LOVE
DESIGN
STUDIO

AIR QUALITY ASSESSMENT (FOR PLANNING)

160 Malden Road
by Love Design Studio

July 2022
PR455_V0

CONTENTS

EXECUTIVE SUMMARY

Love Design Studio have been requested to undertake an air quality assessment review for the proposed development at 160 Malden Road, Camden.

The proposed development includes the demolition of the existing buildings on site and the construction of a mixed-use development comprising 207 m^2 commercial space and 15 residential apartments (Class C3), with associated landscaping.

An assessment has been undertaken to determine whether there are any air quality constraints to the redevelopment of the site and to identify whether mitigation measures are required to minimise off-site impacts or protect future occupants from poor air quality.

The development traffic will not significantly affect local air quality.

Pollutant concentrations at the ground-floor building façades fall within the London Council's exposure category APEC-A and therefore mitigation is not required to protect future occupants from poor air quality.

Summaries of each element are set out below:

EXISTING AIR QUALITY

The primary source of airborne emissions in Camden is road traffic; key pollutants of concern with respect to health effects, are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

A review of local air quality monitoring data indicates that annual mean NO_2 concentrations in Camden continue to exceed the air quality objective of 40 $\mu g/m^3$ close to main roads through the Borough. Particulate concentrations, however, are well within the relevant objectives.

CONSTRUCTION DUST

A construction dust risk assessment has been undertaken following the guidance in the London Plan SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b). Guidance for mitigation can be found within the body of this report. Following the successful implementation of the recommended best practice dust control measures, the off-site dust impacts are expected to be negligible.

TRAFFIC EMISSIONS

The proposed development has no allocated parking.

The requirement to assess the impact of both construction and operational traffic has been screened out using the screening criteria in the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) planning guidance (EPUK and IAQM, 2017).

BUILDING EMISSIONS

The proposed energy strategy is air source heat pumps.

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INTRODUCTION

Love Design Studio have been requested to undertake an air quality assessment review for the proposed development at 160 Malden Road, Camden, NW5 4BS.

The proposed development comprises a 4-storey development with 207 m^2 of office space at ground-floor level and 15 residential units spread across the upper floors.

REQUIREMENTS OF ASSESSMENT

The proposals for the 15 dwellings include an energy strategy using non-combustion air source heat pumps. There will be no parking provided on site, although it is anticipated that one blue badge holder will park on-street.

There is the potential for construction activities to impact upon nearby existing sensitive receptors. The main pollutants of concern related to construction activities are dust and PM_{10}.

The London Borough of Camden (LBC) has declared the entire borough an Air Quality Management Area (AQMA) for exceedances of the annual mean nitrogen dioxide (NO_2) objective and 24-hour mean PM_{10} objective. Detailed dispersion modelling of traffic on the local road network has been undertaken to determine whether future occupants of the proposed development will be exposed to poor air quality.

The assessment has been prepared considering all relevant local and national guidance and regulations, and follows the methodology set out in the LBC Air Quality Planning Guidance (2021).

SITE DESCRIPTION

The proposed development site is located on the B511 Malden Road. The site is bound to the northeast and north by Wellesley Road Care Home, a residential development. Other land-uses in close proximity to the site are primarily residential, or commercial at ground-floor with residential above.

Figure 1: Site plan aerial view with the proposed development (red boundary)

AIR QUALITY POLLUTANTS

The pollutants for consideration in this assessment are nitrogen dioxide (NO_2) and particulate matter (as PM_{10} and $PM_{2.5}$).

The air is naturally made up primarily of Nitrogen (N_2) and Oxygen (O_2), with a relatively small proportion of Argon, Carbon dioxide and other gases. Added to this are a number of gases and microscopic particulate solids that, even at relatively low atmospheric concentrations, can affect air quality, damaging health and the natural and built environment. Some of these pollutants can also contribute to climate change.

Some pollutants remain relatively close to their sources and have a local effect (such as NO_2 from road transport), whereas others can be transported hundreds or thousands of kilometres from source via upper tropospheric air currents.

NITROGEN OXIDES (NOX)

Petrol and diesel emissions from road traffic are the main sources of nitrogen oxides (NOx) in many urban areas, particularly close to busy roads. They are also a source of particulate matter, especially from brake and tyre wear and re-suspended dusts, which can also be generated by electric vehicles. Diesel trains, shipping and aviation are also a source of NOx, sulphur dioxide (SO_2) and particulate matter.

Domestic wood burning is an increasing source of particulate matter affecting ambient air in urban areas. Gas boilers are also a major source of nitrogen oxides (NOx). Historically, coal burning was also a significant source of sulphur dioxide (SO_2) and particulate matter leading to smog conditions. Paints, cleaning products, carpets and furnishings can also release volatile organic compounds (VOCs), adding to emissions from heating and cooking appliances and ingress of outdoor air pollution sources to affect indoor air.

Nitrogen oxides (NOx) are emitted in the form of nitric oxide (NO) and nitrogen dioxide (NO_2). Almost all NOx are formed through combustion processes (a very small amount is released from agriculture or waste processes).

PARTICULATE MATTER (PM)

Unlike pollutant gases, PM is not typically defined by its chemical composition. PM is made up of a wide range of substances (solid or liquid) that have varying sizes, shapes, sources and chemical compositions.

PM is most commonly defined by its size, the most common being PM_{10} – i.e., aerodynamic diameter <10 µm. Other common measures are of $PM_{2.5}$ and $PM_{1.0}$ (fine) and $PM_{0.1}$ (ultrafine/nano-particles).

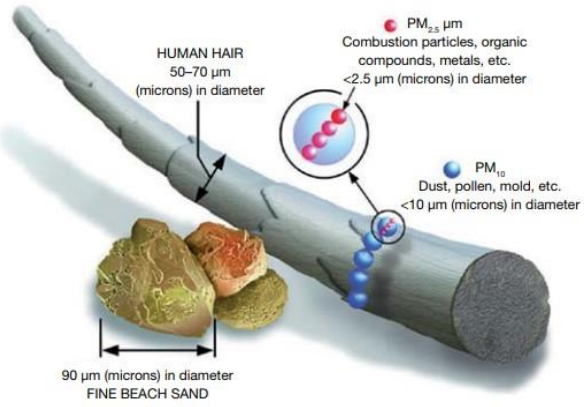

Figure 2: Schematic comparing particulate matter size fractions against a human hair and a grain of sand (Source: https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM)

PLANNING POLICY

There are various National, Regional and Local planning policy documents and supplementary design guides available to help steer designers and assessors in minimising the impacts of new development on local air quality and for the air quality experienced by new habitants be safe.

The various policy documents are set out below:

THE AIR QUALITY STRATEGY

Part IV of The Environment Act 1995 required the UK Government to prepare an Air Quality Strategy. The Air Quality Strategy (Defra, 2007) provides an overview and outline of ambient air quality policy in the UK and the devolved administrations. The strategy sets out air quality standards and objectives intended to protect human health and the environment.

The air quality standards and objectives for NO_2, PM_{10} and $PM_{2.5}$, as set out in the Air Quality Standards Regulations 2010 (The Stationary Office, 2010), are summarised in Table 1. For PM_{10} and NO_2 these were to have been achieved by 2004 and 2005 respectively and continue to apply in all future years thereafter. The objective for $PM_{2.5}$ is an exposure reduction target, however there is increasing evidence that fine particles are particularly detrimental to human health and to this end the UK Government (Clean Air Strategy, 2019) aim to ensure that public exposure to $PM_{2.5}$ concentrations above 10 µg/m^3 is halved by 2025.

Table 1: The Air Quality Standards and Objectives for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Averaging Period	Concentration
NO_2	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
PM_{10}	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m^3
$PM_{2.5}$	Annual Mean	25 µg/m^3

The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed for a period appropriate to the averaging period of the objective. Examples of where the objectives should apply are provided in the Local Air Quality Management Technical Guidance (Defra, 2021). The annual mean NO_2 and PM_{10} objectives should apply at the building façades of residential properties, schools, hospitals, care homes etc.;

they should not apply at the building façades of places of work, hotels, gardens or kerbside sites.

