AIR QUALITY ASSESSMENT

71 Avenue Road, Camden

Produced by XCO2 for Private Client

May 2023

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Date	26/05/2023					
Project reference	9.924					

EXECUTIVE SUMMARY

An assessment has been undertaken to quantify the potential impacts on local air quality associated with the construction and operation of the proposed development at 71 Avenue Road, in the London Borough of Camden. Based on the results of the assessment, it is considered that redevelopment of the site would not cause a significant impact on local air quality.

During the construction phase, the site has the potential to generate dust nuisance beyond the application boundary. However, through the implementation of a Dust Management Plan, the impacts will be effectively minimised and are unlikely to be significant.

Dispersion modelling of emissions from traffic on the local road network has been undertaken to ascertain the likely level of exposure of future users of the proposed development to elevated nitrogen dioxide and particulate concentrations. The assessment indicates that NO_2, PM_{10} and $PM_{2.5}$ concentrations will be well within the relevant long and short-term air quality standards and therefore site is suitable for residential development, as proposed.

INTRODUCTION

This report presents an assessment of the potential impact on local air quality of the construction and operation of a proposed development at 71 Avenue Road in the London Borough of Camden (LBC). The site location is presented in Figure 1.

The scheme comprises the demolition of the existing residence and erection of a two storey, single family dwellinghouse (Class C3) with basement and accommodation in the roof space. The proposed ground-floor layout is presented in Figure 2.

The site falls within the LBC Air Quality Management Area (AQMA) which is borough-wide designation due to measured and modelled exceedances of the air quality objectives for nitrogen dioxide (NO_2) and particulate matter (as PM_{10}). The primary source of emissions of these pollutants in the Borough is road traffic.

An assessment has been undertaken to determine the potential impact on local air quality during both the construction and operational phases of the development, with recommendations made for mitigation where appropriate.

Figure 1: Site Location

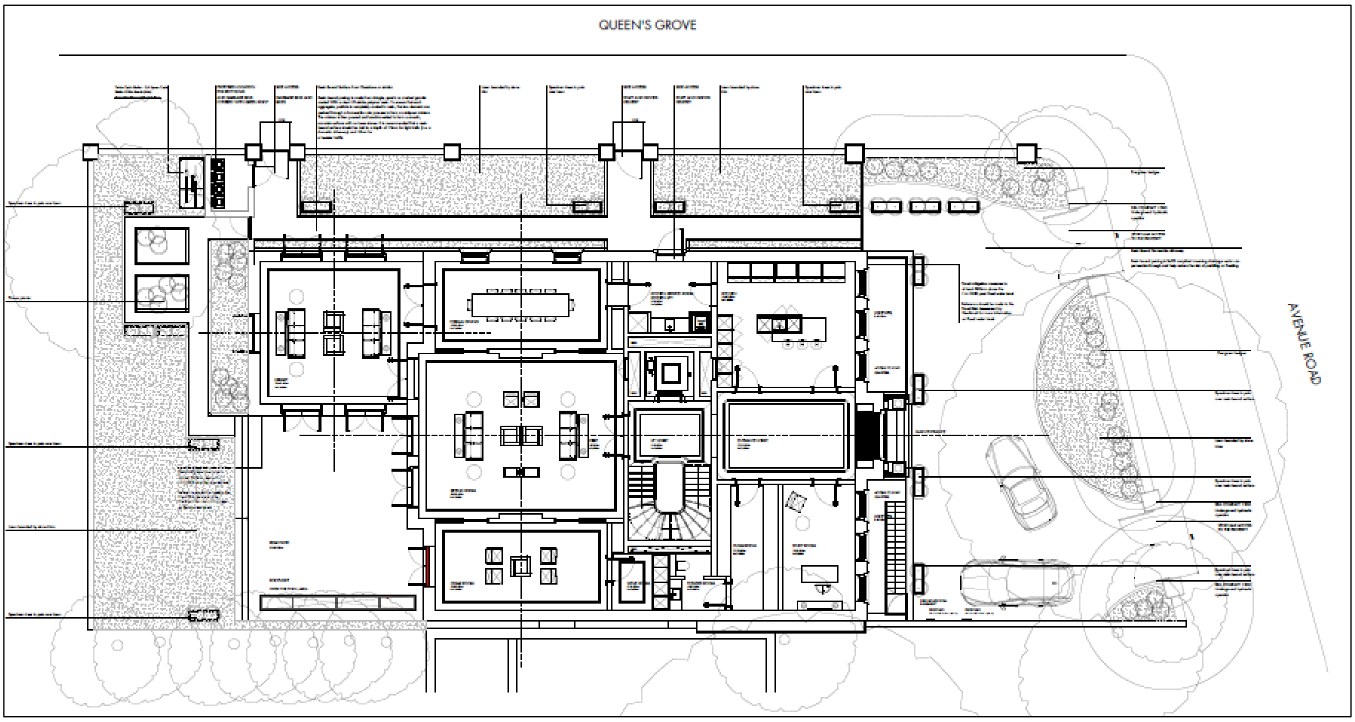

Figure 2: Proposed Ground-Floor Layout

POLICY CONTEXT

An overview of the relevant policy drivers for the assessment is provided in the following section.

NATIONAL LEGISLATION

THE AIR QUALITY STRATEGY FOR ENGLAND, SCOTLAND, WALES AND NORTHERN IRELAND

The Air Quality Strategy for England, Wales and Northern Ireland[1] was published in 2007 and sets out policy targets (objectives) for sulphur dioxide (SO_2), nitrogen dioxide (NO_2), benzene (C_6H_6), carbon monoxide (CO), lead (Pb), particulate matter (PM_{10}, $PM_{2.5}$), 1,3-butadiene (C_4H_6) and polyaromatic hydrocarbons (PAH). The Standards are concentrations measured over a specified time period that are considered acceptable in terms of the effect on health and the environment. The Objectives are the target date on which exceedance of a Standard must not exceed a specified number.

In January 2019, the UK government published a Clean Air Strategy[2], which outlines measures to reduce emissions from a wide range of sources including transport, farming and industry. The Strategy proposes new local powers to implement Clean Air Zones in problem areas, backed up by clear enforcement mechanisms.

In the context of the proposed development, the primary pollutants of concern are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

The assessment of potential air quality impacts associated with these pollutants has been evaluated with respect to the current air quality standards and objectives for the protection of human health, as set out in the Air Quality Regulations 2010[3] and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[4].

It is widely accepted that there is no safe level for $PM_{2.5}$ and on this basis The Environment Act (2021) required the Air Quality Regulations to be updated to include a more stringent long-term air quality target by the 31st of October 2022. On 31st January 2023, the Government published an Environmental Improvement Plan[5], which includes an Annual Mean Concentration Target (AMCT) of 10 $\mu g/m^3$, to be achieved by the end of 2040. The Plan also includes an interim target of 12 $\mu g/m^3$, to be achieved by the end of January 2028. The 10 $\mu g/m^3$ target for $PM_{2.5}$ has been adopted into UK law via the Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[6].

The Air Quality Standards and Objectives for NO_2, PM_{10} and $PM_{2.5}$ that are applicable in England, are presented in Table 1.

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[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007.

[2] Clean Air Strategy 2019, Defra, January 2019

[3] The Air Quality Standards Regulations 2010, Statutory Instrument 2010 No. 1001

[4] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument 2020 No. 000

[5] Environmental Improvement Plan 2023, Defra, January 2023

[6] Environmental Targets (Fine Particulate Matter) (England) Regulations 2023, Statutory Instrument 2023 No. 96

Table 1: National Air Quality Standards and Objectives

Pollutant	Averaging Period	Standard	Objective
NO_2	1-hour	200 µg/m³, not to be exceeded more than 18 times per calendar year (a)	31 December 2005
	Annual	40 µg/m³	
PM_{10}	24-hour	50 µg/m³, not to be exceeded more than 35 times per calendar year (b)	31 December 2004
	Annual	40 µg/m³	
$PM_{2.5}$	Annual	20 µg/m³	2020
	Annual	12 µg/m³ (interim target)	31 January 2028
	Annual	10 µg/m³ (target)	31 December 2040
(a) Equivalent to the 99.8th percentile of 1-hour means. (b) Equivalent to the 90.4th percentile of 24-hour means.			

