Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Document information

Document prepared for
Ian Liptrot
Metashape Limited

Date of issue
09/06/2022

Issue no.
1

Our reference
7649 - Bird In Hand - Air Quality Assessment-2206-09nv

Document prepared by
Nikita Vasilev

Quality assured by
Yiota Paraskeva

Disclaimer
This report is made on behalf of Eight Associates Ltd. By receiving the report and acting on it, the client - or any third party relying on it - accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

Contents:

Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Executive summary

Overview

Eight Associates has been commissioned to carry out an Air Quality Assessment (AQA) for the proposed development at Bird In Hand, West End Lane, North Maida Vale, NW6 4NX, in the London Borough of Camden. The proposals consist of the Conversion of Former Bird in Hand Public House and associated flat to provide 1 no dwellinghouse, and erection of five storey building to the rear to provide 9 no flats, and associated landscaping, plant, refuse and cycle storage.

The unmitigated risk to local sensitive receptors from emissions of dust and pollution from construction is deemed to be low. However, the risk will be mitigated further through the measures set out in the Air Quality & Dust Management Plan (AQDMP), which will be implemented through the contractor's Construction Environmental Management Plan. With the mitigation measures in place, the residual effects arising from the construction phase of the proposed development would be deemed 'not significant'.

The entire borough was declared as an Air Quality Management Area (AQMA) in 2002 for exceedances of the National Air Quality Objectives (NAQOs) for nitrogen dioxide (NO_2) and 24-hour mean exceedance for particulate matter (PM_{10}). Even though the NAQOs for PM_{10} and $PM_{2.5}$ are currently being met, it remains a pollutant of concern. The site is located in a NO_2 Focus Area.

A review of the latest monitoring data for NO_2 at the closest locations to the development indicates that the NAQO at the closest monitoring station has been achieved for the latest reporting year of 2020, but exceeded for 2017-2019. NAQO at another monitoring site was consistently achieved for reporting years 2019-2020. Although the sites demonstrated exceedances, there is a decreasing trend in NO_2 levels. The LAEI 2019 modelled mean annual NO_2 concentrations were estimated at approximately 31.8 $\mu g/m^3$ at the site, achieving the NAQO but exceeding the WHO guideline.

No nearby monitored mean annual PM_{10} concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of PM_{10} at the site were estimated at approximately 17.5 $\mu g/m^3$, achieving the NAQO but exceeding the WHO guidelines.

No nearby monitored mean annual $PM_{2.5}$ concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of $PM_{2.5}$ are estimated as approximately 11.5 $\mu g/m^3$, achieving the NAQO but exceeding the WHO guideline.

Since the development is located in a NO_2 Focus Area, atmospheric dispersion modelling was carried out. The performance of the modelled receptors at all modelled façades indicates the effects of NO_2, PM_{10} and $PM_{2.5}$ concentrations in the three different scenarios, 'Baseline 2019', '2025 no development' and '2025 with development' to be not significant. Therefore, residents having access to amenity spaces will not be exposed to high level of pollution.

For developments within London, the AQA methodology includes the requirement to undertake an assessment against the Air Quality Neutral (AQN) guidance. The scheme has been assessed for both the impacts of transport and building operation against the AQN guidance and it meets the requirements for AQN.

Even though further mitigation measures to reduce exposure of future occupants to pollutants are not explicitly required, the design mitigation hierarchy has been applied nonetheless, to maximise air quality for occupants, where feasible. Measures include, provision of sustainable transport modes, such as cycling, integration of low carbon energy technologies, urban greening and a well-designed mechanical ventilation system.

Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Introduction

Project Overview

Eight Associates has been commissioned to carry out an Air Quality Assessment (AQA) for the proposed development at Bird In Hand, London, NW6 4NX, in the London Borough of Camden. The proposals consist of the Conversion of Former Bird in Hand Public House and associated flat to provide 1 no dwellinghouse, and erection of five storey building to the rear to provide 9 no flats, and associated landscaping, plant, refuse and cycle storage.