The 24-hour mean PM_{10} objective should apply at all locations where the annual mean objective applies, as well as the gardens of residential properties and hotels. The 1-hour mean NO_2 objective should apply at all locations where the annual and 24-hour mean objectives apply, as well as at kerbside sites where the public have regular access.

It is widely accepted that there is no safe level for $PM_{2.5}$ and The Environment Act 2021 requires the Regulations to be updated to include a more stringent long-term air quality target by the 31st of October 2022. A consultation on new environmental targets was opened on 16th March 2022, which proposes an Annual Mean Concentration Target for England of 10 µg/m^3, to be met by 2040.

NATIONAL PLANNING POLICY

The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

The purpose of the planning system is to contribute to the achievement of sustainable development. In summary the framework advises:

"THE PLANNING SYSTEM SHOULD CONTRIBUTE TO CONSERVING AND ENHANCING THE ENVIRONMENT AND REDUCING POLLUTION 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."

"TO PREVENT UNACCEPTABLE RISKS FROM POLLUTION AND LAND INSTABILITY, PLANNING POLICIES AND DECISIONS SHOULD ENSURE THAT NEW DEVELOPMENT IS APPROPRIATE FOR ITS LOCATION. THE EFFECTS (INCLUDING CUMULATIVE EFFECTS) OF POLLUTION ON HEALTH, THE NATURAL ENVIRONMENT OR GENERAL AMENITY, AND THE POTENTIAL SENSITIVITY OF THE AREA OR PROPOSED DEVELOPMENT TO ADVERSE EFFECTS FROM POLLUTION, SHOULD BE TAKEN INTO ACCOUNT."

"PLANNING POLICIES SHOULD SUSTAIN COMPLIANCE WITH AND CONTRIBUTE TOWARDS EU LIMIT VALUES OR NATIONAL OBJECTIVES FOR POLLUTANTS, TAKING INTO ACCOUNT THE PRESENCE OF AIR QUALITY MANAGEMENT AREAS AND THE CUMULATIVE IMPACTS ON AIR QUALITY FROM INDIVIDUAL SITES IN LOCAL AREAS. PLANNING DECISIONS SHOULD ENSURE THAT ANY NEW DEVELOPMENT IN AIR QUALITY MANAGEMENT AREAS IS CONSISTENT WITH THE LOCAL AIR QUALITY ACTION PLAN."

The NPPF is supported by the Planning Practice Guidance (PPG) (DCLG, 2014):

"THE DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS CARRIES OUT AN ANNUAL NATIONAL ASSESSMENT OF AIR QUALITY USING MODELLING AND MONITORING TO DETERMINE COMPLIANCE WITH RELEVANT LIMIT VALUES. 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, OR WHERE THE NEED FOR EMISSIONS REDUCTIONS HAS BEEN IDENTIFIED.

THE LOCAL AIR QUALITY MANAGEMENT (LAQM) REGIME REQUIRES EVERY LOCAL AUTHORITY TO REGULARLY REVIEW AND ASSESS AIR QUALITY IN THEIR AREAS. AIR QUALITY IS A DEVOLVED MATTER, AND FOR ENGLAND THESE REVIEWS IDENTIFY WHETHER NATIONAL OBJECTIVES IN THE AIR QUALITY (ENGLAND) REGULATIONS 2000 HAVE BEEN, OR WILL BE, ACHIEVED BY AN APPLICABLE DATE.

IF NATIONAL OBJECTIVES ARE NOT MET, OR AT RISK OF NOT BEING MET, THE LOCAL AUTHORITY CONCERNED MUST DECLARE AN AIR QUALITY MANAGEMENT AREA AND PREPARE AN AIR QUALITY ACTION PLAN. THIS IDENTIFIES MEASURES THAT WILL BE INTRODUCED IN PURSUIT OF THE OBJECTIVES AND CAN HAVE IMPLICATIONS FOR PLANNING.

AIR QUALITY CONSIDERATIONS MAY ALSO BE RELEVANT TO OBLIGATIONS AND POLICIES RELATING TO THE CONSERVATION OF NATIONALLY AND INTERNATIONALLY IMPORTANT HABITATS AND SPECIES. THE AIR POLLUTION INFORMATION SYSTEM AND NATURAL ENGLAND'S 'IMPACT RISK ZONES' TOOL (AVAILABLE ON MAGIC) CAN HELP TO DETERMINE THE TYPES OF DEVELOPMENT PROPOSAL WHICH CAN ADVERSELY AFFECT THESE DESIGNATED SITES OF SPECIAL SCIENTIFIC INTEREST AND INDICATES WHEN CONSULTATION WITH NATURAL ENGLAND IS REQUIRED.

REGIONAL POLICIES

Under the legislation establishing the Greater London Authority (GLA), the Mayor is required to publish a Spatial Development Strategy (SDS) and keep it under review. The SDS is known as the London Plan. As the overall strategic plan for London, it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years.

The document brings together the geographical and locational aspects of the Mayor's other strategies, to ensure consistency with those strategies, including those dealing with transport, environment, economic development, housing, culture and health & health inequalities.

Relevant policies are set out below:

Policy GG3 (F) Creating a healthy city:

F SEEK TO IMPROVE LONDON'S AIR QUALITY, REDUCE PUBLIC EXPOSURE TO POOR AIR QUALITY AND MINIMISE INEQUALITIES IN LEVELS OF EXPOSURE TO AIR POLLUTION.

Policy SI 1 Improving air quality

A DEVELOPMENT PLANS, THROUGH RELEVANT STRATEGIC, SITE-SPECIFIC AND AREA-BASED POLICIES, SHOULD SEEK OPPORTUNITIES TO IDENTIFY AND DELIVER FURTHER IMPROVEMENTS TO AIR QUALITY AND SHOULD NOT REDUCE AIR QUALITY BENEFITS THAT RESULT FROM THE MAYOR'S OR BOROUGHS' ACTIVITIES TO IMPROVE AIR QUALITY.

B TO TACKLE POOR AIR QUALITY, PROTECT HEALTH AND MEET LEGAL OBLIGATIONS THE FOLLOWING CRITERIA SHOULD BE ADDRESSED:

1) DEVELOPMENT PROPOSALS SHOULD NOT:

A) LEAD TO FURTHER DETERIORATION OF EXISTING POOR AIR QUALITY

B) CREATE ANY NEW AREAS THAT EXCEED AIR QUALITY LIMITS, OR DELAY THE DATE AT WHICH COMPLIANCE WILL BE ACHIEVED IN AREAS THAT ARE CURRENTLY IN EXCEEDANCE OF LEGAL LIMITS

C) CREATE UNACCEPTABLE RISK OF HIGH LEVELS OF EXPOSURE TO POOR AIR QUALITY.

2) IN ORDER TO MEET THE REQUIREMENTS IN PART 1, AS A MINIMUM:

A) DEVELOPMENT PROPOSALS MUST BE AT LEAST AIR QUALITY NEUTRAL

B) DEVELOPMENT PROPOSALS SHOULD USE DESIGN SOLUTIONS TO PREVENT OR MINIMISE INCREASED EXPOSURE TO EXISTING AIR POLLUTION AND MAKE PROVISION TO ADDRESS LOCAL PROBLEMS OF AIR QUALITY IN PREFERENCE TO POST-DESIGN OR RETRO-FITTED MITIGATION MEASURES

C) MAJOR DEVELOPMENT PROPOSALS MUST BE SUBMITTED WITH AN AIR QUALITY ASSESSMENT. AIR QUALITY ASSESSMENTS SHOULD SHOW HOW THE DEVELOPMENT WILL MEET THE REQUIREMENTS OF B1

D) DEVELOPMENT PROPOSALS IN AIR QUALITY FOCUS AREAS OR THAT ARE LIKELY TO BE USED BY LARGE NUMBERS OF PEOPLE PARTICULARLY VULNERABLE TO POOR AIR QUALITY, SUCH AS CHILDREN OR OLDER PEOPLE SHOULD DEMONSTRATE THAT DESIGN MEASURES HAVE BEEN USED TO MINIMISE EXPOSURE.

