Aether

Air Quality Assessment for the proposed development at 329 - 331 Kentish Town Road, Camden, London

Report to Medley Assets Ltd

September 2020

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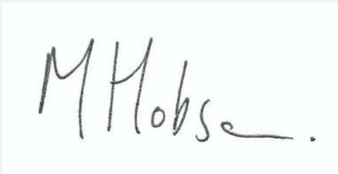
Signature	
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Company Details:	Aether Ltd Oxford Centre for Innovation New Road Oxford OX1 1BY UK Registered in England 6630896
Contact:	enquiries@aether-uk.com +44(0)1865 261466 www.aether-uk.com

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1 Introduction

Aether has been commissioned by Savills to undertake an air quality assessment for the proposed development at 329 - 331 Kentish Town Road, Camden, London. The development will consist of the conversion of the existing upper floors at 329-331 Kentish Town Road to three residential units and the construction of two new residential units at first and second floor levels to the rear of the property facing York Mews. Access is proposed via the ground and first floors at the rear with associated servicing areas. Air pollutant emitting on-site energy generation will be included. However, no information is currently available on the specifics of the boiler that will be installed and therefore at the present time this aspect has not been included in the assessment.

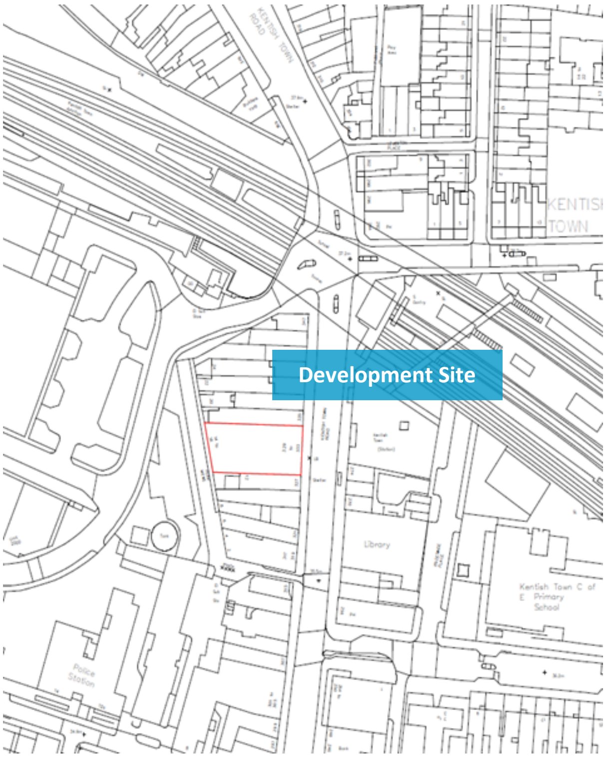
The development falls within the London Borough of Camden, which suffers from elevated levels of air pollution, primarily due to high levels of traffic. It is therefore important to assess whether there will be an exceedance of the air quality objectives for particulate matter (PM_{10}) or nitrogen dioxide (NO_2) at the proposed site and then advise whether any action is required to reduce the residents' exposure to air pollution. The assessment utilises ADMS-Roads, a comprehensive dispersion modelling tool for investigating air pollution problems due to small networks of roads and industrial sources. In addition, an air quality neutral assessment has been undertaken.

The expected completion date of the proposed development is 2022. The assessment has therefore been completed for 2023, the expected first full year of occupation.

1.1 The Location of the Development

The proposed development is located on Kentish Town Road in the London Borough of Camden in northwest London (**Figure 1**).

Figure 1: Location of the development site



1.2 Assessment Criteria

A summary of the air quality objectives relevant to the Camden development, as set out in the UK Air Quality Strategy[1], is presented in **Table 1** below.

Table 1: UK Air Quality Objectives for NO_2 and PM_{10}

Pollutant	Concentration	Measured as
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual mean
	200 µg/m^3	Hourly mean not to be exceeded more than 18 times per year (99.8th percentile)
Particulate Matter (PM_{10})	40 µg/m^3	Annual mean
	50 µg/m^3	24 hour mean not to be exceeded more than 35 times a year (90.4th percentile)

The oxides of nitrogen (NO_X) comprise principally of nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is a reddish brown gas (at sufficiently high concentrations) and occurs as a result of the oxidation of NO, which in turn originates from the combination of atmospheric nitrogen and oxygen during combustion processes. NO_2 can also form in the atmosphere due to a chemical reaction between NO and ozone (O_3). Health based standards for NO_X generally relate to NO_2, where acute and long-term exposure may adversely affect the respiratory system.

Particulate matter is a term used to describe all suspended solid matter, sometimes referred to as Total Suspended Particulate matter (TSP). Sources of particles in the air include road transport, power stations, quarrying, mining and agriculture. Chemical processes in the atmosphere can also lead to the formation of particles. Particulate matter with an aerodynamic diameter of less than 10 µm is the subject of health concerns because of its ability to penetrate deep within the lungs and is known in its abbreviated form as PM_{10}.

A growing body of research has also pointed towards the smaller particles as a metric more closely associated with adverse health impacts. In particular, particulate matter with an aerodynamic diameter of less than 2.5 micrometres, known as $PM_{2.5}$. Local Authorities in England have a flexible role[2] in working towards reducing emissions and concentrations of $PM_{2.5}$ as there is no specific objective. However, under EU Directive 2008/50/EC[3], there is an annual mean limit of 25 µg/m^3.