The London Borough of Camden has declared an Air Quality Management Area (AQMA) for the whole Borough due to continued exceedances against National Air Quality Objectives (NAQOs) for the annual mean NO_2 and 24-hour mean exceedance for PM_{10}. Additionally, the north façade faces West End Lane. Due to the proposed nature of the development, including substantial refurbishments where occupants will be exposed to poor air quality, an AQA has been undertaken to accompany the planning application.

Scope of Assessment

An AQA has been undertaken in accordance with relevant planning policy and best-practice guidance at national, regional and local levels. The AQA includes:

- Establishment of nearby sensitive receptors to air pollution.
- Assessment of air quality and dust impacts during the construction phase.
- Establishment and review of existing air quality.
- Evaluation of outline proposals against the Air Quality Neutral (AQN) benchmarks.
- Assessment of air quality impacts expected during the operation of the new development.
- Assessment of the mitigation strategy to limit the exposure of building users and nearby receptors, to air pollution.

Key policy and guidance documents considered in the AQA are outlined in Table 1.

Table 1: National, regional and local policies and guidance.

National	National Planning Policy Framework (Ministry of Housing, Communities & Local Government, 2021)
	The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Department for Environment, Food & Rural Affairs, Defra, 2007)
	Land-Use Planning & Development Control: Planning for Air Quality (Environmental Protection UK (EPUK), Institute of Air Quality Management (IAQM), 2017)
	Clean Air Strategy (Department for Environment, Food & Rural Affairs, Defra, 2019)
	Air Quality Plan for Nitrogen dioxide (NO_2) in UK (Defra, 2017)
	Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014)
	Environment Act 2021 (Ministry of Housing, Communities & Local Government, 2021)
	A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM, 2020)
	The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ministry of Housing, Communities & Local Government, 2019)
	Local Air Quality Management: Technical guidance LAQM.TG (19) (Department for Environment, Food & Rural Affairs, Defra, 2021)
Regional	The London Plan 2021 (Mayor of London, 2021)
	Sustainable Design and Construction: Supplementary Planning guidance (Mayor of London, 2014)
	The Control of Dust and Emissions during Construction and Demolition: Supplementary Planning Guidance (Mayor of London, 2014)
	London Local Air Quality Management Technical Guidance LLAQM.TG (19) (Mayor of London, 2019)
	Clearing the Air - The Mayor's Air Quality Strategy (Mayor of London, 2010)
	Air Quality and Planning Guidance (London Councils, 2007)
Local	Camden Local Plan 2017 (London Borough of Camden, 2017)
	Camden Planning Guidance – Air Quality (London Borough of Camden, 2021)
	Clean Air Action Plan 2019-2022 (London Borough of Camden, 2018)

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Policy Review

National Legislation and Policy

The Air Quality Standards Regulations 2016 implements the requirements of EU Directive 2008/50/EC into UK legislation. Defra, on behalf of the UK Government, has produced a series of plans for the UK to meet the EU targets in the shortest possible time, the latest being the UK plan for tackling roadside NO_2 concentrations in July 2017 (NO_2 being identified as the primary pollutant for which the EU limit values are exceeded). An overview document has been produced, together with detailed plans for 37 zones where the objectives for NO_2 were not met in 2015.

The plan for the Greater London area sets out a range of measures to reduce NO_2 concentrations and indicates that with these measures, London will be compliant by 2025.

Table 2 sets out the ambient air quality standards for a range of key pollutants requiring specific objectives for ambient concentrations for pollutants UK and WHO limit values, respectively to be achieved and maintained.

Table 2: UK and WHO limit values for key pollutants.[1]

Pollutants	UK Concentrations	WHO Concentrations	Measured as	Date to be achieved by (UK only)
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times per year	25 µg/m^3	24-hour mean	31 December 2005
	40 µg/m^3	10 µg/m^3	Annual mean	31 December 2005

Table 2: UK and WHO limit values for key pollutants (continued).