LOCAL AIR QUALITY MANAGEMENT

The framework for Local Air Quality Management (LAQM) in the UK was introduced by the Environment Act 1995[7]. Local Authorities are required to regularly review and assess air quality to establish whether there are any locations where pollutant concentrations exceed the relevant air quality objectives or EU limit values. Where an exceedance is identified, the local authority is obliged to declare an Air Quality Management Area (AQMA) and prepare an Action Plan setting out measures to improve air quality and achieve compliance with the objective(s).

THE NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework NPPF[8] sets out the Government's policies for planning and how these should be applied. With regard to air quality, the NPPF 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*".

[7] Part IV of the Environment Act 1995
[8] Department for Communities and Local Government, National Planning Policy Framework, July 2021

REGIONAL POLICY

THE LONDON PLAN

Policy SI1 (Improving Air Quality) of the London Plan[9] sets out the Greater London Authority's (GLA) commitment to improving air quality and public health and states:

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, which do not demonstrate that design measures have been used to minimise exposure should be refused.

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:

a) How proposals have considered ways to maximise benefits to local air quality, and
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.

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 benefits can be demonstrated within the area affected by the development.

[9] The London Plan 2021, The Spatial Development Strategy for Greater London, Greater London Authority, March 2021.

LONDON ENVIRONMENT STRATEGY (2018)

Chapter 4 of the London Environment Strategy[10] outlines the Mayor's commitment to improving air quality in London. The strategy aims plan to significantly reduce NO_2 and particulate (PM_{10}, $PM_{2.5}$ and black carbon) concentrations through a number of key objectives and policies:

Objective 4.1 support and empower London and its communities, particularly the most disadvantaged and those in priority locations, to reduce their exposure to poor air quality.

- Policy 4.1.1 Make sure that London and its communities, particularly the most disadvantaged and those in priority locations, are empowered to reduce their exposure to poor air quality.
- Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action.

Objective 4.2 achieve legal compliance with UK and EU limits as soon as possible, including by mobilising action from London boroughs, government and other partners.

- Policy 4.2.1 Reduce emissions from London's road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport.
- Policy 4.2.2 Reduce emissions from non-road transport sources, including by phasing out fossil fuels.
- Policy 4.2.3 Reduce emissions from non-transport sources, including by phasing out fossil fuels.
- Policy 4.2.4 The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality.
- Policy 4.2.5 The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence based steps to improve air quality.

Objective 4.3 establish and achieve new, tighter air quality targets for a cleaner London by transitioning to a zero emission London by 2050, meeting World Health Organization health-based guidelines for air quality.

- Policy 4.3.1 The Mayor will establish new targets for $PM_{2.5}$ and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners.
- Policy 4.3.2 The Mayor will encourage the take up of ultra-low and zero emission technologies to make sure London's entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines.
- Policy 4.3.3 Phase out the use of fossil fuels to heat, cool and maintain London's buildings, homes and urban spaces, and reduce the impact of building emissions on air quality.
- Policy 4.3.4 Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces.

With regard to Policy 4.3.1, the Mayor of London has set a target for compliance with the now superseded WHO guideline value[11] for $PM_{2.5}$ of 10 $\mu g/m^3$ by 2030. However, recent modelling[12] suggests that due to the transboundary nature of $PM_{2.5}$, compliance in London is unlikely to be achieved without additional measures at national, European and international level.

[10] London Environment Strategy, The Mayor of London, May 2018
[11] Air Quality Guidelines Global Update 2005, World Health Organisation
[12] $PM_{2.5}$ in London: Roadmap to meeting World Health Organization guidelines by 2030, GLA, October 2019

GREATER LONDON AUTHORITY AIR QUALITY FOCUS AREAS

Air Quality Focus Areas have been identified by the Greater London Authority (GLA) where there is high human exposure in locations where the annual mean air quality objective for NO_2 is exceeded. The purpose of the Focus Areas is to allow local authorities to target actions to improve air quality where it is most needed and to inform the planning process with regard to the air quality impact of new developments.

The proposed development is not located within an AQFA, but is approximately 500m southeast of AQFA 32 'Swiss Cottage from South Hamstead to Finchley Road Station'.

LOCAL POLICY

THE LONDON BOROUGH OF CAMDEN LOCAL AIR QUALITY MANAGEMENT

The London Borough of Camden carries out frequent assessments of air quality within the area and produces annual reports in accordance with the requirements of Defra.

Historically, routine monitoring has identified widespread exceedances of the air quality objectives for NO_2 and PM_{10}. As a consequence, in 2002, the Council declared a Borough-wide AQMA for these pollutants. More recent monitoring indicates that the NO_2 objectives are still widely exceeded at roadside locations within the Borough, but PM_{10} concentrations are now generally within the objective.

CAMDEN LOCAL PLAN

Policy CC4 'Air Quality' of Camden's Local Plan[13] 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.'

[13] Camden Local Plan (Adopted July 2017)

CAMDEN CLEAN AIR STRATEGY (2019 – 2034) AND CLEAN AIR ACTION PLAN (2023 – 2026)

The Camden Clean Air Strategy and Clean Air Action Plan[14] set out the Camden's commitment to improving air quality in the borough. The strategic objectives are set out in the Strategy and the Action Plan contains the actions that will be taken to achieve the objectives between 2023 and 2026.

The Strategy has set a 2034 deadline for achieving the World Health Organisation (WHO) limits[15] for annual mean NO_2, PM_{10} and $PM_{2.5}$ of 10 µg/m^3, 15 µg/m^3 and 5 µg/m^3, respectively. These self-imposed targets are considerably more stringent than the current UK air quality standards, including the new concentration targets published by Defra in January 2023.

Interim annual mean targets have also been set to measure ongoing progress as follows:

- NO_2: 30 µg/m^3 by 2026 and 20 µg/m^3 by 2030
- PM_{10}: 20 µg/m^3 by 2026
- $PM_{2.5}$: 10 µg/m^3 by 2030

The key objectives of the Action Plan are to reduce concentrations of these pollutants by:

- Reducing construction emissions
- Reducing building emissions (encouraging the use of clean fuels and technologies)
- Reducing transport emissions
- Supporting communities and schools
- Lobbying and advocating for greater action on air quality and health
- Continuing public health and awareness raising
- Raising awareness of poor indoor air quality and workplace exposure

The Action Plan is supported by a number of other plans and strategies including the Camden Transport Strategy[16] and the Climate Action Plan[17].

[14] London Borough of Camden, Camden Clean Air Strategy 2019 – 2024 and Camden Clean Air Action Plan 2023-2026, December 2022

[15] WHO global air quality guidelines: particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide, September 2021

[16] Camden Transport Strategy 2019-2041, April 2019

[17] Camden Climate Action Plan 2020 – 2025

METHODOLOGY

This section outlines the assessment methodology, taking into account all relevant national and local policies and technical guidance relating to air quality.

CONSTRUCTION DUST

The potential impact of dust generated during site enabling, earthworks and construction works at the proposed development has been assessed in accordance with the Mayor of London's Supplementary Planning Guidance (SPG) for the control of dust and emissions during construction and demolition[18], which is closely aligned with the Institute of Air Quality Management (IAQM) construction dust guidance[19] . A full description of the construction dust methodology is provided in Appendix A.

A detailed assessment of dust impacts is required where there are human 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).

The IAQM/ SPG methodology allows the potential risk of dust soiling and human health effects to be determined, based primarily on the sensitivity of nearby receptors (human and ecological) and the anticipated magnitude of the dust emission due to:

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

The assessment of dust risk 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.

A range of best practice mitigation measures are provided within the guidance, which are dependent on the level of dust risk attributed to the site. It is recommended that these measures are incorporated into a Dust Management Plan (DMP) of the Construction Environmental Management Plan (CEMP) for the proposed development.

The significance of the residual impacts following appropriate mitigation is determined by professional judgement.