C MASTERPLANS AND DEVELOPMENT BRIEFS FOR LARGE-SCALE DEVELOPMENT PROPOSALS SUBJECT TO AN ENVIRONMENTAL IMPACT ASSESSMENT SHOULD CONSIDER HOW LOCAL AIR QUALITY CAN BE IMPROVED ACROSS THE AREA OF THE PROPOSAL AS PART OF AN AIR QUALITY POSITIVE APPROACH. TO ACHIEVE THIS A STATEMENT SHOULD BE SUBMITTED DEMONSTRATING:

1) HOW PROPOSALS HAVE CONSIDERED WAYS TO MAXIMISE BENEFITS TO LOCAL AIR QUALITY, AND

2) WHAT MEASURES OR DESIGN FEATURES WILL BE PUT IN PLACE TO REDUCE EXPOSURE TO POLLUTION, AND HOW THEY WILL ACHIEVE THIS.

D IN ORDER TO REDUCE THE IMPACT ON AIR QUALITY DURING THE CONSTRUCTION AND DEMOLITION PHASE DEVELOPMENT PROPOSALS MUST DEMONSTRATE HOW THEY PLAN TO COMPLY WITH THE NON-ROAD MOBILE MACHINERY LOW EMISSION ZONE AND REDUCE EMISSIONS FROM THE DEMOLITION AND CONSTRUCTION OF BUILDINGS FOLLOWING BEST PRACTICE GUIDANCE.147

E DEVELOPMENT PROPOSALS SHOULD ENSURE THAT WHERE EMISSIONS NEED TO BE REDUCED TO MEET THE REQUIREMENTS OF AIR QUALITY NEUTRAL OR TO MAKE THE IMPACT OF DEVELOPMENT ON LOCAL AIR QUALITY ACCEPTABLE, THIS IS DONE ON-SITE. WHERE IT CAN BE DEMONSTRATED THAT EMISSIONS CANNOT BE FURTHER REDUCED BY ON-SITE MEASURES, OFF-SITE MEASURES TO IMPROVE LOCAL AIR QUALITY MAY BE ACCEPTABLE, PROVIDED THAT EQUIVALENT AIR QUALITY

The London Plan is supported by the Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance (GLA, 2014b), which sets out the requirements for dust risk assessments for all major developments in London.

New London Plan Air Quality Positive Guidance (GLA, 2021) and Air Quality Neutral Guidance (GLA, 2021) has been published; however, these documents are currently in draft format and have not been adopted within this assessment

The London Environment Strategy (GLA, 2018) outlines the actions that the Mayor will take to improve air quality in London, with the aim of achieving compliance with the EU limit values as soon as possible. The Strategy includes several measures to improve air quality, including those that encourage the

use of sustainable transport modes, promote the use of cleaner vehicles, improve traffic management and use the planning process to improve air quality.

LOCAL POLICY- LONDON BOROUGH OF CAMDEN

The main source of pollution in Camden is road traffic vehicle emissions.

Other significant sources of air pollution are industrial and construction sites, residential and commercial gas use, and emissions from outside of the borough.

LBC declared an Air Quality Management Area (AQMA) on 20th September 2002 due to annual mean NO_2 concentrations and 24-hour mean PM_{10} not meeting the national air quality objectives in many parts of the borough.

The AQMA covers the whole of the London Borough of Camden.

CAMDEN LOCAL PLAN

Policy CC4 'Air Quality' of Camden's Local Plan (2017) states that:

"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."

CAMDEN CLEAN AIR ACTION PLAN

LBCs Clean Air Action Plan (2019 – 2022) outlines the Council's commitment to improving air quality in the Borough. The key objectives of the plan are to reduce PM_{10}, $PM_{2.5}$ and NO_2 concentrations by:

- Reducing construction emissions
- Reducing building emissions (encouraging the use of clean fuels and technologies)
- Reducing transport emissions
- Supporting communities and schools

- Reducing emissions from delivery, servicing and freight
- Continuing public health and awareness raising
- Lobbying

ASSUMPTIONS & LIMITATIONS

This review is to assess if air quality is a constraint to the development of the site, as proposed.

Where limited access or information is available, assumptions have been made which may affect the conclusions reached in this report. The report provided is solely for the use of the client and no liability to anyone else is accepted and this report is based upon and subject to the scope of work set out in Love Design Studio's quotation and standard terms and conditions.

ASSESSMENT METHODOLOGY

The scope of the assessment is as follows:

- Review of existing air quality.
- Assessment of impact of the proposed development on local air quality during the construction phase.
- Assessment of impact of the proposed development on local air quality during the operational phase.
- Assessment of exposure of future occupants of the proposed development to poor air quality.

EXISTING AIR QUALITY

A review of existing air quality in the area around the proposed development has been undertaken using data from the following sources:

- The London Borough of Camden's Annual Air Quality Status Reports (ASR)
- The London Air Quality Network (https://www.londonair.org.uk); and
- Defra UK Air Pollution Background Concentration Maps.

LBC currently monitor pollutant concentrations automatically at four locations in the borough. The nearest automatic monitoring site to the proposed development is Swiss Cottage (OSGR 526629, 184391), which measures NOx, NO_2 and PM_{10} concentrations 1.5m from the kerb of the A41 Finchley Road. The nearest automatic monitoring sites measuring urban background pollutant concentrations are London Bloomsbury (OSGR 530123, 182014) and Arsenal (OSGR 531325, 186032), which is in the London Borough of Islington.

A summary of concentrations measured at these locations between 2015 and 2019 is presented in Table 2. Data for 2020 and 2021 have not been included due to the influence of the Covid-19 pandemic on traffic levels.

The data indicates that the annual mean air quality objective for NO_2 of 40 µg/m^3 is consistently exceeded close to the A41 (Swiss Cottage), however at urban background locations, the measured concentrations are considerably lower and well within the objective. The urban background concentrations measured at Bloomsbury are somewhat higher than at Arsenal which is likely due to the relatively close proximity of the monitoring station to the A4200 (Russell Square).

With the exception of 2016, the number of hourly mean NO_2 concentrations over 200 µg/m^3 measured by the Swiss Cottage automatic monitoring site has been well below the 18 allowable within the objective.

The measured annual mean PM_{10} concentrations between 2015 and 2019 were around 50% of the air quality objective of 40 µg/m^3 at all three sites. The number of 24-hour mean PM_{10} concentrations above 50 µg/m^3 was also well below the 35 allowable within the objective.

Data from Swiss Road and Bloomsbury indicate that both roadside and urban background annual mean $PM_{2.5}$ concentrations are within the current air quality objective of 25 µg/m^3, but are above the proposed new Concentration Target of 10 µg/m^3.

Table 2: Ratified Automatic Monitoring Data

Statistic	2015	2016	2017	2018	2019	Air Quality Objective
Swiss Cottage (Camden)						
Annual Mean NO_2 (µg/m^3)	61	66	53	54	43	40
NO_2 Number of 1-hour means > 200 µg/m^3	11	37	1	2	1	18
Annual Mean PM_{10} (µg/m^3)	20	21	20	21	19	40
PM_{10} Number of 24-hour means > 50 µg/m^3	8	7	8	4	8	35
Annual Mean $PM_{2.5}$ (µg/m^3)	17	17	14	15.6	11	25
London Bloomsbury (Camden)						
Annual Mean NO_2 (µg/m^3)	48	42	38	36	32	40
NO_2 Number of 1-hour means > 200 µg/m^3	0	0	0	0	0	18
Annual Mean PM_{10} (µg/m^3)	n/a	20	19	17	18	40
PM_{10} Number of 24-hour means > 50 µg/m^3	n/a	9	6	1	9	35
Annual Mean $PM_{2.5}$ (µg/m^3)	11	12	13	10	11	25
Arsenal (Islington)						
Annual Mean NO_2 (µg/m^3)	29	33	31	27	25	40
NO_2 Number of 1-hour means > 200 µg/m^3	0	0	1	0	0	18
Annual Mean PM_{10} (µg/m^3)	18	18	18	19	19	40

Statistic	2015	2016	2017	2018	2019	Air Quality Objective
PM_{10} Number of 24-hour means > 50 µg/m³	1	3	3	1	9	35

Notes:

(a) Exceedances of the objectives are shown in bold.