Further information on the health effects of air pollution can be found in the reports produced by the Committee on the Medical Effects of Air Pollutants[4].

As defined by the regulations, the air quality objectives for the protection of human health are applicable:

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[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007), Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

[2] LAQM TG16 – paragraph 1.09

[3] https://ec.europa.eu/environment/air/quality/directive.htm

[4] https://www.gov.uk/government/collections/comeap-reports

- Outside of buildings or other natural or man-made structures above or below ground
- Where members of the public are regularly present.

Using these definitions, the annual mean objectives will apply at locations where members of the public might be regularly exposed such as building façades of residential properties, schools and hospitals and will not apply at the building façades of offices or other places of work, where members of the public do not have regular access. The 24 hour objective will apply at all locations where the annual mean objective would apply together with hotels. Therefore, in this assessment the annual mean and 24 hour mean objectives will apply at all floors of the residential development. This does not include the retained retail space at the ground floor unit at the existing building frontage on Kentish Town Road. The hourly objective will apply at all locations where members of the public could reasonably be expected to spend that amount of time. Therefore, in this assessment the hourly objective will also apply at the same parts of the development.

1.3 Local Air Quality Management

Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met, the authority must designate an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP).

The London Borough of Camden has declared one AQMA covering the whole borough[5]. This AQMA was declared in 2002 due to exceedances of the annual mean NO_2 and daily mean PM_{10} objectives. An AQAP was published in 2019, which includes some specific measures such as obtaining s106 funding to manage and enforce construction dust impacts, the creation of clean air zones around schools and hospitals, enforcement of non-road mobile machinery policies and enforcement of air quality neutral policies and positive planning policies for new developments[6].

1.4 The ADMS-Roads Method

Local air quality has been assessed using ADMS-Roads, a comprehensive dispersion model that can be used to predict concentrations of pollutants in the vicinity of roads and small industrial sources. The model has been used for many years in support of planning applications for new residential/commercial developments.

ADMS-Roads is able to provide an estimate of air quality both before and after development, taking into account important input data such as background pollutant concentrations, meteorological data, traffic flows and on-site energy generation (if applicable). The model output can be verified against local monitoring data to increase the accuracy of the predicted pollutant concentrations and this approach has been followed in this assessment.

The use of dispersion modelling enables estimates of concentrations to be made at varying heights. As a result, suggestions for appropriate mitigation measures can be

[5] http://uk-air.defra.gov.uk/aqma/local-authorities?la_id=331

[6] https://www.camden.gov.uk/air-quality

made where necessary, taking into consideration the identification of worst-case locations.

The most recent version of ADMS-Roads (v5) was issued in April 2020 and requires the following information to assess the impact at sensitive receptor locations:

- **Setup:** General site details and modelling options to be used
- **Source:** Source dimensions and locations, release conditions, emissions
- **Meteorology:** hourly meteorological data
- **Background:** Background concentration data
- **Grids:** Type and size of grid for output
- **Output:** Output required and sources/groups to include in the calculations.

2 Methodology

2.1 Local Pollutant Concentrations

It is good practice to include up-to-date local background pollutant concentrations in the assessment model, and also to verify modelled outputs against local monitoring data where available. This section provides an overview of the local data available for use in the assessment.

2.1.1 Local monitoring data

The Council undertake automatic monitoring of nitrogen dioxide and particulate matter at three sites in the borough. In addition, they have one automatic monitor that solely measures particulate matter. Unfortunately, all these sites are located at least 2.5km from the development site and are therefore the results are not indicative of the local area. However, NO_2 concentrations are also measured passively at diffusion tube sites across the Borough. Details of the closest two monitoring sites are given in **Table 2**.

Monitoring results have been taken from the Council's latest Annual Status Report (ASR)[7].

Table 2: Monitoring sites within 1km of the 329 - 331 Kentish Town Road, Camden development

Site Name	Site Type	Pollutant	Grid Reference	Distance to Kerb (m)	Approx. Distance to development site (m)
CA16 Kentish Town Road	R	NO_2	529013, 185102	1	40
CA24 Chetwynd Road	R	NO_2	528722, 185950	1	870

Note: R = roadside

The diffusion tubes were analysed by Gradko International Ltd, who participate in the Proficiency scheme[8]. Whilst diffusion tubes provide an indicative estimate of pollutant concentrations, they tend to under or over read. The data is therefore corrected using a bias adjustment factor. There are two types of bias adjustment factor – local and

[7] https://www.camden.gov.uk/air-quality#dfmo
[8] This is a national QA/QC scheme.

national. The local factor is derived from co-locating diffusion tubes (usually in triplicate) with automatic monitors, whereas the national factor is obtained from the average bias from all local authorities using the same laboratory. The London Borough of Camden has applied a national bias adjustment factor (0.87) to their 2019 diffusion tube results.

Monitoring results are presented in **Table 3**. The data shows that the annual mean NO_2 objective was exceeded in every year shown at the CA16 Kentish Town Road monitoring site and in 2017 at the CA24 Chetwynd Road site.