Pollutants	UK Concentrations	WHO Concentrations	Measured as	Date to be achieved by (UK only)
Particles (PM_{10})	50 µg/m^3 not to be exceeded more than 35 times per year	45 µg/m^3	24-hour mean	31 December 2004
	40 µg/m^3	15 µg/m^3	Annual mean	31 December 2004
Particles ($PM_{2.5}$)	-	15 µg/m^3	24-hour mean	-
	20 µg/m^3	5 µg/m^3	Annual mean	31 December 2010
Carbon monoxide (CO)	10 mg/m^3	-	Max. daily 8-hour mean	31 December 2003
Sulphur dioxide (SO_2)	266 µg/m^3 not to be exceeded more than 35 times per year	-	15-minute mean	31 December 2005
	350 µg/m^3 not to be exceeded more than 24 times per year	-	1 hour mean	31 December 2004
	125 µg/m^3 not to be exceeded more than 3 times per year	40 µg/m^3	24-hour mean	31 December 2004
Ozone (O_3)	100 µg/m^3 not to be exceeded more than 10 times per year	100 µg/m^3	8-hour mean	31 December 2005

[1] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020. The full 2021 WHO can be viewed on WHO website.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

National Planning Policy Framework (Ministry of Housing, Communities & Local Government, 2021)

The National Planning Policy Framework (NPPF) published in July 2021 sets out the UK Government's planning policies for England. Planning law requires that applications for planning permission must be determined in accordance with the local development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It states that the purpose of the planning system is to contribute to the achievement of sustainable development; and that planning decisions on individual applications must reflect statutory requirements. Specifically, in terms of air quality, it requires the planning system to prevent development from contributing to or being put at unacceptable risk from unacceptable levels of air pollution.

Planning policies should promote compliance with or contribute towards achievement of EU limit values and NAQOs, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development within an AQMA is consistent with the local Air Quality Action Plan (AQAP).

The NPPF is supported by a series of Planning Practice Guidance (PPG) documents. The guidance in relation to air quality (PGG – Air Quality, November 2019) provides guiding principles on how planning can take account of the impact of new development on air quality.

Environment Act 2021 (Ministry of Housing, Communities & Local Government, 2021)

The Secretary of State must by regulations set a target ("the $PM_{2.5}$ air quality target") in respect of the annual mean level of $PM_{2.5}$ in ambient air. The $PM_{2.5}$ air quality target may, but need not, be a long-term target. In this section "$PM_{2.5}$" means particulate matter with an aerodynamic diameter not exceeding 2.5 micrometres. Regulations setting the $PM_{2.5}$ air quality target may make provision defining "ambient air". The duty in subsection (1) is in addition to (and does not discharge) the duty in section 1(2) to set a long-term target in relation to air quality. Section 1(4) to (9) applies to the $PM_{2.5}$ air quality target and to regulations under this section as it applies to targets set under section 1 and to regulations under that section. In this Part "the $PM_{2.5}$ air quality target" means the target set under subsection.

National Air Quality Management

Part IV of the Environment Act 1995 requires the UK Government to publish an Air Quality Strategy and for local authorities to review, assess and manage air quality within their areas, known as Local Air Quality Management (LAQM).

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra, 2007)

The 2007 Air Quality Strategy establishes the policy for ambient air quality in the UK. It includes the National Air Quality Objectives (NAQOs) for the protection of human health and vegetation for 11 pollutants. Those NAQOs included as part of LAQM are prescribed in the Air Quality Standards Regulations 2016 and the Air Quality (Amendment) (England) Regulations 2002. It should be noted that the EU limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and legal responsibility.