Annual mean NO_2 concentrations are also measured via a network of passive diffusion tubes; a summary of the monitoring sites in closest proximity to the proposed development is presented in Table 3. The locations of the diffusion tubes and the Swiss Road (CD1) automatic monitoring site are presented in Figure 3.

Table 3: Details of Non-Automatic Monitoring (Diffusion Tube) Monitoring Sites

Site ID	Site Name	X (m)	Y (m)	Site Type
CA7	Frognal Way	526213	185519	Urban Background
CA16	Kentish Town Road	529013	185102	Roadside
CA17	47 Fitzjohn's Road	526547	185125	Roadside
CTLEN1	Haverstock School (Haverstock Hill)	528081	184490	Roadside

The diffusion tube data, presented in Table 4, show that there ongoing exceedances of the annual mean NO_2 concentrations close to Kentish Town Road and Fitzjohn's Road. Dispersion of vehicle emissions is poor in both locations due to tall buildings and overhanging trees, respectively. The 2019 annual average concentration measured by the diffusion tube on Haverstock Hill (CTLEN1), which is in a comparatively open location, was well within the objective at 32.3 µg/m³.

The NO_2 concentrations measured at the Frognal Way urban background site were less than 60% of the annual mean air quality objective in 2018 and 2019. The data are slightly lower than the urban background NO_2 concentrations measured automatically at Islington Arsenal. On this basis, it is unlikely that the concentrations measured at London Bloomsbury are representative of the existing background at the proposed development.

Diffusion tubes are unable to provide short-term NO_2 concentrations; however, measurements across the UK have shown that an exceedance of the 1-hour mean AQO for NO_2 is unlikely where the annual mean concentration is less than 60 µg/m³ (Laxen and Barner, 2003) On this basis, the data in Table 4

indicate that it is unlikely that the short-term objective is currently being exceeded in the area.

Both the automatic and diffusion tube data indicate that, overall, there has been a decline in concentrations since 2016, which is consistent with the trend widely observed across London, where there was an average decline between 2016 and 2019 of 21% (GLA, 2020). Further improvements are expected due to the recent (October 2021) expansion of the ULEZ.

Table 4: Annual Mean NO_2 Ratified and Bias-adjusted Monitoring Results (µg m-^{3}) (a)

Site ID	Site Type	Annual Mean Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
CA7	Urban Background	27.8	27.9	32.3 (c)	22.1	22.8
CA16	Roadside	63.6	58.7	**74.9** (c)	**54.7** (b)	45.0
CA17	Roadside	55.8	**56.4** (b)	-	**48.1** (b)	42.5
CTLEN1	Roadside	-	-	-	-	32.3

Notes:

(a) Exceedances of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in bold.
(b) Data capture < 90%
(c) Data capture < 75%, therefore data has been annualised by LBC.

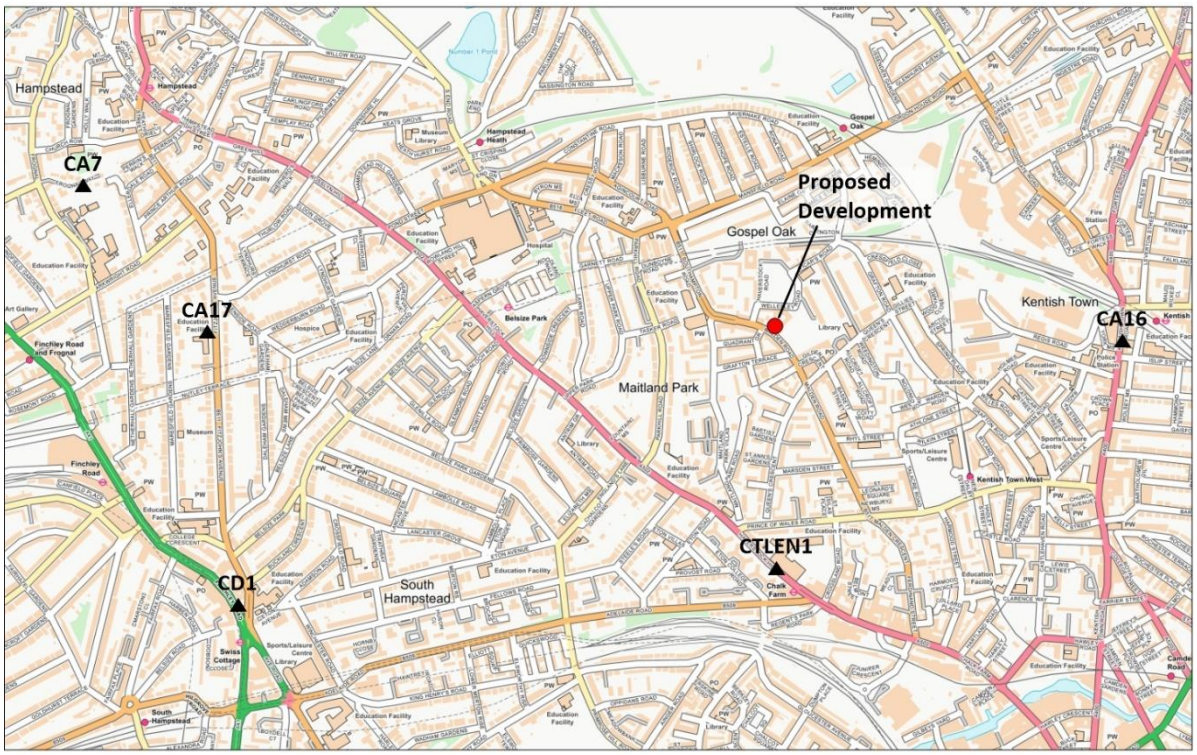

Figure 3: Automatic and Diffusion Tube Monitoring Sites

For comparison with the Frognal Way and Islington Arsenal monitoring data, annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations have been obtained from the latest Defra background maps. The maps were published in August 2020 and are based on 2018 monitoring data, with projections for future years.

The maximum 2019 (verification year) annual mean background concentrations for the area around the proposed development have been derived from contour plots of the mapped data and are presented in Table 5. The mapped concentrations are well within the air quality objectives.

The highest of the mapped or measured 2019 background concentrations have been used in the assessment to predict concentrations in the anticipated opening year of the proposed development (2025). Since a year-on-year decline in background concentrations is expected due to ongoing emissions reductions policies and the increasing uptake of low emission/ electric vehicles, this is considered a conservative approach.

Table 5: Annual Mean Mapped and Measured 2019 Background Pollutant Concentrations (µg/m³)

Pollutant	Mapped Proposed Development	Measured Frognal Way	Measured Islington Arsenal	Assessment Value	Air Quality Objective
NO_2	27.7	22.8	25	27.7	40
PM_{10}	18.4	-	19	19.0	40
$PM_{2.5}$	11.9	-	-	11.9	25

CONSTRUCTION PHASE IMPACTS

Potential impacts on air quality may arising during the construction phase from the following sources:

- Emissions of NOx, PM_{10} and $PM_{2.5}$ from construction traffic;
- Emissions from on-site non road mobile machinery (NRMM); and
- Emissions of dust from on-site activities, including re-suspended dust from vehicle movements.

TRAFFIC EMISSIONS

The Environmental Protection UK (EPUK)/ Institute of Air Quality Management (IAQM) planning guidance (IAQM & EPUK, 2017) provide screening criteria for potential impacts on local air quality. It states that for developments within an AQMA, a detailed assessment of traffic-related impacts is required where:

- There is a change in the annual average daily traffic (AADT) flow of light goods vehicles (LGV) of more than 100 vehicles; and/or
- There is a change in the AADT flow of heavy goods vehicles (HGV) of more than 25 vehicles; and/or
- There is a change in the road re-alignment by more than 5m; and/or
- A new junction is introduced, which will significantly alter vehicle speeds.