Diffusion tubes do not provide information on hourly exceedances, but research[9] identified a relationship between the annual and 1 hour mean objective, such that exceedances of the latter were considered unlikely where the annual mean was below 60 µg/m^3.Therefore, exceedances of the hourly mean objectives are expected at the CA16 Kentish Town Road diffusion tube monitoring site in 2017.

Table 3: Monitoring results for sites within 1km of the proposed development site, 2017-2019

Objective	Site Name	2017	2018	2019
Annual mean NO_2 (µg/m^3)	CA16 Kentish Town Road	**<u>68.9</u>**	**54.7**	**45.0**
Annual mean NO_2 (µg/m^3)	CA24 Chetwynd Road	**50.6**	38.7	35.2

Values exceeding the 40 µg/m^3 annual mean objective are shown in bold, values above 60 µg/m^3 are also underlined

2.1.2 Background mapped data

Background pollutant concentration maps are available from the Defra LAQM website[10] and data has been extracted for Camden for this assessment. These 2018 baseline, 1 kilometre 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 projections in the 2018 LAQM background maps are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these maps do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

The estimated mapped background NO_X, NO_2 and PM_{10} concentrations around the development site are 42.4 µg/m^3, 27.2 µg/m^3 and 18.1 µg/m^3 respectively in 2019. For 2023 (the estimated first full year of occupation), the concentrations obtained for the same pollutants are 36 µg/m^3, 23.8 µg/m^3 and 16.9 µg/m^3 respectively.

Due to the lack of a nearby urban background monitoring site, the 2019 mapped background concentrations have been used in this assessment. To provide a conservative estimate, the projected improvements in background air quality by 2023 have not been used in the dispersion modelling. This is in line with best practice to apply worst-case assumptions.

[9] As described in Box 5.2 of LAQM Technical Guidance (TG16).
[10] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

2.2 Model input data

Hourly meteorological data from Heathrow for 2019 has been used in the model. The wind-rose diagram (**Figure 2**) presents this below.

Figure 2: Wind-rose diagram for Heathrow meteorological data, 2019

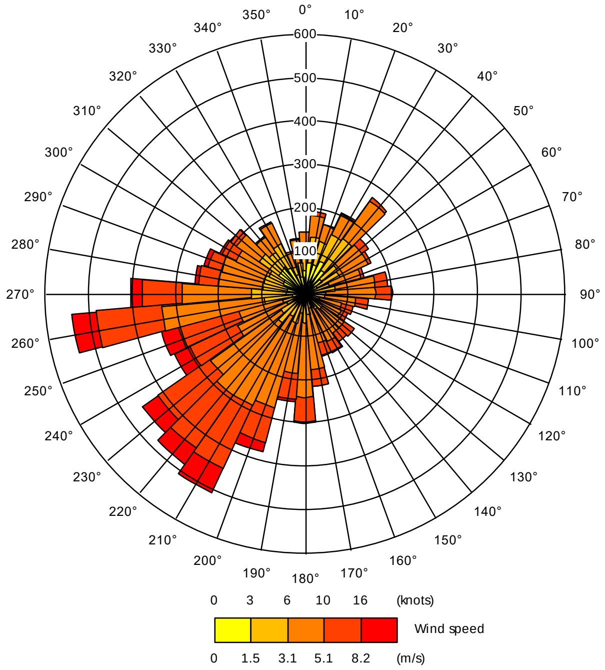
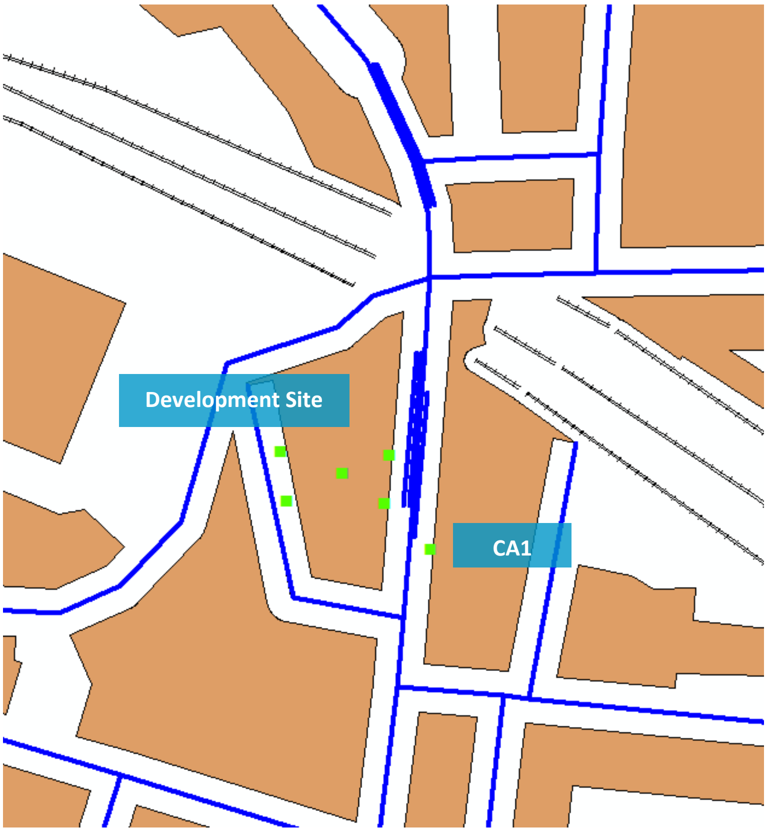