[18] The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance, Greater London Authority, July 2014
[19] Guidance on the assessment of dust from demolition and construction, IAQM, v1.1, June 2016

CONSTRUCTION TRAFFIC

Construction traffic will contribute to existing traffic levels on the surrounding road network. However, based on the scale of the proposed development, the temporary increase in traffic is considered unlikely to be significant in terms of total flow or construction duration.

All non-road mobile machinery (NRMM) will comply with the emission standards specified in the Mayor of London's Control of Dust and Emissions during Construction and Demolition SPG.

The impact of vehicular emissions of NO_2 and PM_{10} from construction traffic and on-site machinery on local air quality is anticipated to be negligible.

OPERATIONAL TRAFFIC

The Environmental Protection UK (EPUK)/ IAQM planning guidance[20] , states that for developments within or near 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 and HGV refers to vehicles above 3.5 tonnes.

The proposed development is a single residential dwelling and therefore the daily trip generation will be very low. The impact of operational traffic has therefore been scoped out of the assessment.

EXPOSURE ASSESSMENT

Detailed dispersion modelling of emissions from traffic on the local road network has been undertaken using the ADMS-Roads dispersion model, to predict pollutant concentrations at the proposed development and determine whether on-site mitigation will be required to protect future occupants from poor air quality.

A summary of the model input parameters is presented in Appendix A. The traffic flows used in the assessment have been projected to 2025 (the proposed opening year) using TEMPro v7.2[21].

[20] Land-use Planning and Development Control: Planning for Air Quality, Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land use planning and development control process, January 2017.
[21] https://www.gov.uk/government/publications/tempro-downloads

EMISSION FACTORS

Concentrations of NOx, PM_{10} and $PM_{2.5}$ have been predicted using vehicle emission factors from the latest version of the Emissions Factor Toolkit (11.0) [22]. The predicted NOx concentrations have been converted to NO_2 using version 8.1 of the NOx to NO_2 calculator, available from the Defra air quality website[23].

METEOROLOGICAL DATA

Hourly sequential meteorological data from London City Airport (approximately 15 km southeast of the proposed development) for 2019 has been used in the dispersion modelling.

SENSITIVE RECEPTORS

Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted using a Cartesian grid of 5 m resolution over the full extent of the development site at an elevation of 1.5m above road-level (representing ground-floor level exposure).

VERIFICATION

There is an inherent level of uncertainty associated with any assessment process; however, the methodology presented has been developed to minimise errors where possible. Potential errors in predicted concentrations due to uncertainties in the assessment source activity data (e.g., traffic flows and emission factors) and the estimated background concentration are minimised by the verification of modelled concentrations using local monitoring data.

The 2022 Local Air Quality Management Technical Guidance (TG22)[24] recommends that modelled concentrations should be within 25% of monitored concentrations, ideally within 10%. Where there is a large discrepancy between modelled and measured concentrations, it is considered necessary to adjust the model results to reflect local air quality more accurately.

The modelled concentrations have been verified using 2019 data from the Swiss Cottage automatic monitoring site. Full details of the model verification process are presented in Appendix B.

EXPOSURE CRITERIA

The London Councils Air Quality Planning Guidance[25] 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 2. The applicable ranges assume a downward trend in pollutant concentrations has been established, which is anticipated due to the uptake of electric vehicles and the implementation of the Ultra-Low Emission Zone.

[22] http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html
[23] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc
[24] Local Air Quality Management Technical Guidance (TG22), Defra, August 2022
[25] London Councils Air Quality and Planning Guidance, January 2007

Table 2: Air Pollution Exposure Criteria

	Applicable Range NO_2 Annual Mean	Applicable Range PM_{10}	Recommendation
APEC - A	> 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	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	> 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.

BUILDING EMISSIONS

The energy strategy for the proposed development is Air Source Heat Pumps (ASHP) and PV. There will be no combustion emissions associated with the site and therefore no impact on local air quality.

BASELINE AIR QUALITY

LOCAL AIR QUALITY MONITORING

AUTOMATIC MONITORING DATA

The nearest automatic air quality monitoring site (AQMS) to the proposed development is at Swiss Cottage, which is approximately 830m to the northwest. The site is affiliated to the London Air Quality Network (LAQN); therefore, the measured data are subject to high levels of quality assurance (QA) and quality control (QC).

The nearest automatic monitoring sites that measure urban background concentrations are at North Ken, Islington Arsenal and Camden Bloomsbury. Details of all four monitoring sites are presented in Table 3.

Table 3: Automatic Monitoring Sites

Site Name	Type	Easting	Northing	Pollutants Monitored	Approximate Location Relative to Proposed Development
Swiss Cottage (Camden)	Kerbside	526629	184391	NO_2, PM_{10}, $PM_{2.5}$	830m northwest
North Ken (Kensington and Chelsea)	Urban background	524045	181752	NO_2, PM_{10}, $PM_{2.5}$	3.6 km southwest
Bloomsbury (Camden)	Urban background	530123	182014	NO_2, PM_{10}, $PM_{2.5}$	3.4 km southeast
Arsenal (Islington)	Urban background	531325	186032	NO_2, PM_{10}	4.7 km northeast

Annual mean NO_2 and particulate (PM_{10} and $PM_{2.5}$) concentrations measured at these locations are summarised in Table 4, together with the number of measured exceedances of the short-term AQOs. The data have been obtained from the local authority Air Quality Annual Status Reports and the London Air Quality Network[26]. Data from 2020 and 2021 has not been included in the assessment due to the influence of the Covid-19 pandemic on traffic levels. The 2022 data have yet to be fully ratified.

The data show that the annual mean AQO for NO_2 of 40 µg/m^3 is routinely exceeded at Swiss Cottage. In 2016, the number of measured hourly means above 200 µg/m^3 was more than double the 18 allowable per annum.

With the exception of Bloomsbury in 2015 and 2016, NO_2 concentrations measured at the urban background automatic monitoring sites nearest the proposed development were below the relevant air quality objectives. There is significant variation in annual mean NO_2 concentrations across the three sites, with the highest concentrations measured in Bloomsbury. The data indicate that Camden's 2026 target of 30 µg/m^3 is being met at both Arsenal and North Ken.

The data from all four automatic monitoring sites indicate a declining trend in annual mean NO_2 concentrations since 2016; a trend that has been widely observed across London, where there was an average reduction between 2016 and 2019 of 21%[27].

[26] www.londonair.org.uk
[27] Air pollution monitoring data in London: 2016 to 2020, Greater London Authority, February 2020.

Concentrations of PM_{10} and $PM_{2.5}$ measured at Swiss Cottage and the three urban background monitoring sites are well within the short and long-term objectives. The data indicate that even at roadside locations, annual mean PM_{10} concentrations are unlikely to exceed 60% of the air quality objective and are also likely to be below Camden's 2026 interim target of 20 µg/m³. With the exception of North Ken, none of the sites are measuring concentrations below Camden's 2034 target of 15 µg/m³. The measured $PM_{2.5}$ concentrations at all four sites exceed the Government's 2040 concentration target and Camden's 2030 interim target of 10 µg/m³. Concentrations at the background monitoring locations are, however, below the Government's 2028 interim target of 12 µg/m³. The data indicate that particulate concentrations at both roadside and background locations in the area, are relatively stable.