In the context of these screening criteria, LGV refers to vehicles below 3.5 tonnes (e.g., cars and vans) and HGV refers to vehicles above 3.5 tonnes.

Where none of these criteria are met, the impact on local air quality is unlikely to be significant.

At the time of writing, the construction phase trip generation for the proposed development is not available. However, based on the small scale of the proposed works, it is unlikely that the temporary increase in traffic will exceed the above thresholds. The impact of the construction traffic on local air quality is therefore expected to be negligible.

NON-ROAD MOBILE MACHINERY EMISSIONS

All non-road mobile machinery (NRMM) will comply with the emission standards specified in London Plan SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b).

On this basis, the impact of the NRMM emissions on local air quality is expected to be negligible.

DUST EMISSIONS

A construction dust risk assessment has been undertaken in accordance with the London Plan SPG on The Control of Dust and Emissions During Construction and Demolition, which utilises the methodology in the IAQM Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014).

A detailed assessment of dust impacts is required where there are sensitive receptors within:

- 350m of the site boundary; or
- 50m of the route(s) used by construction vehicles on public roads, up to 500m from the site entrance(s).

For ecological impacts, a detailed assessment is required if there are dust sensitive habitat sites within

- 50m of the site boundary; or
- 50m of the route(s) used by construction vehicles on public roads, up to 500m from the site entrance(s).

A map showing receptors within 20, 50, 100, 200 and 350m of the proposed development is presented in Figure 4. The proposed development is in an urban area with a large number of receptors within 350m of the site, that have the potential to be affected by dust generated during the construction phase. A detailed assessment of potential impacts is therefore required. There are no dust sensitive habitat sites within 50m of the site, therefore ecological impacts have not been assessed.

The methodology assesses the potential risk of dust soiling and human health effects, based primarily on the sensitivity and proximity of nearby receptors and the anticipated magnitude of the dust emission due to:

- Demolition;
- Earthworks;
- Construction; and
- Track-out (re-suspended dust from vehicle movements).

The assessment is also based on professional judgement, taking into account factors such as the prevailing wind direction, the proposed construction phasing, the likely duration of dust raising activities, local topography and existing air quality.

The risk of dust soiling impacts depends on the proximity and sensitivity of the nearest receptors to the proposed construction works. Residential properties, school and hospitals are of particularly high sensitivity to dust effects. Due to the very close proximity of the Wellesley Road Care Home, the sensitivity of the area to dust soiling impacts is 'high'.

The potential impact of dust emissions on human health depends on existing airborne particulate concentrations, such that there is a greater risk of an exceedance of the air quality objectives in areas with elevated concentrations. The data from the Islington Arsenal and Swiss Corner automatic monitoring sites indicates that existing PM_{10} concentrations in the area are likely to be below 24 $\mu g/m^3$ and therefore the sensitivity of the area to human health impacts is 'low'.

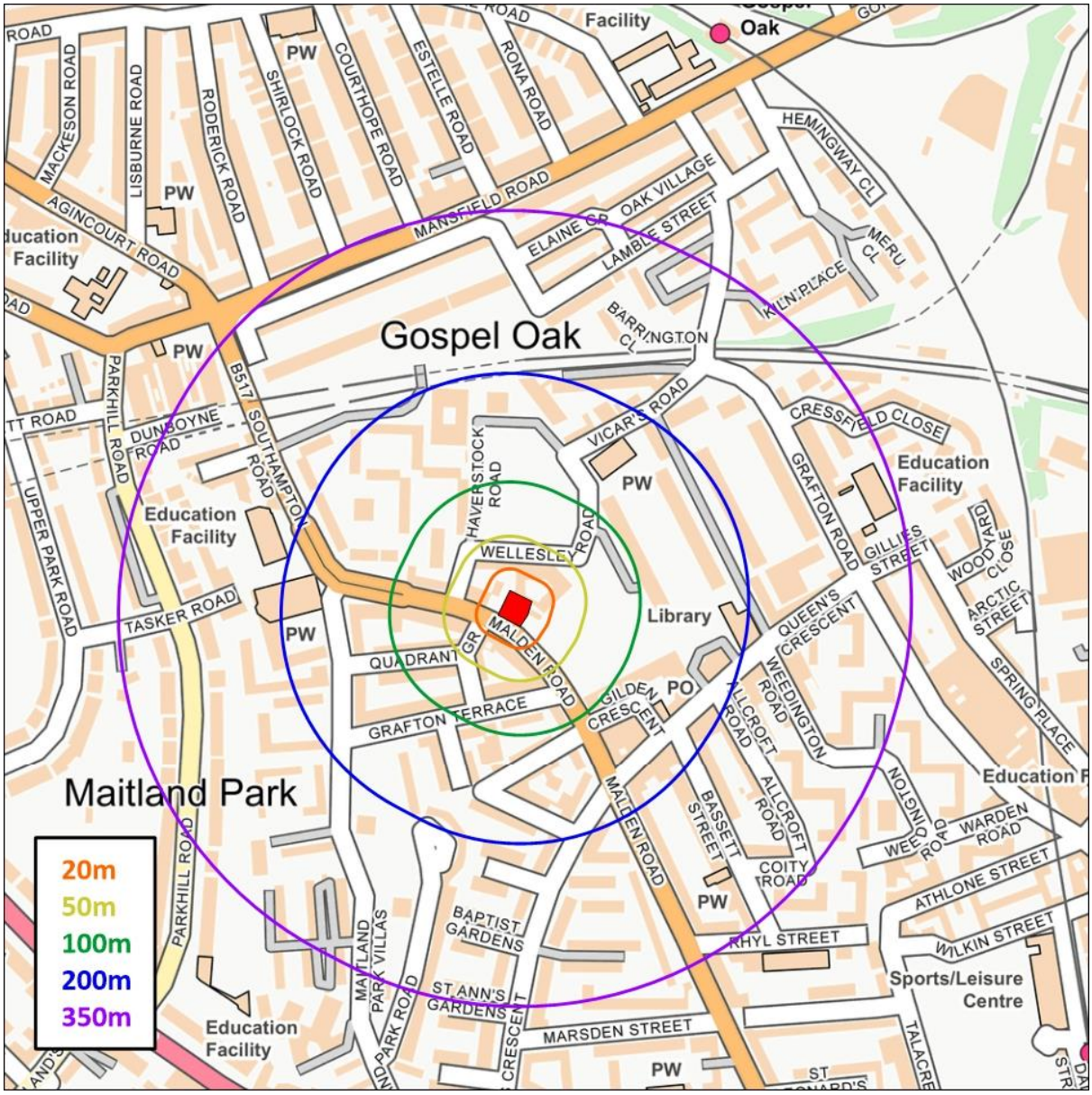

Figure 4: Dust Risk Assessment Buffers

The magnitude of the likely dust emission from demolition, earthworks, construction and trackout, has been evaluated using the guidance and is summarised in Table 6.

Table 6: Dust Emission Magnitude

Dust Source	Proposed Development	Dust Emission Magnitude
Demolition	The existing brick and concrete buildings on site (655m^3) will be demolished. The structures are less than 5.5m high. Based on the small scale of the works, it is unlikely that crushing and screening of the demolition material will be undertaken.	Small
Earthworks	The site is small (729m^2) and there is unlikely to be sufficient space for more than 1-2 earth moving vehicles or large stockpiles of material. However, the soil type may be dusty, and it cannot be guaranteed that the works will be undertaken during wetter months.	Medium
Construction	The total construction volume is 4,900m^3. The construction materials will include brick and concrete, which are potentially dusty. Based on the scale of the works, it is unlikely that concrete batching will be undertaken on site.	Medium
Trackout	Based on the scale of the proposed works, it is unlikely that, on average, there would be more than 2-3 outward HGV movements per day. Due to the small size of the site, there will be limited vehicular access over unmade ground.	Small

A summary of the potential risk of dust impacts, prior to mitigation, based on the 'low' sensitivity of the area to health impacts and 'high' sensitivity to dust soiling impacts is presented in Table 7. Overall, the risk of dust impacts during the construction phase, prior to mitigation, is assessed as 'medium'.