Figure 3: Road sources and receptors



Contains Ordnance Survey data © Crown copyright and database right [2019]

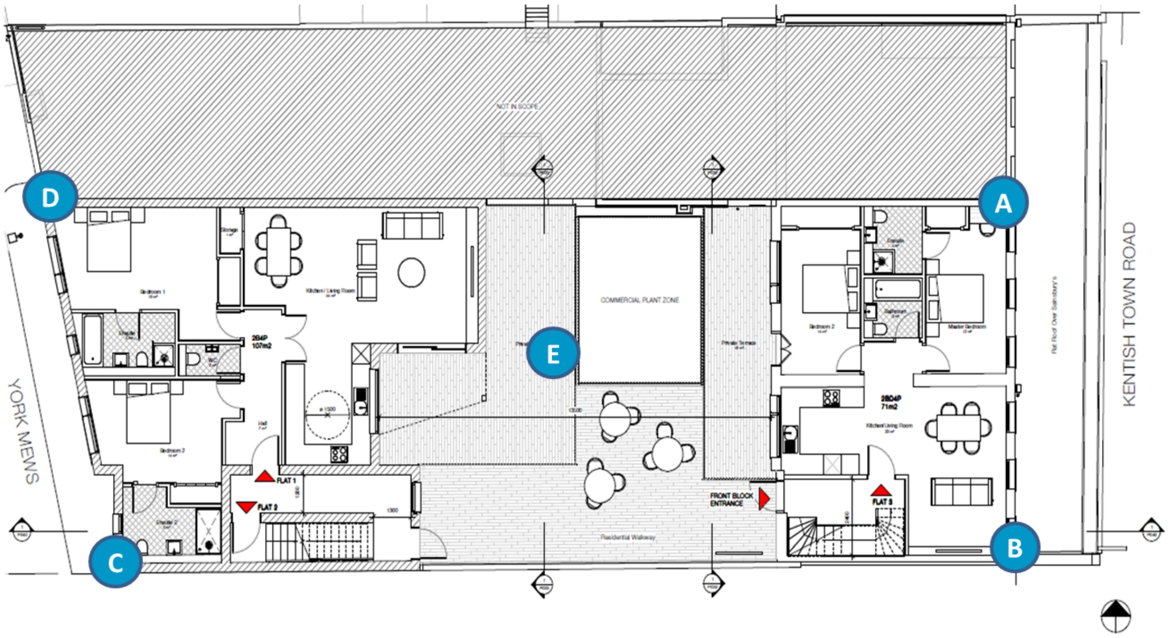
ArcMap software has been used to model the road source locations (blue lines) that are within 200 metres of the receptor locations (green squares). This data can then be automatically uploaded to ADMS-Roads. This generates an accurate representation of the surrounding area to be assessed in the model in terms of the length of roads and distances between sources and receptors. This is shown in **Figure 3** above. It is assumed that the contribution of other sources to NO_2 and PM_{10} is included in the background concentrations.

Five sensitive receptor locations have been selected for the assessment:

- A: Northern corner of the development, located closest to the building façade on Kentish Town Road
- B: Southern corner of the development, located closest to the proposed building façade on Kentish Town Road
- C: Southern corner of the development, located on the rear façade of the proposed development overlooking York Mews
- D: Northern corner of the development, located on the rear façade of the proposed development overlooking York Mews
- E: Centre of the proposed development

These sites have been chosen to reflect the extremities of the site and their proximity to road traffic sources. The architect's plans (**Figure 4**) show the development site in more detail with receptor locations highlighted (blue circles). An assessment is made for the receptors at varying heights to assess likely concentrations across floor levels. It has been assumed that background concentrations remain constant at all heights of the development based on the 2017 City Air Quality at Height report[11]. Exposure has been assumed to be represented at the mid-point of each floor.

Figure 4: The location of the receptors used in the modelling



[11] http://www.wsp-pb.com/PageFilesn/80156/WSPPB%20City%20Air%20Quality%20at%20Height.pdf

2.3 Traffic data

Average annual daily traffic (AADT) count data for 2019 (the selected baseline year) has been obtained for A400 - Kentish Town Road from the Department for Transport (DfT) Traffic Counts[12], which provides data for major roads. In the absence of any other data being available for the minor roads, estimates are based upon average values for an 'urban minor road, London' from the DfT National Road Traffic Survey, 2019[13].Therefore there will be uncertainty in the model input. A time variant factor was applied to all data based on the distribution on all roads by time of day and day of the week in Great Britain[14]. All roads within 200 metres of the modelled receptors have been included in the assessment. The values are shown in Appendix B.

For the purpose of this assessment, the RTF[15] model has been utilised to project traffic growth. It has been assumed that traffic on local roads will increase by 8.2 % between 2019 and 2023.

The proposed development includes no additional car parking spaces and subsequently is not expected to have any impact on local traffic levels. Results (**Section 3** of this report) therefore refer to concentrations modelled in 2023 regardless of whether the development takes place or not. As a result, the assessment and its conclusions are focused on the exposure of residents to currently elevated levels of pollutant concentrations, rather than assessing the impacts of the development per se.