The EU limit values are mandatory whereas the NAQOs are policy objectives. Local authorities are not required to achieve them but have to work towards their achievement. In addition, the EU limit values apply in all locations except where members of the public do not have access and there is no fixed habitation, on factory premises or at industrial installations, and on the carriageway/central reservation of roads except where there is normally pedestrian access. Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the NAQOs, it must designate these areas as AQMAs and develop an Air Quality Action Plan (AQAP) setting out measures to reduce pollutant concentrations with the aim of meeting the NAQOs.

Clean Air Strategy (Defra, 2019)

Additionally, the Clean Air Strategy 2019 sets outs goals that will be more stringent than EU requirements with the aim of reducing human exposure to toxic pollutants by taking into account the World Health Organisation's guidelines. The policies in the Strategy aim to reduce $PM_{2.5}$ concentrations across the UK so that the number of people living in locations above the WHO annual mean guideline limit of 10 µg/m3 is reduced by 50% by 2025. Moreover, the Strategy will feed information to local authorities on how the cumulative impacts of nitrogen deposition in natural habitats should be assessed and mitigated through the planning system.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Regional Policy and Guidance

The London Plan 2021 (Mayor of London, 2021)

Policy SI 1 in the Intended London Plan 'Improving air quality' states that:

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:

- lead to further deterioration of existing poor air quality
- 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
- 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:

- development proposals must be at least Air Quality Neutral
- 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
- 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
- development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.

C Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

- 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.

Clearing the Air - The Mayor's Air Quality Strategy (Mayor of London, 2010)

The Mayor of London produced an Air Quality Strategy in 2002 under the requirements of the Greater London Authority Act 1999, which was superseded by the subsequent Air Quality Strategy, published in 2016. The Air Quality Strategy sets out how the National Air Quality Strategy would be implemented in London as a whole.

The Mayor's Air Quality Strategy outlines a number of policies to deliver the required reductions in PM_{10} and NO_2 concentrations in Greater London, to meet the EU limits. The planning process is required to improve air quality by ensuring that new developments, as a minimum, are 'air quality neutral'. With regard to the proposed development the key policies are as follows:

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

- Policy '6 - Reducing emissions from construction and demolition sites' which states that the Mayor will work with the London Council to review and update the Best Practice guidance for construction and demolition sites and create supplementary planning guidance to assist implementation;
- Policy '7 - Using the planning process to improve air quality - new developments in London as a minimum shall be 'air quality neutral' which states that the Mayor will encourage boroughs to require emissions assessments to be carried out alongside conventional air quality assessments. Where air quality impacts are predicted to arise from developments these will have to be offset by developer contributions and mitigation measures secured through planning conditions, section 106 agreements or the Community Infrastructure Levy;
- Policy '8 - Maximising the air quality benefits of low to zero carbon energy supply' which states that the Mayor will apply emission limits for both PM and NOx for new biomass boilers and NOx emission limits for Combined Heat and Power (CHP) plant. Air quality assessments will be required for all developments proposing biomass boilers or CHP plants and operators will be required to provide evidence yearly to demonstrate compliance with the emission limits; and
- Policy '9 - Energy efficient buildings' which states that the Mayor will set CO2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. These measures will result in reductions of NOx emissions.

Sustainable Design and Construction: Supplementary Planning Guidance (Mayor of London, 2014)
The Supplementary Planning Guidance (SPG), which supports the London Plan, was first published in 2006 and was updated in April 2014. The following guidance on air quality is provided in Section 4:

- Developers should design schemes to be 'Air Quality Neutral';
- Developments should be designed to minimise the generation of air pollutants;
- Developments should be designed to minimise exposure to poor air quality;
- Energy plant, including boilers and CHP) should meet relevant emission limits; and
- Developers and contractors should follow the relevant guidance on minimising impacts from construction and demolition.

The SPG states that where developers are unable to meet the 'air quality neutral' benchmark, consideration should be given to off-site NO_x and PM_{10} abatement measures.