Table 7: Risk of Dust Impacts Prior to Mitigation

Dust Source	Risk of Human Health Impacts	Risk of Dust Soiling Impacts	Overall Risk
Demolition	Low	Medium	Medium
Earthworks	Low	Medium	Medium
Construction	Low	Medium	Medium
Trackout	Negligible	Low	Low
Overall risk of dust impacts, prior to mitigation			Medium

OPERATIONAL PHASE IMPACTS

Potential impacts on air quality may arising during the operational phase from the following sources:

- Emissions of NOx, PM_{10} and $PM_{2.5}$ from operational traffic; and
- Building-related emissions from on-site combustion sources (e.g., gas boilers).

TRAFFIC EMISSIONS

This Application is for the provision of 207 m^2 commercial space and 15 residential dwellings; however, there will be no parking provided. A total of 8 two-way trips per day (8 AADT) are anticipated, which, in accordance with the EPUK/IAQM criteria, will not significantly affect local air quality. A detailed assessment of potential impacts is therefore not required.

Building Emissions

The energy strategy for the proposed development is Air Source Heat Pumps (ASHP) and therefore there will be no on-site combustion emissions.

EXPOSURE ASSESSMENT

A review of the UK Pollutant Release and Transfer Register (PRTR) has not identified any significant combustion sources in the area that would significantly affect air quality at the proposed development. Air quality at the proposed development will therefore be primarily affected by emissions from traffic on the surrounding road network.

Detailed dispersion modelling of emissions from traffic on Malden Road has been undertaken using ADMS-Roads to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the proposed development in the expected opening year of the development (2025). Traffic flows have been obtained from the Department of Transport (DfT) automatic traffic count (ATC) data. A factor has been applied to the data to account for traffic growth from the baseline (2019) to the assessment year.

A summary of the model input parameters and traffic data is presented in **Appendix B**.

The modelled NOx and PM_{10} concentrations have been verified using 2019 data from diffusion tube monitoring site CTLEN1 on Haverstock Hill (see **Appendix C**). The built environment on Haverstock Hill near the monitoring site is similar to Malden Road, with no street canyons or severe congestion, therefore the monitoring site is considered the most suitable in the area for model verification purposes.

Concentrations have been predicted over a Cartesian receptor grid of 5m resolution. The predicted NOx concentrations have been converted to NO_2 using version 8.1 of the Defra NOx to NO_2 calculator.

The London Councils Air Quality Planning Guidance (GLA,2007) provides criteria for determining the significance of exposure to air pollution and level of mitigation required. The Air Pollution Exposure Criteria (APEC) are presented in Table 8. The applicable ranges assume a downward trend in pollutant concentrations has been established.

The potential exposure of future occupants of the proposed development to poor air quality and the requirement for mitigation has been evaluated in accordance with these criteria.

Table 8: Air Pollution Exposure Criteria

Category	Applicable Range NO_2	Applicable Range PM_{10}	Recommendation
APEC-A	Annual mean: > 5% below national objective	Annual Mean: > 5% below national objective 24-Hr Mean: > 1-day less than national objective	No air quality grounds for refusal; however, mitigation of any emissions should be considered.
APEC-B	Annual Mean: Between 5% below or above national objective	Annual Mean: Between 5% above or below national objective 24-Hr Mean: Between 1-day above or below national objective.	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., Maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered, and internal pollutant emissions minimised.
APEC-C	Annual Mean: > 5% above national objective	Annual Mean: > 5% above national objective 24-Hr Mean: > 1-day more than national objective.	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

PREDICTED NO_2 CONCENTRATIONS

Predicted 2025 ground-floor level annual mean NO_2 concentrations at the proposed development are presented in Figure 5.

The highest concentrations are predicted at the roadside façade at just over of 29 µg/m^3 (exposure category APEC-A).

The predicted ground-floor level annual mean NO_2 concentrations are well below the 60 µg/m^3 threshold for a potential exceedance of the short-term air quality objective and therefore the risk of an exceedance at the proposed development is considered to be negligible.

Figure 5: Predicted Ground-Floor Level Annual Mean NO_2 Concentrations ($\mu g/m^3$)

PREDICTED PM_{10} AND $PM_{2.5}$ CONCENTRATIONS

Predicted 2025 annual mean ground-floor level PM_{10} and $PM_{2.5}$ concentrations at the proposed development are presented in Figure 6 and Figure 7, respectively. The concentrations are well below the relevant air quality objectives at the façade of the new building.

The Local Air Quality Management Technical Guidance (Defra, 2021) provides a relationship between predicted annual mean PM_{10} concentrations and the likely number of exceedances of the short-term (24-hour mean) PM_{10} objective of 50 µg/m^3. The objective allows 35 exceedances per year, which is equivalent to an annual mean of 32 µg/m^3. The maximum predicted PM_{10} concentration at the proposed development is just 19.4 µg/m^3, therefore the dispersion modelling indicates that compliance with the short term PM_{10} objective will be achieved at all locations on site.

The maximum predicted $PM_{2.5}$ concentration at a building facade is 55% of the current exposure reduction target of 25 µg/m^3, but is above the proposed concentration target of 10 µg/m^3. However, 98% of the maximum predicted concentration at the facade of the building is attributable to the existing background $PM_{2.5}$ concentration (11.9 µg/m^3).

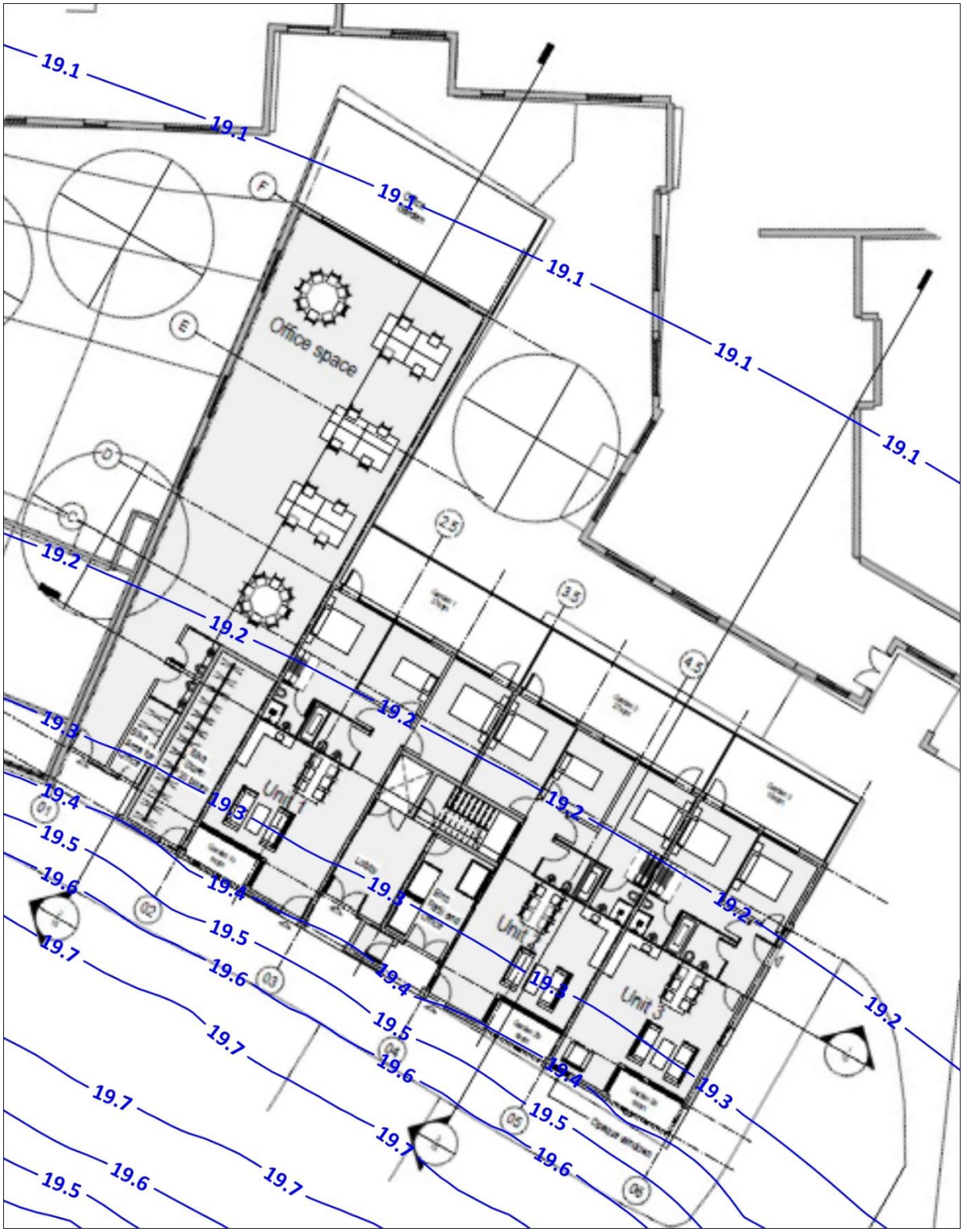

Figure 6: Predicted Ground-Floor Level Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