An average speed of 26.7 kph has been assumed on all surrounding roads, which is the average traffic speed for Outer London during PM peak hours[16]. This provides a worst-case scenario, as it is the slowest time period reported, resulting in highest exhaust emissions.

2.3.1 Queuing Traffic

Special consideration has been given to notable junctions modelled in this assessment. CERC note 60[17] has been used for estimating emissions from queuing traffic. This defines a representative AADT for queuing traffic to be 30,000 at 5 kph, assuming an average vehicle length of 4 m. These figures, along with the traffic composition of the corresponding roads were then input into the Emission Factor Toolkit (EFT)[18] to calculate emission rates. The emission rates were then used within the dispersion model as separate road sources of pre-defined length, representing each queue with time-varying emission profiles applied to represent busy periods.

2.4 Conversion of NO_X to NO_2

Evidence shows that the proportion of primary NO_2 in vehicle exhaust has increased[19]. This means that the relationship between NO_X and NO_2 at the roadside has changed from that currently used in the ADMS model. A NO_X to NO_2 calculator (Published in April

[12] http://www.dft.gov.uk/traffic-counts
[13] http://www.dft.gov.uk/statistics/series/traffic/
[14] https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra
[15] http://laqm.defra.gov.uk/documents/RTF-Automated-Traffic-Growth-Calculator-v3-1.xls
[16] Travel in London Report 10: http://www.tfl.gov.uk/corporate/publications-and-reports/travel-in-london-reports
[17] Cambridge Environmental Research Consultants Ltd, Modelling Queuing Traffic – note 60, 20th August 2004
[18] Latest version 9.0, http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html
[19] http://uk-air.defra.gov.uk/assets/documents/reports/aqeg/primary-no-trends.pdf

2019)[20] has therefore been developed and has been used in conjunction with the ADMS model to obtain a more accurate picture of NO_2 concentrations.

2.5 Model Verification

Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of predicted versus measured concentrations. Where there is a disparity, the first step is to check the input data and the model parameters in order to minimise the errors. If required, the second step will be to determine an appropriate adjustment factor that can be applied.

In the case of NO_2, the model should be verified for NO_X as the initial step and should be carried out separately for the background contribution and the source (i.e. road traffic). Once the NO_X has been verified and adjusted as necessary, a final check should be made against the measured NO_2 concentration.

For this project, modelled annual mean road-NO_X estimates have been verified against the concentrations measured at the Kentish Town Road diffusion tube site (see **Appendix A**). This site was selected because it represents the only monitoring site close to the proposed development. Ideally three verification sites would have been used, but no other sites were deemed suitable due to their distance from the development site.

The adjustment factor determined for annual mean NO_X concentrations was also applied to the modelled annual mean PM_{10} concentrations. This was done as no PM_{10} monitoring data that is representative of the development site is available, and this approach was considered more appropriate than not applying any adjustment[21].

[20] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOXNO2calc
[21] Paragraph 7.529 of LAQM TG(16)

3 Results

3.1 Results of the Dispersion Modelling

Table 4 below provides the estimated pollutant concentrations in the base year (2019) and the development year (2023) without / with[22] development. Given the inherent uncertainties in the modelling, background pollutant concentrations and vehicle fleet emission factors have been maintained at 2019 levels in the development year scenarios to provide a conservative estimate. Traffic growth has been predicted using the RTF calculator. It is worth noting that the increase in pollutant concentrations anticipated between 2019 and 2023 is not as a result of the development, but due to expected general traffic increases in the local area.

[22] The development is not expected to impact local air quality (see Section 2).

Table 4: Estimated pollutant concentrations in 2019 and 2023 ($\mu g/m^3$)

Floor level	Receptor	Annual mean NO_2 concentration (µg /m3)		Annual mean PM_{10} concentration (µg /m3)		NO_2 Change	PM_{10} change
		2019	2023	2019	2023		
Ground	A	**51.0**	**51.3**	21.5	21.5	0.4	<0.1
	B	**46.8**	**47.1**	20.8	20.9	0.4	<0.1
	C	33.1	33.2	18.9	19.0	0.1	<0.1
	D	32.7	32.9	18.9	18.9	0.1	<0.1
	E	36.6	36.8	19.3	19.4	0.2	<0.1
1	A	39.7	39.9	19.7	19.8	0.2	<0.1
	B	38.0	38.2	19.5	19.6	0.2	<0.1
	C	31.6	31.7	18.7	18.7	0.1	<0.1
	D	31.5	31.6	18.7	18.7	0.1	<0.1
	E	34.1	34.3	19.0	19.0	0.2	<0.1
2	A	32.5	32.6	18.8	18.8	0.1	<0.1
	B	32.3	32.4	18.8	18.8	0.1	<0.1
	C	30.5	30.6	18.5	18.5	0.1	<0.1
	D	30.4	30.5	18.5	18.5	<0.1	<0.1
	E	31.7	31.8	18.7	18.7	0.1	<0.1
3	A	29.7	29.8	18.4	18.4	<0.1	<0.1
	B	29.8	29.9	18.4	18.5	<0.1	<0.1

Note: Exceedances of the objectives are highlighted. The changes in NO_2 and PM_{10} presented may not exactly equal the difference in the constituent parts shown due to rounding.