Table 4: Automatically Measured Pollutant Concentrations

Site Name	2014	2015	2016	2017	2018	2019
Swiss Cottage						
Annual Mean NOx (µg/m³)	177.1	158.6	178.9	140.0	126.8	96.7
Annual Mean NO_2 (µg/m³)	**66**	**61**	**66**	**53**	**54**	**43**
Number of Predicted Exceedances of the 1-Hour Mean AQO of 200 µg/m³	13	11	**37**	1	2	1
Annual Mean PM_{10} (µg/m³)	22	20	21	20	21	19
Number of Predicted Exceedances of the 24-Hour Mean PM_{10} AQO of 50 µg/m³	11	8	7	8	4	8
Annual Mean $PM_{2.5}$ (µg/m³)	-	17	17	14	15.6	11
North Ken						
Annual Mean NOx (µg/m³)	53.2	45.6	59	50.8	40.7	39.3
Annual Mean NO_2 (µg/m³)	34	32	35	33	27 (a)	27
Number of Predicted Exceedances of the 1-Hour Mean AQO of 200 µg/m³	0	0	0	1	0 (a)	0
Annual Mean PM_{10} (µg/m³)	19	19	19	-	14	15
Number of Predicted Exceedances of the 24-Hour Mean PM_{10} AQO of 50 µg/m³	3	1	7	-	1	5
Annual Mean $PM_{2.5}$ (µg/m³)	-	11	12	12	9 (a)	10
Bloomsbury						
Annual Mean NOx (µg/m³)	72.1	74.4	75.0	61.4	54.4	46.3
Annual Mean NO_2 (µg/m³)	n/a	**48**	**42**	38	36	32
Number of Predicted Exceedances of the 1-Hour Mean AQO of 200 µg/m³	n/a	0	0	0	0	0
Annual Mean PM_{10} (µg/m³)	20	n/a	20	19	17 (a)	18
Number of Predicted Exceedances of the 24-Hour Mean PM_{10} AQO of 50 µg/m³	10	n/a	9	6	1	9
Annual Mean $PM_{2.5}$ (µg/m³)	n/a	11	12	13	10	11
Arsenal						
Annual Mean NOx (µg/m³)	52.2	40.0	55.0	48.3	39.3	36.8
Annual Mean NO_2 (µg/m³)	n/a	29	33	31	27	25
Number of Predicted Exceedances of the 1-Hour Mean AQO of 200 µg/m³	n/a	0	0	1	0	0

Annual Mean PM_{10} (µg/m^3)	n/a	18	18	18	19	19
Number of Predicted Exceedances of the 24-Hour Mean PM_{10} AQO of 50 µg/m^3	n/a	1	3	3	1	9
(a) 88% data capture						

NON-AUTOMATIC MONITORING DATA

Monitoring of ambient NO_2 concentrations is also undertaken by LBC at a number of locations using passive diffusion tubes. A summary of the diffusion tube monitoring locations considered relevant to the assessment is presented in Table 5**Error! Reference source not found.**. The locations of the diffusion tubes are presented in Figure 3.

Table 5: Diffusion Tube Monitoring Locations

Site ID	Location	Type	Distance from kerb (m)	Easting	Northing
CA7	Frognal Way	Urban Background	30.0	526213	185519
CA15	Swiss Cottage (co-located with AQMS)	Kerbside	<1.0	526633	184392
CA17	47 Fitzjohn's Avenue	Roadside	5.0	525325	185255

A summary of the bias adjusted annual mean NO_2 concentrations measured between 2015 and 2019 is presented in Table 6. Again, Data from 2020 and 2021 has not been included in the assessment due to the influence of the Covid-19 pandemic on traffic levels. Exceedances of the air quality objective are highlighted in bold.

The annual mean NO_2 concentrations measured at the Frognal Way background diffusion tube site were well within the air quality objective of 40 µg/m^3 and are also lower than Camden's 2026 target. The annual mean concentrations measured at the Fitzjohn's Avenue roadside location are somewhat higher and consistently exceed the air quality objective, although the concentrations are lower than those measured on at Swiss Cottage. A decline in concentrations since 2016 is evident at all three monitoring locations.

Table 6: Annual Mean NO_2 Concentrations Measured by Diffusion Tube (µg/m^3)

Location	Type	2015	2016	2017	2018	2019
Frognal Way	Urban Background	27.8	27.9	32.3 (a)	22.1	22.8
Swiss Cottage	Kerbside	**69.3**	**73.9**	- (c)	**62.3**	**49.7** (a)
47 Fitzjohn's Avenue	Roadside	**55.8**	**56.4 (a)**	**- (c)**	**48.1**	**42.5**
(a) Data capture < 90% (b) Data capture < 50%						

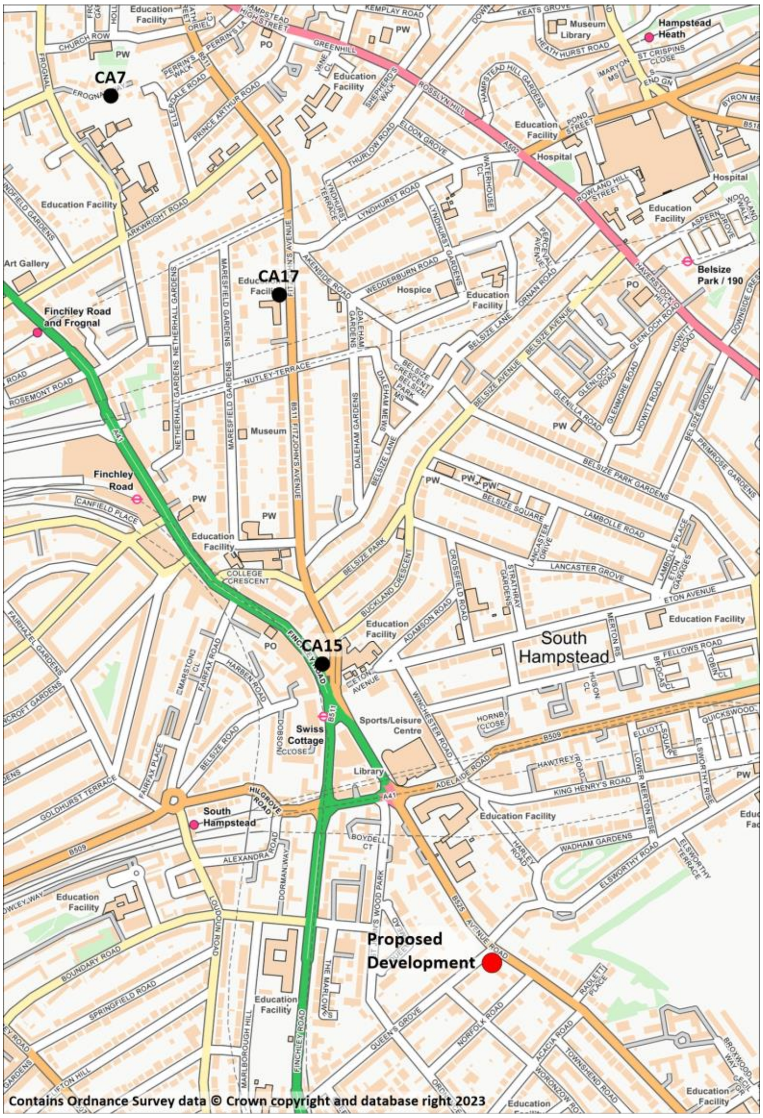

Figure 3: Location of Diffusion Tubes

MAPPED AND ASSESSMENT BACKGROUND CONCENTRATIONS

The urban background automatic sites detailed in Table 3 are a considerable distance from the proposed development and therefore may not be representative of background concentrations at the proposed development. There is also significant variation in the measured NO_2 concentrations across the three automatic sites. The nearest background monitoring location to both the Swiss Cottage verification site and the proposed development is the diffusion tube monitoring site at Frognal Way, however the measured NO_2 concentration at Frognal Way in 20189 was just 22.8 µg/m^3, considerably lower than the concentrations measured at all three background AQMS's.

For comparison with the measured data, annual mean concentrations measured at London Bloomsbury (the closest automatic monitoring site to the proposed development) and Frognal Way have been obtained from the Defra UK

Background Air Pollution maps[28]. These 1km grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The latest background maps were issued in August 2020 and are based on 2018 monitoring data, with projections for future years.

A comparison between the 2019 mapped (derived from contour plots of the mapped data) and measured concentrations is presented in Table 7.

Table 7: A Comparison between the Mapped and Measured 2019 Annual Mean Background Pollutant Concentrations at London Bloomsbury and Frognal Way (µg/m^3)

Pollutant	Mapped		Measured		Measured / Mapped	
	London Bloomsbury AQMS	Frognal Way Diffusion Tube	London Bloomsbury AQMS	Frognal Way Diffusion Tube	London Bloomsbury AQMS	Frognal Way Diffusion Tube
NO_2	41.6	26.1	32.0	22.8	0.77	0.87
NOx	76.0	-	46.3	-	0.61	-
PM_{10}	20.2	-	18.0	-	0.89	-
$PM_{2.5}$	12.9	-	11.0	-	0.85	-

The mapped concentrations at the Swiss Cottage verification site and the proposed development site are presented in Table 8.