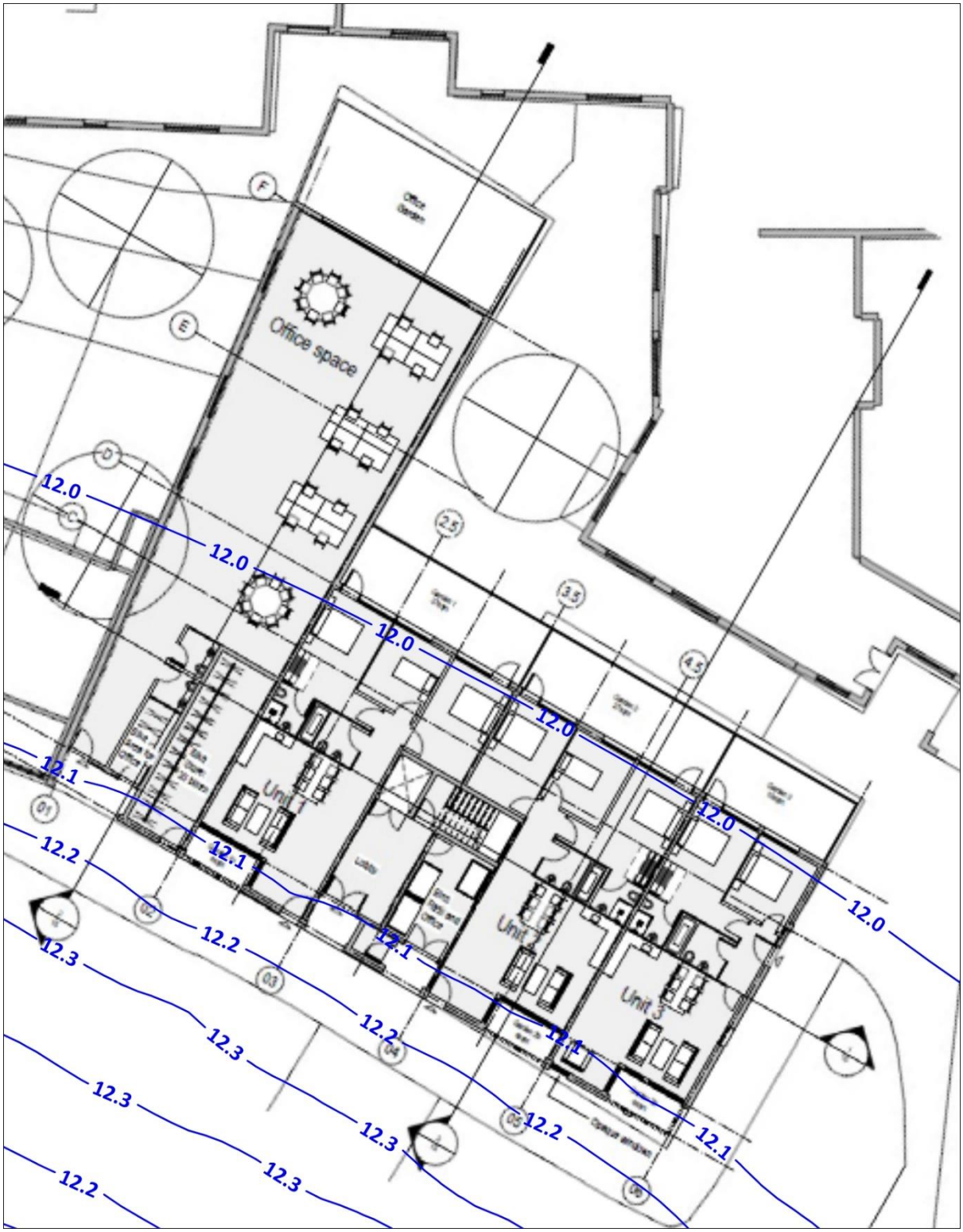

Figure 7: Predicted Ground-Floor Level Annual Mean $PM_{2.5}$ Concentrations ($\mu g/m^3$)

MITIGATION

CONSTRUCTION PHASE

Best practice dust control should be implemented on site in accordance with the GLA guidance which provides 'Highly Recommended (H)' and 'Desirable (D)' mitigation measures, based on the assessed risk of impacts (see Appendix F).

Overall, the site has been assessed as Medium Risk, prior to mitigation. The specific risk of impacts from demolition, earthworks and construction is Medium, however the risk of impacts from trackout has been assessed as Low.

The relevant 'Highly Recommended' and 'Desirable' mitigation measures for the construction phase, based on the assessed risk of impacts, are presented in Table 9 and Table 10, respectively. These measures should be incorporated into the Construction Environmental Management Plan (CEMP) or Dust Management Plan (DMP) for the proposed development.

Table 9: Highly Recommended Mitigation Measures

Category	Measure
Site Management	- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. - Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site Manager. - Display the head or regional office contact information. - Record and respond to all dust and air quality pollutant emissions complaints. - Make the complaints log available to the local authority when asked. - Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked. - Increase the frequency of site inspections 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 dry or windy conditions. - Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
Preparing and	- Plan site layout so that machinery and dust causing

Category	Measure
maintaining the site	activities are located away from receptors, as far as is possible. - Erect solid screens or barriers around dusty activities or at the site boundary that are at least as high as any stockpiles on site. - 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 from site as soon as possible. - Cover, seed or fence stockpiles to prevent wind whipping. - If relevant, put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly. Potentially agree monitoring locations with the Local Authority if required and where possible, commence baseline monitoring at least three months before phase begins.
Operating vehicle/machinery and sustainable travel	- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable. - 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. - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Operations	- 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 the 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

Category	Measure
	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.
Waste management	- Reuse and recycle waste to reduce dust from waste materials. - Avoid bonfires and burning of waste materials.
Demolition	- Ensure water suppression is used during demolition operations. - Avoid explosive blasting, using appropriate manual or mechanical alternatives. - Bag and remove any biological debris or damp down such material before demolition.
Construction	- 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.

Table 10: Desirable Mitigation Measures

Category	Measure
Preparing and maintaining the site	- Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution. - Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
Demolition	- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Earthworks	- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces. - Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil. - Only remove secure covers in small areas during work and not all at once.
Construction	- Avoid scabbling (roughening of concrete surfaces) if possible. - 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.
Trackout	- Use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site. - Avoid dry sweeping of large areas. - Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport. - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

OPERATIONAL PHASE

Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at the ground floor of the proposed development are well within the relevant air quality standards (exposure category APEC-A). Operational mitigation measures are therefore not required to protect future occupants from poor air quality.

CONCLUSION

An assessment has been undertaken to determine the potential impact on local air quality associated with the construction and operation of the proposed development on Malden Road, Camden.

The potential risk of dust impacts during the construction phase has been determined in accordance with the GLA's construction and demolition SPG. Based on the close proximity of existing residential properties to the site boundary and the proposed works, there is a risk of dust impacts, prior to mitigation. However, through the implementation of best practice dust control, the impact of the dust and PM_{10} releases at sensitive receptor locations is expected to be negligible.