Nitrogen dioxide

In the base year scenario, the model predicts annual mean NO_2 concentrations to be above the annual mean objective at receptor A and B at ground floor level. The worst-case location is identified as receptor A which is located on the façade of the proposed development located closest to Kentish Town Road, where roadside concentrations will be maximised.

The estimated annual mean NO_2 concentrations at the development site are reasonable when compared to the data collected at the nearest monitoring site. The estimated concentrations are higher at the development site compared to those recorded at the diffusion tube site due to the lower height of the receptor and its proximity to traffic queues on Kentish Town Road caused by bus stops located at the façade of the building.

The Guidance states that authorities may assume exceedances of the hourly mean objective are only likely to occur where annual mean concentrations are 60 $\mu g/m^3$ or above. Therefore, it is considered highly unlikely that this objective will be exceeded at any of the receptors modelled.

The model has also been run for a future year scenario taking into account predicted increases to traffic levels on local roads. The results indicate that annual mean NO_2 concentrations would increase by a maximum of 0.4 $\mu g/m^3$ at worst-case locations.

Particulate matter

The model estimates no exceedance against the annual mean PM_{10} objective. Potential exceedances of the daily mean PM_{10} objective can be estimated based on the annual mean[23], such that:

$$No.24 - hour\ mean\ exceedances = -18.5 + 0.00145 \times Annual\ Mean^3 + \left(\frac{206}{Annual\ Mean}\right)$$

On this basis, it is estimated that in there will be six exceedances of the daily mean PM_{10} limit value. Therefore, the daily mean PM_{10} objective would be met as 35 exceedances of limit value are allowed per year.

For estimating $PM_{2.5}$ concentrations, where no appropriate sites measuring both PM_{10} and $PM_{2.5}$ are available, then a nationally derived correction ratio of 0.7 can be used[24]. If this factor is used, then all locations in the modelling meet the EU Directive annual mean $PM_{2.5}$ limit value of 25 $\mu g/m^3$.

3.2 Mitigation Measures

Based on the ADMS results, there is no specific requirement for mitigation as concentrations are estimated to meet the objective levels at all residential levels of the development. However, whilst there is no recorded exceedance, modelled concentrations at the first floor level at receptors A and B are within 10% of the objective level. Therefore it is recommended that mitigation is considered in the form of mechanical ventilation or NO_X/NO_2 filters. If the former is utilised as a minimum, air

[23] Paragraph 7.92 of LAQM TG(16)
[24] LAQM: TG16, paragraph 7.109

inlets should be installed at the rear of the building at the main roof level of the building and circulated to the first floor of the development for the residential units fronting Kentish Town Road.

The developer is encouraged to refer to the National House Builders Registration Council's (now NHBC) guidance for installing mechanical ventilation, found in Chapter 8.3 'Mechanical ventilation with heat recovery'[25]. Some best practice for installing and maintaining mechanical ventilation includes:

- Insulating ductwork and other components from the cold
- Ensuring the appropriate location of inlet and extract to allow for maintenance and change of filters
- Checking filters following construction as they may be blocked with construction dust.

It is widely acknowledged that there is no safe level of exposure to air pollution[26], and as such, the developer is encouraged to consider further mitigation measures to reduce emissions arising from the site. The National Planning Policy Framework[27], requires new developments to support sustainable travel and air quality improvements. A key theme of the NPPF is that developments "should ensure that appropriate opportunities to promote sustainable transport can be – or have been taken up". It states that developments should be located and designed where practical to:

- Give priority to pedestrian and cycle movements and have access to high quality public transport facilities. *The proposed development site is located within very close proximity of Kentish Town railway station and therefore this requirement is met.*
- Incorporate facilities for charging plug-in and other ultra-low emission vehicles. *Not applicable*
- A key tool to facilitate the above will be a Travel Plan. All developments which generate a significant amount of movement should be required to provide a Travel Plan. *Not applicable*

3.3 Mitigating the Impacts of the Construction Phase

Emissions and dust from the construction phase of a development can have a significant impact on local air quality. The Institute of Air Quality Management (IAQM) has produced a document titled 'Guidance on the assessment of dust from demolition and construction'[28] published in May 2015. This guidance contains a methodology for determining the significance of construction developments on local air quality using a simple four step process:

- STEP 1: Screen the requirement for a more detailed assessment
- STEP 2: Assess the risk of dust impacts
- STEP 3: Determine any required site-specific mitigation
- STEP 4: Define post mitigation effects and their significance.

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[25] http://www.nhbc.co.uk/Builders/ProductsandServices/TechnicalStandards/
[26] https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution
[27] https://www.gov.uk/government/publications/national-planning-policy-framework--2 Published in July 2018
[28] http://iaqm.co.uk/guidance/

The risk of dust emissions from a demolition/construction site causing loss of amenity and/or ecological impacts is related to a number of factors, including: the activities being undertaken; the duration of these activities; the size of the site; the mitigation measures implemented and meteorological conditions. In addition, the proximity of receptors to the site and the sensitivity of these receptors to dust, impacts the level of risk from dust emissions. Receptors include both 'human receptors' and 'ecological receptors'. The former refers to a location where a person or property may experience adverse effects for airborne dust or dust soiling, or exposure to PM_{10}, over a time period relevant to the air quality objectives (see **Table 1**). Ecological receptors are defined as any sensitive habitat affected by dust soiling, through both direct and indirect effects. Following assessment of the impacts of dust as a result of the development, a qualitative risk impact level can be assigned, ranging from 'negligible' to 'high risk'. Based on the designated risk impact level, the mitigation measures which are appropriate for all sites and are applicable specifically to demolition, earthworks, construction and trackout can be determined. Examples of the general measures include:

- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site
- 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
- Ensure all loads entering and leaving the site are covered
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation

The use of the outlined IAQM methodology for assessing the impacts of dust from demolition/construction is considered to be current best practice. Therefore, it is recommended that the developer refers to the relevant IAQM documentation, to help reduce the impact of dust and vehicle exhaust emissions, and liaises with the Local Authority to come up with an acceptable dust management strategy.