Table 8: Mapped 2019 Annual Mean Background Pollutant Concentrations at Swiss Cottage and the Proposed Development (µg/m^3)

Pollutant	Swiss Cottage	Proposed Development
NO_2	30.0	30.0
NOx	48.2	48.3
PM_{10}	19.1	18.8
$PM_{2.5}$	12.2	12.1

The mapped NOx and NO_2 concentrations at London Bloomsbury are considerably higher than the measured concentrations, indicating that the mapped data are over predicting concentrations at this location. The mapped NO_2 concentration at Frognal Way is also somewhat higher than the measured concentration.

To avoid an unrealistic overprediction of NOx and NO_2 concentrations at Swiss Cottage and the proposed development, the adjusted mapped background concentrations have been derived by multiplying the mapped NOx and NO_2 concentrations by the ratio of the measured and mapped concentrations at Frognal Way. This is a more conservative approach than using the NO_2 and NOx ratios derived using the London Bloomsbury data.

The mapped PM_{10} and $PM_{2.5}$ concentrations at Swiss Cottage have been adjusted using the London Bloomsbury data. A summary of the background concentrations used in the assessment is presented in Table 9. These data have been used to predict pollutant concentrations at the proposed development in 2025 (the opening year). Since background air quality is expected to continue to improve due to the proposed expansion of the ULEZ and the increased uptake of low emission vehicles, this approach is considered to provide a conservative assessment of potential exposure at the proposed development.

[28] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Table 9: 2019 Annual Mean Background Pollutant Concentrations at Swiss Cottage and the Proposed Development used in the Assessment (µg/m^3)

Pollutant	Swiss Cottage	Proposed Development
NO_2	26.1	26.1
NOx	41.9	42.0
PM_{10}	17.0	16.8
$PM_{2.5}$	10.4	10.3

CONSTRUCTION DUST RISK ASSESSMENT

SENSITIVITY OF THE AREA TO DUST IMPACTS

The assessment of dust impacts is dependent on the proximity of the most sensitive receptors to the construction area and existing PM_{10} concentrations (i.e., the potential for additional dust to result in an exceedance of the short or long-term air quality objectives). Automatic monitoring of background particulate concentrations at London Bloomsbury indicates that PM_{10} concentrations in the area are unlikely to exceed 24 µg/m^3, the lowest threshold for the assessment of dust impacts on human health.

A summary of the receptor and area sensitivity to health and dust soiling impacts is presented in Table 10.

There are no dust sensitive habitat sites within 50m of the Site; therefore, impacts on ecology have not been considered in the assessment.

Table 10: Sensitivity of Receptors and the Local Area to Dust Impacts

<table>
<tr><th rowspan="2">Receptor</th><th rowspan="2">Distance from Site Boundary</th><th rowspan="2">Number of Receptors</th><th colspan="2">Sensitivity to Health Impacts</th><th colspan="2">Sensitivity to Dust Soiling Impacts</th></tr>
<tr><th>Receptor</th><th>Area</th><th>Receptor</th><th>Area</th></tr>
<tr><td rowspan="3">Residential Properties</td><td><20m</td><td><10</td><td rowspan="3">High</td><td>Low</td><td rowspan="3">High</td><td>Medium</td></tr>
<tr><td><50m</td><td><15</td><td>Low</td><td>Medium</td></tr>
<tr><td><100m</td><td><50</td><td>Low</td><td>Low</td></tr>
<tr><td colspan="3">Overall Sensitivity of the Area</td><td colspan="2">Low</td><td colspan="2">Medium</td></tr>
</table>

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.

A wind rose for London City Airport is presented in Figure 4, which shows that the prevailing wind is from the southwest. Receptors to the northeast of the site are, therefore, most likely to experience dust impacts during the construction phase.

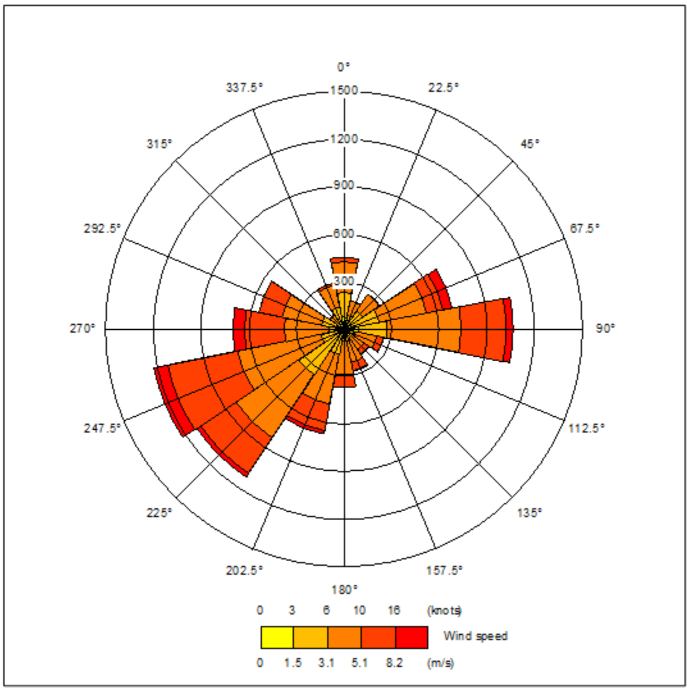

Figure 4: Wind Rose London City Airport

DUST EMISSION MAGNITUDE

The magnitude of the potential dust emission from earthworks, construction and trackout, has been evaluated using the criteria in Table A5 of Appendix A and is presented in Table 11.

Table 11: Evaluation of Dust Emission Magnitude

Dust Source	IAQM Criteria	Proposed Development	Dust Emission Magnitude
Demolition	Total building volume (m^3)	1,963	Small
	Potentially dusty material?	Brick	Small
	On-site crushing and screening?	Yes	Large
	Maximum height of demolition activities above ground-level (m)	<10 m	Small
Overall Dust Emission Magnitude From Demolition			**Small**
Whilst crushing and screening will be undertaken on Site, the scale of the works is very minor and therefore the dust emission magnitude is expected to be 'small'.			
Earthworks	Site area (m^2)	825	Small
	Soil type?	Clay	Large
	Number of heavy earth moving vehicles active at any one time	2	Small
	Maximum bund height (m)	2	Small
	Total material moved (tonnes)	Approx. 60	Small

Dust Source	IAQM Criteria	Proposed Development	Dust Emission Magnitude
	Earthworks during wetter months?	Cannot be guaranteed.	Medium
Overall Dust Emission Magnitude From Earthworks			**Small**
Whilst the soil type is potential dusty, the scale of the works is very minor and therefore the dust emission magnitude is expected to be 'small'.			
Construction	Total building volume (m^3)	6,067	Small
	Potentially dusty construction materials?	Brick, concrete	Medium
	On-site concrete batching?	No	-
	Sandblasting?	No	-
Overall Dust Emission Magnitude From Construction			**Small**
Whilst the construction materials are potentially dusty, the scale of the works is very minor and therefore the dust emission magnitude is expected to be 'small'.			
Trackout	Number of outward HGV movements in any one day	Unknown, expected < 5 based on proposed works.	Small
	Dusty surface material?	n/a	-
	Unpaved road length (m)	0	-
Overall Dust Emission Magnitude From Trackout			**Small**
There will be no access over unmade ground.			

ASSESSMENT OF DUST RISK PRIOR TO MITIGATION

A summary of the potential risk of dust impacts prior to mitigation, based on the low sensitivity of the area to human health impacts and medium sensitivity to dust soiling impacts, is presented in Table 12. Overall, **the risk of dust impacts during the construction phase, <u>prior to mitigation</u>, is assessed as low**.

Table 12: Risk of Dust Impacts Prior to Mitigation

Dust Source	Emission Magnitude	Human Health Risk	Dust Soiling Risk	Overall Risk
Demolition	Small	Low	Low	**Low**
Earthworks	Small	Low	Low	**Low**
Construction	Small	Low	Low	**Low**
Trackout	Small	Negligible	Negligible	**Negligible**

EXPOSURE ASSESSMENT

The potential impact of local air quality on future occupants of the development are identified in this section.

