoid bonfires and burning of waste materials;
- ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives;
- Bag and remove any biological debris or damp down such material before demolition;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- 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;

The guidance also details a number of measures which are considered to be 'desirable'. It is recommended that these measures should also be considered for inclusion within the DMP:

- undertake daily on-site and off-site inspection, where receptors area nearby, to monitor, record inspection results and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary;
- implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing);
- soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;
- only remove the cover in small areas during work and not all at once;
- avoid scabbling (roughening of concrete surfaces);
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

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