In addition to the IAQM guidance referred to above, the Mayor of London has introduced standards to reduce emissions of pollutants from construction and demolition activity and associated equipment. In July 2014 the Mayor adopted the Control of Dust and Emissions from Construction and Demolition Supplementary Planning Guidance following extensive consultation. The SPG includes the world's first non-Road Mobile Machinery Low Emission Zone (NRMM LEZ) combining standards to address both nitrogen oxide (NO_X) and particulate matter (PM) emissions[29].

From 1st September 2015, construction equipment used on the site of any major development within Greater London has been required to meet the EU Stage IIIA as a minimum; and construction equipment used on any site within the Central Activity Zone or Canary Wharf has been required to meet the EU Stage IIIB standard as a minimum. Some exemptions are provided where pieces of equipment are not available at the emission standard stipulated or in the volumes required to meet demand in a construction environment as dynamic as London. From September 2020, the requirements become more stringent. Construction equipment used on major development sites within the Central Activity Zone, Canary Warf and Opportunity Areas must meet EU Stage IV standards and EU Stage IIIB across the rest of London. As Stages IIB and IV have not been defined for machines with constant speed engines, e.g.

[29] https://nrmm.london/

generators, these machines will need to meet stage V from September 2020 by default. However, in recognition of the disruption COVID-19 has caused a time limited exemption from the new standards until 28th February 2021 has been introduced.

3.4 Air Quality Neutral Assessment

London Plan Policy 7.14 requires development proposals within Greater London to be at least 'air quality neutral' in terms of buildings and transport and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs). A method for assessing this is outlined in the Sustainable Design and Construction Supplementary Planning Guidance (SPG) April 2014[30].

The proposed development is not expected to result in any trip generation and therefore is assumed to meet the Air Quality Neutral Guidance for Transport.

The SPG outlines building emission benchmarks for NO_X and PM_{10} for all land use classes and these are presented in **Table 5** below. New major developments[31] in London must meet these benchmarks or implement mitigation measures to reduce emissions either on-site or off-site. Where this is not practical or desirable, some form of pollutant offsetting could be applied. One route would be to enforce the necessary "air quality neutral" measures via a Section 106 agreement.

This development comes under land use class C3 (Residential dwellings).

Table 5: Building Emission Benchmarks by Land Use Category

Land use class	NO_X (g/m^2)	PM_{10} (g/m^2)
A1 (Retail)	22.60	1.29
A3-A5 (Restaurants, drinking establishments, hot food takeaway)	75.20	4.32
A2, B1 (Financial/professional services/business)	30.80	1.77
B2-B7 (General industrial)	36.60	2.95
B8 (Storage and distribution)	23.60	1.90
C1 (Hotels)	70.90	4.07
C2 (Residential institutions)	68.50	5.97
C3 (Residential dwellings)	26.20	2.28
D1 (a) (Medical and health services)	43.00	2.74
D1 (b) (Crèche, day centres etc.)	75.00	4.30
D1 (c-h) (Schools, libraries, places of worship etc.)	31.00	1.78
D2 (a-d) (Cinemas, concert halls etc.)	90.30	5.18
D2 (e) (Swimming pools, gymnasium etc.)	284.00	16.30

[30] https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/sustainable-design-and

[31] As outlined in the London Plan (10 or more residential dwellings (or where the number is not given, an area of more than 0.5 ha; or for all other uses, where the floor space is 1,000 m^2 or more, or the site area is 1 ha or more).The proposed development is smaller than the criteria provided but an assessment has been undertaken regardless.

The guidance on application of Air Quality Neutral[32] has been followed in this assessment. Building Emissions have been developed for the proposed building based upon:

- Gross Floor Area (m^2) of development
- On-site emissions of NO_X and PM_{10} associated with building use (kg/annum) calculated from energy use (kWh/annum) and a default emission factor (kg/kWh)

Table 6 presents the input data used for the building emissions benchmark calculation. Figures on gross internal area (GIA) were provided by the architect. Annual energy use has been estimated based upon CIBSE TM46:2008 energy benchmarks[33].

Table 6: Building Emissions Input Data

Land use class	Boiler fuel	GIA (m2)	Energy Use (kWh/annum)	NO_X EF (kg/kWh)
C3 (Residential dwellings)	Gas	464.55	420	0.00004

It has been possible to estimate annual building NO_X emissions from the input data gathered and compare this total against the relevant Building Emissions Benchmarks (**Table 7**). The results indicate that the proposed development site **meets the air quality neutral requirements for buildings**. This conclusion is based on the assumption that CSH/BREEAM Ultra-Low NO_X gas boilers (< 40 mg/Kwh) are installed, and that no other energy generation is associated with the development. Gas consumption will result in negligible particulate matter emissions and therefore compliance with the building emissions benchmarks for PM_{10} are not considered further.