NITROGEN DIOXIDE

Predicted ground-floor level annual mean NO_2 concentrations due to emissions from traffic on the local road network are presented a contour plot in Figure 5. The maximum concentration at the façade of the proposed dwelling is 27.5 µg/m^3, well below the air quality objective of 40 µg/m^3. **The development therefore falls within exposure category APEC-A, with respect to NO_2.** The predicted concentrations are also below Camden's 2026 target of 30 µg/m^3, despite the conservative assumption that there will be no improvement in background air quality between 2019 (the baseline year) and 2025 (the opening year).

The predicted concentrations at all locations on site are less than 50% of the 60 µg/m^3 threshold for a potential exceedance of the 1-hour mean air quality objective and therefore the risk of non-compliance at the development is negligible.

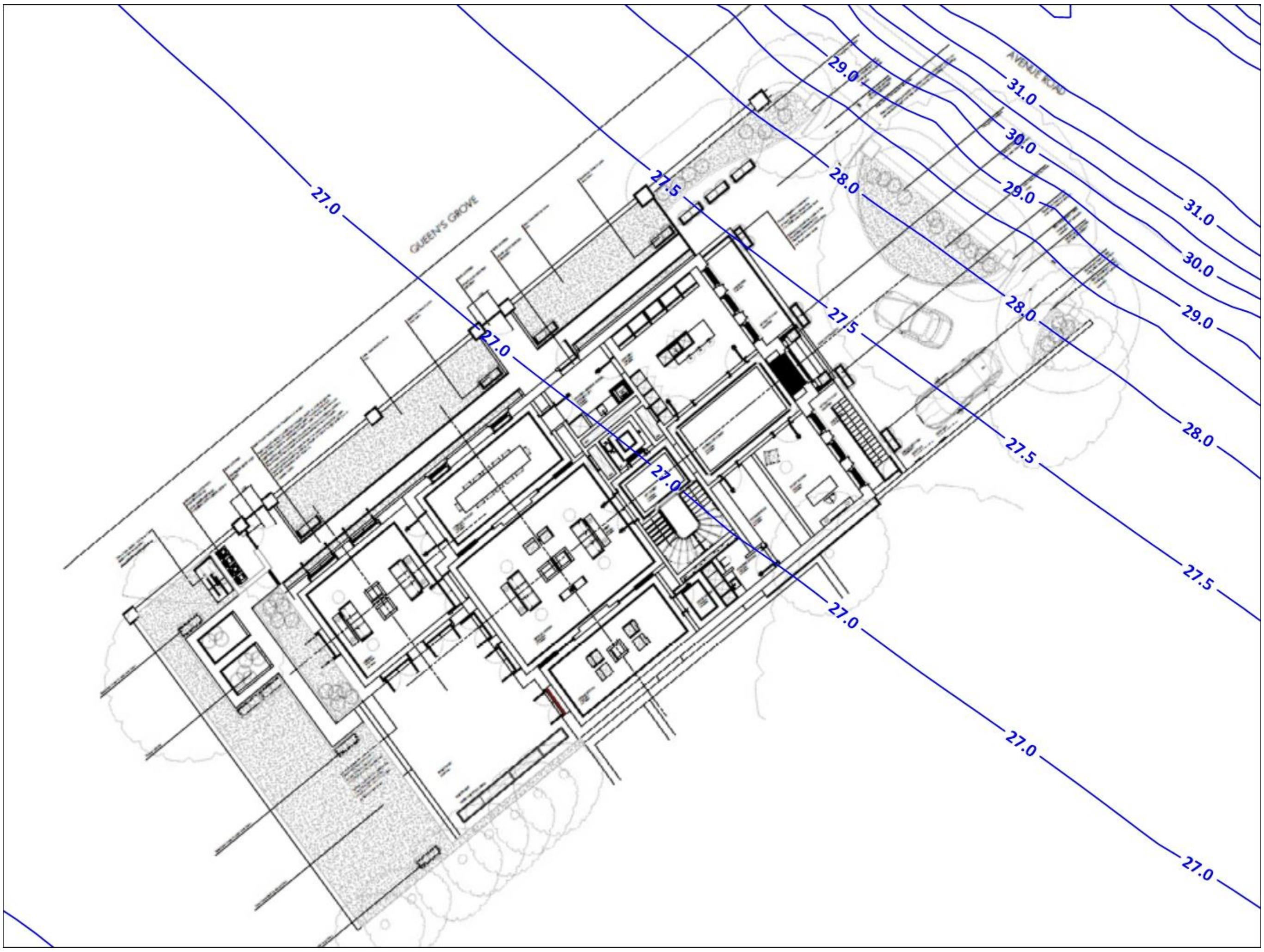

Figure 5: Predicted 2025 Ground-Floor Level Annual Mean NO_2 Concentrations (µg/m^3)

PARTICULATE MATTER

Predicted annual mean PM_{10} and $PM_{2.5}$ concentrations at ground-floor level across the proposed development site are presented as contour plots in Figure 6 and Figure 7, respectively. The predicted concentrations are well within the current long-term air quality objectives for the protection of human health.

TG22 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. On this basis, the dispersion modelling indicates that compliance with the short-term PM_{10} objective will be achieved at all locations on site. **The proposed development therefore falls within exposure category APEC-A for particulate matter.**

The measured background $PM_{2.5}$ concentration used in the assessment of 10.3 µg/m^3, exceeds the Government's 2040 concentration target and Camden's 2026 target of 10 µg/m^3, but is below the Government's interim target of 12 µg/m^3. The predicted concentrations at the proposed dwelling are close to background level. Following the implementation of increasingly stringent legislative measures aimed at reducing $PM_{2.5}$ emissions, concentrations at the proposed development in the future are anticipated to be lower than predicted.