The construction works will generate a small number of vehicle trips on the local road network. However, based on the scale of the proposed development, the temporary increase in emissions will not significantly affect local air quality.

The proposed development will be car-free, and traffic associated with the proposed development will have a negligible impact on local air quality. The transport-related emissions are air quality neutral.

The energy strategy for the proposed development is ASHP and therefore the building-related emissions are air quality neutral.

Detailed dispersion modelling has been undertaken to predict pollutant concentrations at the proposed development in the opening year (2025). The predicted concentrations are less than 75% of the air quality objectives at the ground-floor facades of the proposed new buildings. The proposed development therefore falls within exposure category APEC-A and mitigation is not required on site to protect future occupants from poor air quality.

Following the successful implementation of the recommended construction phase mitigation measures, it is considered that air quality does not pose a constraint to the redevelopment of the site, as proposed.

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APPENDICES

APPENDIX A – CONSTRUCTION DUST RISK ASSESSMENT METHODOLOGY

Factors defining the sensitivity of a receptor to dust impacts are presented in Table 11.

Table 11: Receptor Sensitivity

Sensitivity	Human Health	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)

Notes:

(a) In the case of the 24-hour objective, 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.

Table 12 and Table 13 summarise the criteria for determining the overall sensitivity of the area to dust soiling and health impacts, respectively. The sensitivity of the area to ecological impacts is presented in Table 14.

Table 12: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source			
		< 20 m	< 50m	< 100m	<200m
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

Key: H = High, M = Medium, L = Low

Table 13: Sensitivity of the Area to Heath Impacts from Dust

Receptor Sensitivity	Annual Mean PM_{10} Concentration (ug/m^3)	Number of Receptors	Distance from the Source			
			< 20 m	< 50m	< 100m	<200m
High	>32	>100	H	H	H	M
		10-100	H	H	M	L
		1-10	H	M	L	L
	28-32	>100	H	H	M	L
		10-100	H	M	L	L
		1-10	H	M	L	L
	24-28	>100	H	M	L	L
		10-100	H	M	L	L
		1-10	M	L	L	L
	<24	>100	M	L	L	L
		10-100	L	L	L	L
		1-10	L	L	L	L
Medium	>32	>10	H	M	L	L
		1-10	M	M	L	L
	28-32	>10	M	M	L	L
		1-10	L	L	L	L
	24-28	>10	L	L	L	L
		1-10	L	L	L	L
	<24	>10	L	L	L	L
		1-10	L	L	L	L
Low	-	≥1	L	L	L	L

Table 14: Sensitivity of the Area to Ecological Impacts from Dust

Receptor Sensitivity	Distance from the Source	
	< 20 m	< 50m
High	H	M
Medium	M	L
Low	L	L

The magnitude of the dust impacts for demolition, earthworks, construction and trackout is classified as small, medium or large depending on the scale of the proposed works as detailed in Table 15.

Table 15: Dust Emission Magnitude

Source	Large	Medium	Small
Demolition	- Total building volume >50,000m^3 - Potentially dusty material (e.g., concrete) - Onsite crushing	- Total building volume 20,000 - 50,000m^3 - Potentially dusty material - Demolition	- Total building volume <20,000m^3 - Construction material with low potential for dust release

Source	Large	Medium	Small
	and screening - Demolition activities >20m above ground level.	activities 10 - 20m above ground level.	- 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) - 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

Notes:

(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes

For each dust emission source, the worst-case area sensitivity is used in combination with the dust emission magnitude to determine the risk of dust impacts prior to mitigation as illustrated in Table 16, Table 17 and Table 18.

Table 16: Risk of Dust Impacts from Demolition

Area Sensitivity	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 Risk

Table 17: Risk of Dust Impacts from Earthworks and Construction

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

Table 18: Risk of Dust Impacts from Trackout

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

APPENDIX B – MODEL INPUT PARAMETERS

Table 19: Model Input Parameters

Input Parameter	Model Verification (2019)	Exposure Assessment (2025)
Vehicle Emission Factors	Emissions Factors Toolkit (EFT2021_v11.0) 2019	Emissions Factors Toolkit (EFT2021_v11.0) 2025
Meteorological Dataset	Hourly sequential data for 2019 from London City Airport	
Surface Roughness	1.0	
Monin-Obukhov Length	75m	

Table 20: Traffic Data (2019 Verification)

Road Link	AADT	HGV (%)	Speed (kph)
Haverstock Hill	14,706 (a)	4.8	24

Notes:

(a) DfT ATC 37264 for 2019

Table 21: Traffic Data (2025 Exposure)

Road Link	AADT	HGV (%)	Speed (kph)
Malden Road	9,706 (a)	4.7	32

Notes:

(a) DfT ATC 811071 for 2019, with TEMPro v7.2 2019 – 2025 growth factor for Camden applied.

APPENDIX C – MODEL VERIFICATION

Verification of the concentrations predicted by the ADMS-Roads model has followed the methodology presented in LAQM.TG16.

Predicted annual mean NO_2 concentrations have been compared with the 2019 concentrations measured by diffusion tube CTLEN1 on Haverstock Road.

Most nitrogen dioxide (NO_2) is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions.

The measured Road-NOx concentration (i.e., the component of total NOx coming from road traffic) has been calculated using the Defra NOx from NO_2 calculator (version 8.1), assuming a 2019 background NO_2 concentration of 27.7 µg/m^3 (as measured by the urban background monitoring station at Islington Arsenal).

An adjustment factor is determined as the ratio between the measured Road-NOx concentration and the modelled Road-NOx concentration (see Table 22). This factor is then applied to the modelled Road-NOx concentrations at the proposed development to provide adjusted modelled Road-NOx concentrations. The equivalent Road-NO_2 concentration is then determined using the Defra NOx from NO_2 calculator and added to the background NO_2 concentration, for comparison with the objective.

In the absence of a nearby particulate monitoring site that is suitable for verification purposes, the derived primary adjustment factor has also been applied to the modelled Road-PM_{10} and Road- $PM_{2.5}$ concentrations, in accordance with the guidance.

Table 22: Verification Calculation for NO_2

Parameter	CTLEN1
Measured NO_2 Concentration (µg/m^3)	32.3
Background NO_2 Concentration (µg/m^3)	27.7
Measured Road-NOx Contribution (µg/m^3)	9.7
Modelled Road-NOx Contribution (µg/m^3)	10.2
Adjustment Factor	0.95

APPENDIX D – GLA CONSTRUCTION DUST MITIGATION MEASURES

Mitigation for all sites: Communications

Mitigation measure	Low Risk	Medium Risk	High Risk
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
3. Display the head or regional office contact information	H	H	H

Mitigation for all sites: Dust Management

Mitigation measure	Low Risk	Medium Risk	High Risk
4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.	D	H	H
Site Management			
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. 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.	H	H	H
8. Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N	N	H
Monitoring			
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, 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 site boundary, with cleaning to be provided if necessary.	D	D	H
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	H	H	H
11. Increase the frequency of site inspections 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 dry or windy conditions.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H
Preparing and maintaining the site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H

Mitigation measure	Low Risk	Medium Risk	High Risk
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	D	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H
Operating vehicle/machinery and sustainable travel			
20. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
21. Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	H	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			
26. 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.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. 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.	D	H	H
Waste management			
31. Avoid bonfires and burning of waste materials.	H	H	H

Measures specific to demolition

Mitigation measure	Low Risk	Medium Risk	High Risk
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. 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. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H

Measures specific to earthworks

Mitigation measure	Low Risk	Medium Risk	High Risk
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable..	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once	N	D	H

Measures specific to construction

Mitigation measure	Low Risk	Medium Risk	High Risk
39. Avoid scabbling (roughening of concrete surfaces) if possible	D	D	H
40. 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.	D	H	H
41. 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.	N	D	H
42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D

Measures specific to trackout

Mitigation measure	Low Risk	Medium Risk	High Risk
43. 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.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	H
50. 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.	N	H	H
51. Access gates to be located at least 10 m from receptors where possible.	N	H	H

Key to tables:

- H Highly recommended
- D Desirable
- N Not required

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