In addition, the developer is directed to recent guidance manuals on reducing air pollution from boilers and buildings[34]. These manuals outline best practice guidance with advice including:

- Maximising energy efficiency
- Guidance on heating/cooling including choice of e.g. boiler systems (and fuel)
- Maintenance and control settings.

Table 7: Comparison of development building emissions to NO_X building Emissions Benchmark (TEB)

Pollutant	Land use class	BEB (g/yr)	Development (g/yr)	+/- (kg/yr)
NO_X	C3 (Residential dwellings)	12171.210	11706.660	-0.465

[32] http://www.london.gov.uk/sites/default/files/GLA%20AQ%20Neutral%20Policy%20Final%20Report%20April%202014%20J1605.pdf
[33] CIBSE TM46:2008 Table 1 Benchmark categories and values – values for "long term residential" and "general office" applied
[34] http://www.camden.gov.uk/ccm/content/environment/green/airquality/guidance-for-reducing-pollution-from-boilers-and-buildings.en

4 Summary and Conclusions

An air quality assessment has been undertaken for a proposed residential development at 329 - 331 Kentish Town Road, Camden, London. The London Borough of Camden has declared one Air Quality Management Area (AQMA) covering the whole borough due to exceedances of the annual mean nitrogen dioxide (NO_2) objective. The proposed development therefore falls within an AQMA.

A conservative approach with regards to expected improvements to air quality has been taken in that no improvement in the pollutant background concentrations or road transport emission factors has been assumed between the base year (2019) and the first year of occupation (2023). With expected improvements to the traffic fleet, improvements in pollutant concentrations may however materialise. This is in line with best practice to apply worst-case assumptions.

The ADMS-Roads dispersion model has been used to determine the impact of emissions from road traffic on sensitive receptors. Predicted concentrations have been compared with the air quality objectives. The results of the assessment indicate that annual mean NO_2 concentrations are above the objective in the base year scenario at some receptor locations. Concentrations of particulate matter (PM_{10}) are predicted to be below the annual mean objective in the base year scenario. Based on the evidence it is estimated that there will be no exceedances of either short term objective for NO_2 or PM_{10}. The future year scenario predicts that NO_2 and PM_{10} concentrations will increase by a maximum of 0.4 and < 0.1 $\mu g/m^3$, respectively as a result of general local traffic increases. At the ground and first floor of the development at receptors located at the façade of the building closest to Kentish Town Road concentrations are predicted to either be in exceedance of, or close to, the annual mean NO_2 objective. Therefore, it is recommended that mechanical ventilation is installed with inlets at the rear of the building at the main roof level of the building and circulated to the ground and first floor of the development at this location. In addition, the developer is encouraged to refer to the IAQM's 'Guidance on the assessment of dust from demolition and construction' in order to minimise the impact of the construction phase on local air quality.

The proposed development has been assessed and found to be compliant with London's 'air quality neutral' guidance for buildings and transport. The buildings assessment has been completed on the assumption that CSH/BREEAM Ultra-Low NO_X gas boilers are installed. Once the development plans regarding energy generation are confirmed re-assessment may be required.

Appendix A – Model Verification

In order to verify modelled pollutant concentrations generated in the assessment, the model has been run to predict the annual mean road-NO_X concentration during 2019 at the Kentish Town Road diffusion tube site described in **Table 2**.

The model output of road-NO_X has been compared with the 'measured' road-NO_X. Measured NO_X for the monitoring sites was calculated using the NO_X to NO_2 calculator[20].

A primary adjustment factor was determined to convert between the 'measured' road contribution and the model derived road contribution (**Figure A.1**). This factor was then applied to the modelled road-NO_X concentration for each receptor to provide adjusted modelled road-NO_X concentrations. Total NO_2 concentrations were then determined by combining the adjusted modelled road-NO_X concentrations with the 2019 background NO_2 concentration.

The results imply that the model was under-predicting the road-NO_X contribution. This is a common experience with ADMS and most other models.

Figure A.1: Comparison of Measured road-NO_X to unadjusted modelled road-NO_X concentrations

Site	Modelled Road NOx	Measured Road NOx	Adjustment Factor
CA16 Kentish Town Road	21.7	43.2	1.98

RMSE

The root mean square error (RMSE) is used to define the average error or uncertainty of the model. The following RMSE value has been calculated:

NO_2: 8.3

If the RMSE values are higher than ±25 % of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. In this case the model is being assessed against the annual mean objective, which is 40 µg/m3 for NO_2. An RMSE value of less than 10 µg/m^3 is obtained and therefore the model behaviour is acceptable.

Appendix B – Traffic Data

Table B.1: Traffic data for 2019 (and prediction for 2023 with / without development)

Road links	Annual Average Daily Traffic (AADT)	% Heavy Duty Vehicles (HDV)	Speed (kph)
A400 - Kentish Town Road	14,169 (15,330)	11.4	27
Minor roads	2,100 (2,272)	2.0	27

Note: The development is not expected to result in any additional daily traffic

Oxford Centre for Innovation

New Road

Oxford

OX1 1BY UK

+44(0)1865 261466

www.aether-uk.com