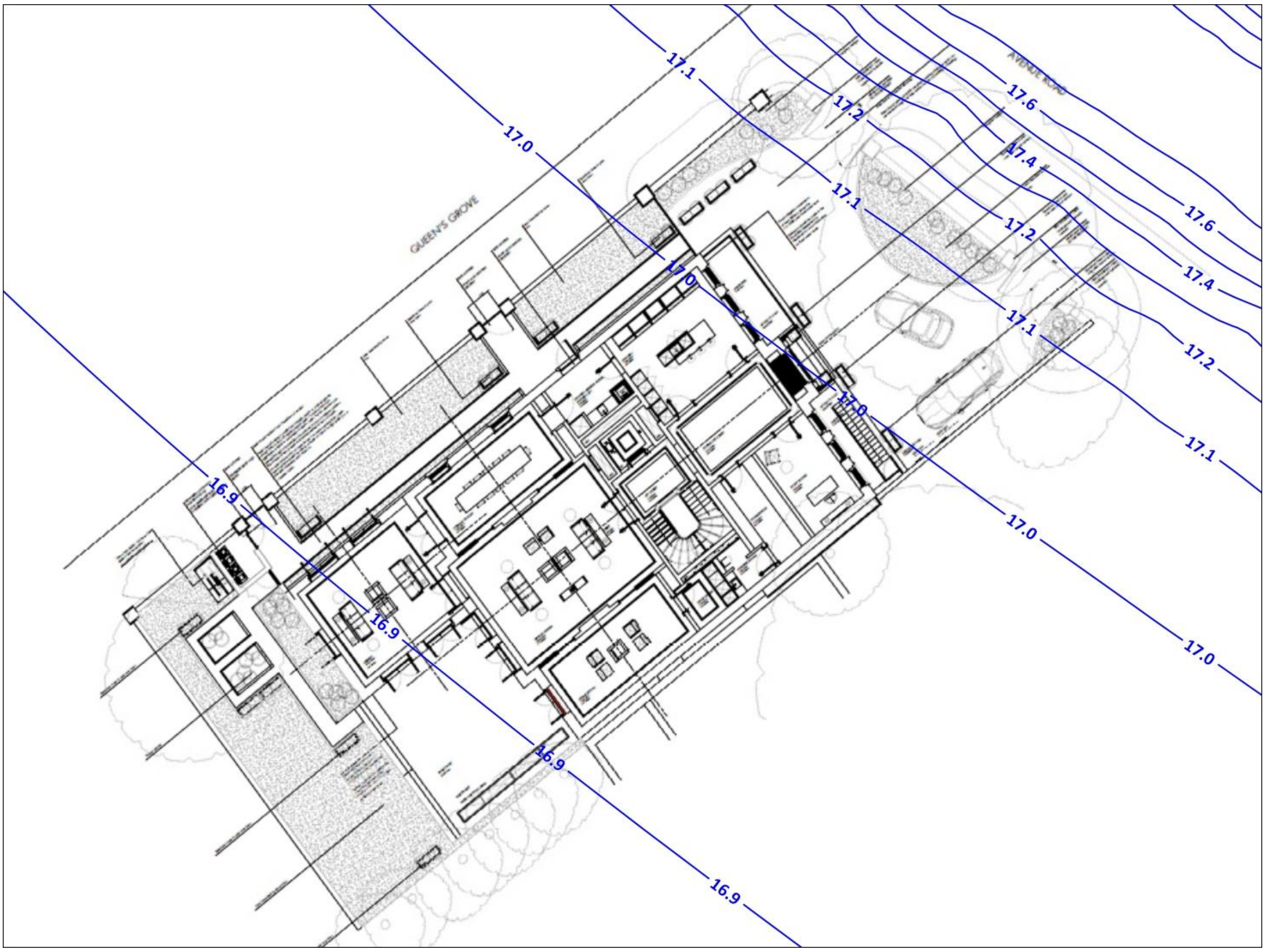

Figure 6: Predicted 2025 Ground-Floor Level Annual Mean PM_{10} Concentration ($\mu g/m^3$)

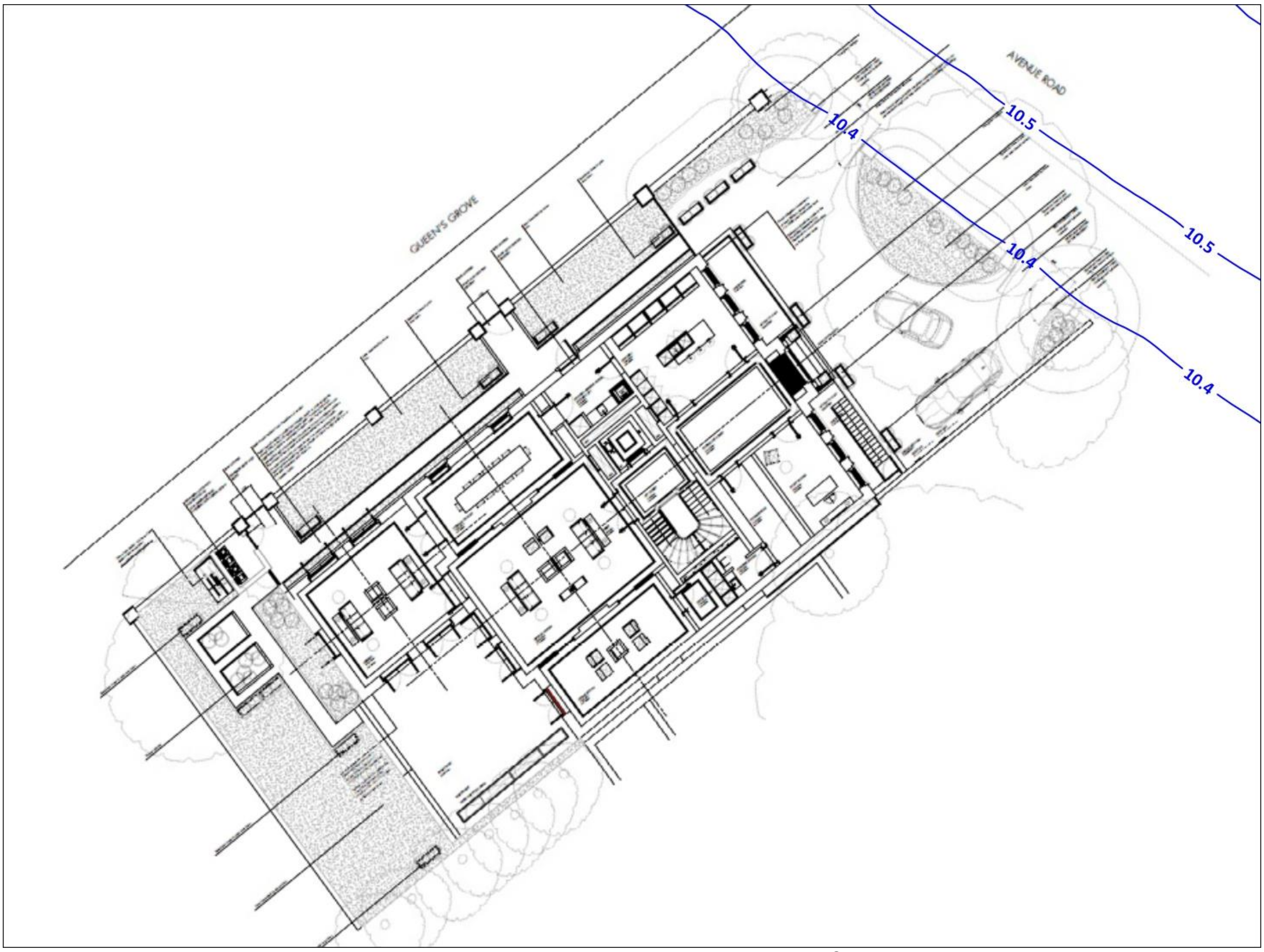

Figure 7: Predicted 2025 Ground-Floor Level Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$)

AIR QUALITY NEUTRAL ASSESSMENT

To assess whether a development is air quality neutral, annual building and transport-related emissions are compared with 'air quality neutral' benchmarks provided within the London Plan Air Quality Neutral Guidance[29]. Where these benchmarks are exceeded, following appropriate mitigation measures, the developer is required to off-set the impacts off-site or make a financial contribution (e.g., through a section 106 agreement).

TRAFFIC EMISSIONS

The proposed dwelling will not provide additional parking compared with existing residence. On this basis, the proposed development is not expected to generate additional traffic above the existing site uses. In accordance with the guidance the proposed development is therefore **Air Quality Neutral with respect to transport-related emissions**.

BUILDING EMISSIONS

The energy strategy for the proposed development is Air Source Heat Pumps (ASHP) and PV. There will be no combustion emissions associated with the site and therefore **the proposed development is Air Quality Neutral with respect to building-related emissions.**

[29] London Plan Guidance Air Quality Neutral, GLA, February 2023

MITIGATION

The following mitigation measures will be required during the construction and operational phases to minimise the air quality impacts arising from the development.

CONSTRUCTION PHASE

London Best Practice Guidance for dust control will be implemented, as appropriate, during the construction phase through the CEMP for the proposed development.

The risk of dust impacts from the site has been assessed as 'low' during demolition, earthworks and construction. The risk of impacts from trackout have been assessed as 'negligible'.

In accordance with the GLA guidance, to minimise the risk of dust impacts at sensitive receptors close to the site, the 'highly recommended' measures detailed in Table 13 should be incorporated into the CEMP. The 'desirable' measures detailed in Table 14 should also be considered for inclusion.

The significance of dust impacts on nearby receptors following the implementation of appropriate and best practice mitigation is expected to be negligible.

Table 13: Highly Recommended Mitigation Measures

Description	Mitigation Measure
Site Management	- 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 maintaining the site	- 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 at the site boundary that are at least as high as any stockpiles on site. - Avoid site runoff of water or mud.

Description	Mitigation Measure
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. - 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 equipment and use fine water sprays on such equipment wherever appropriate.
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.

Table 14: Desirable Mitigation Measures

Description	Mitigation Measure
Preparing and maintaining the 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. - Keep site fencing, barriers and scaffolding clean using wet methods. - Remove materials from site as soon as possible.
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).
Construction	- Avoid scabbling (roughening of concrete surfaces) if possible. - 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.
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

Detailed dispersion modelling of traffic on the local road network indicates that concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be well within the relevant long and short-term air quality standards at the façade of the proposed dwelling (**APEC-A**). On this basis, mitigation measures are not required to protect future occupants from poor air quality.

The proposed development will include a 50kW electric vehicle charge point and facilities for electric bike charging, encouraging the use of sustainable transport.

SUMMARY AND CONCLUSIONS

An assessment has been undertaken to assess the potential impacts on local air quality associated with the construction and operation of the proposed development.

Releases of dust and PM_{10} are likely to occur during site activities. However, through good site practice and the implementation of highest levels of dust control, as outlined in the CEMP for the proposed development, the impact of dust and PM_{10} releases will be effectively mitigated, and the resultant impacts are considered to be negligible.

Detailed dispersion modelling has been undertaken to predict concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the proposed development site to determine whether mitigation will be required to protect future occupants from poor air quality. The predicted concentrations are below the relevant long and short-term air quality objectives at the facade of the new building (exposure category APEC-A).

The energy strategy for the proposed development is ASHP/ PV and therefore there will be no combustion emissions associated with the site and no impact on local air quality.

Based on the results of the assessment and with the implementation of the recommended construction-phase mitigation measures, it is considered that air quality would not pose a constraint to the redevelopment of the site as proposed.

APPENDIX A – CONSTRUCTION DUST RISK ASSESSMENT METHODOLOGY

Factors defining the sensitivity of a receptor to dust impacts are presented in Table A1.

Table A1: Receptor Sensitivity

Receptor 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)

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.

The sensitivity of the area as a whole is dependent on the number of receptors within each sensitivity class and their distance from the source. Human health impacts are also dependent on the existing PM_{10} concentrations in the area.

Table A2 and Table A3 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 A4.

Table A2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source			
		<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

Table A3: Sensitivity of the Area to Health Impacts from Dust

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source				
			<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
	24-28	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

XCO2

Table A4: Sensitivity of the Area to Ecological Impacts from Dust

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

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 A5.

Table A5: Dust Emission Magnitude

Source	Large	Medium	Small
Demolition	- Total building volume >50,000m³ - Potentially dusty material (e.g., concrete) - Onsite crushing and screening - Demolition activities >20m above ground level.	- Total building volume 20,000 - 50,000m³ - Potentially dusty material - Demolition activities 10 - 20m above ground level.	- Total building volume <20,000m³ - Construction material with low potential for dust release - Demolition activities <10m above ground level - Demolition during wetter months
Earthworks	- Total site area >10,000m² - 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 - 10,000m² - 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 <2,500m² - 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 >100,000m³ - On site concrete batching - Sandblasting	- Total building volume 25,000 - 100,000m³ - Potentially dusty construction material (e.g., concrete) - On site concrete batching	- Total building volume <25,000m³ - 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

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 Tables A6, A7 and A8.

Table A6: 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 A7: Risk of Dust Impacts from Earthworks and Construction

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

Table A8: 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	Low Risk	Low Risk	Negligible Risk

APPENDIX B – ADMS-ROADS INPUT PARAMETERS

Table B1: Summary of ADMS-Roads Input Parameters

Parameter	2019 Verification	2025 Exposure
ADMS-Roads Model Version	5.1	5.1
Vehicle Emission Factors	EFT v11 for 2019	EFT v11 for 2025
Meteorological Data	Hourly sequential data from London City Airport (2019)	Hourly sequential data from London City Airport (2019)
Surface Roughness	1.0m	1.0m
Monin-Obukhov Length	75m	75m

Table B2: Summary of Traffic Data for Model Verification

Road Link	2019 AADT	HGV (%)	Average Speed (kph)
Finchley Road North of Swiss Cottage	42,988 (a)	5.6	16
Finchley Road South of Swiss Cottage	22,624 (b)	10.6	16
Avenue Road N of Adelaide Road	38699 (c)	6.1	16
Avenue Road S of Adelaide Road	11,808 (c)	4.5	24
College Crescent	17,333 (c)	4.6	16
(a) DfT ATC 16434 for 2018 (b) DfT ATC 48537 for 2018 (c) AADT obtained from the 2019 London Atmospheric Emissions Inventory (LAEI).			

Table B3: Summary of Traffic Data for the Prediction of 2025 Pollutant Concentrations at the Proposed Development

Road Link	2025 AADT (a)	HGV (%)	Average Speed (kph)
Avenue Road	12,623	4.5	24
(a) AADT derived from 2016 London Atmospheric Emissions Inventory (LAEI) with TEMPro v7.2 growth factor for Camden applied to project flows to 2025.			

APPENDIX C – MODEL VERIFICATION

Nitrogen Dioxide (NO_2)

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. Verification of concentrations predicted by the ADMS-Roads model has followed the methodology presented in TG22.

Predicted annual mean concentrations of NOx have been compared with the 2019 annual mean concentration measured by the LBC automatic air quality monitoring station located on the A41 at Swiss Cottage.

A Road-NOx (i.e., the component of total NOx coming from road traffic) concentration has been derived by subtracting the 2019 adjusted mapped background NOx concentration (see Table 9) from the NOx concentration measured at Swiss Cottage.

The ratio of the measured and modelled Road-NOx contributions provides an adjustment factor for the modelled Road-NOx concentrations. This factor is then applied to the modelled road NOx concentrations before they are converted to Road-NO_2 using the Defra NOx to NO_2 calculator and added to the background NO_2 concentration to produce a total adjusted modelled NO_2 concentration. The calculation of the adjustment factor for NO_2 is presented in Table C1.

Table C1: Verification Calculation for NO_2

Parameter	Value
2019 Measured NO_2 Concentration	43.0 μg/m^3
2019 Measured NOx Concentration	96.7 μg/m^3
2019 Background NOx Concentration	41.9 μg/m^3
Measured Road-NOx Concentration	54.8 μg/m^3
Modelled Road-NOx Concentration	30.9 μg/m^3
Adjustment Factor	**1.77**

Particulate Matter (as PM_{10})

Predicted annual mean concentrations of PM_{10} have been compared with the 2018 annual mean concentration measured by the Swiss Cottage automatic air quality monitoring station. A measured Road-PM_{10} (i.e., the component of total PM_{10} coming from road traffic) concentration has been derived by subtracting the background concentration (see Table 9) from the concentration measured at Swiss Cottage.

The ratio of the measured and modelled Road-PM_{10} contributions provides an adjustment factor for the modelled Road-PM_{10} concentrations. The calculation of the adjustment factor for PM_{10} is presented in Table C2.

Table C2: Verification Calculation for PM_{10}

Parameter	Value
2019 Measured PM_{10} Concentration	19.0 $\mu g/m^3$
2019 Background PM_{10} Concentration	17.0 $\mu g/m^3$
Measured Road-PM_{10} Concentration	2.0 $\mu g/m^3$
Modelled Road-PM_{10} Concentration	2.1 $\mu g/m^3$
Adjustment Factor	**0.95**

Particulate Matter (as $PM_{2.5}$)

Predicted annual mean concentrations of $PM_{2.5}$ have been compared with the 2018 annual mean concentration measured by the Swiss Cottage automatic air quality monitoring station. A measured Road-$PM_{2.5}$ (i.e., the component of total $PM_{2.5}$ coming from road traffic) concentration has been derived by subtracting the 2019 background concentration (see Table 9) from the measured roadside $PM_{2.5}$ concentration.

The ratio of the measured and modelled Road-$PM_{2.5}$ contributions provides an adjustment factor for the modelled Road-$PM_{2.5}$ concentrations. The calculation of the adjustment factor for $PM_{2.5}$ is presented in Table C3.

Table C3: Verification Calculation for $PM_{2.5}$

Parameter	Value
2019 Measured $PM_{2.5}$ Concentration	11.0 $\mu g/m^3$
2019 Background $PM_{2.5}$ Concentration	10.4 $\mu g/m^3$
Measured Road-$PM_{2.5}$ Concentration	0.6 $\mu g/m^3$
Modelled Road-$PM_{2.5}$ Concentration	1.3 $\mu g/m^3$
Adjustment Factor	**0.46**

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