The Control of Dust and Emissions during Construction and Demolition: Supplementary Planning Guidance (SPG) (Mayor of London, 2014)
This SPG provides detailed best practice guidance, seeking to address emissions from construction activities, including construction machinery with respect to London's 'low emission zone' for non-road mobile machinery (NRMM), introduced in 2015. The SPG incorporates the Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction' approach for assessing the risk of dust impacts from construction.

London Local Air Quality Management Technical Guidance LLAQM.TG (19) (Mayor of London, 2019)
This technical guidance - London Local Air Quality Management (LLAQM) Technical Guidance – has been prepared by the Greater London Authority (GLA) to support London boroughs in carrying out their duties under the Environment Act 1995 and connected regulations.

Local Policy and Guidance

Camden Local Plan (London Borough of Camden, adopted 2017)
The Camden Local Plan sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010)The Local Plan will cover the period from 2016-2031.The policies below relate directly to air quality and development:

Policy CC4 – Air Quality

- 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
- 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.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Camden Planning Guidance – Air Quality (London Borough of Camden, 2021)
The whole of Camden is an Air Quality Management Area (AQMA) as it does not meet national air quality objectives for nitrogen dioxide (NO_2) and because it is widely accepted that there is no safe level for particulates (PM_{10} and smaller). Air quality is particularly severe along major roads through the borough, and in the south of borough which is characterised by high levels of traffic. Major roads are those either in the Transport for London Road Network or designated as a Major Road by Camden.

- All of Camden is a designated Air Quality Management Area due to the high concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}).
- All developments are to protect future occupants from exposure to poor air quality.
- All developments are to limit their impact on local air quality and be at least air quality neutral.

Policy 3.5.Air quality assessments are to include the following:

- Emissions: An inventory of the PM_{10} and NO_x emissions associated with the proposed development, including the type and quantity of emission concentrations, during the construction and operational phase. This shall cover transport, stationary and mobile emission sources.
- Modelling: The application of atmospheric dispersion modelling to predicted NO_2 and PM_{10} concentrations, both with and without the proposed development. Dispersion modelling shall be the carried out in accordance with Air Quality and Planning Guidance, London Councils (2007) and London Local Air Quality Management Plan Technical Guidance 2016. Modelling should not predict improvements to future years (future vehicle emissions or future background concentrations).

Clean Air Action Plan 2019-2022 (London Borough of Camden, 2018)
Camden's Clean Air Action Plan has been produced as part of our duty to London Local Air Quality Management. It outlines the action we will take to improve air quality in Camden between 2019 and 2022.

Some relevant actions related to reducing emissions from buildings and new development include:

- Working to reduce emissions from our own estate and operations.
- Helping residents and visitors to reduce emissions and exposure.
- Using planning policy and regulation to reduce air pollution.
- Implementing innovative projects across the borough to improve air quality.
- Using our influence to lobby for increased financial and regulatory support for the mitigation of air pollution.
- Maintaining a monitoring network and ensuring the data is freely accessible.
- Raising awareness on how to reduce emissions and exposure.

Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Site Overview

The development site at Bird In Hand is on the south side of West End Lane in the north of the London Borough of Camden. The OS grid reference for the site is X (Eastings) 525443, Y (Northings) 183783 and the postcode is NW6 4NX. It is bounded by residential buildings to the west and to the east, West End Lane to the north and garages to the south, as illustrated in in Figure 1.

The total area of the site is approximately 360m^2 (0.04 ha). The building on site is a two-storey occupied building.

Figure 1: The red line illustrates the approximate location of the development site.

Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Development Overview

Description of Proposed Development

The proposals consist of the Conversion of Former Bird in Hand Public House and associated flat to provide 1 no dwellinghouse, and erection of five storey building to the rear to provide 9 no flats, and associated landscaping, plant, refuse and cycle storage. Illustrations of the proposed ground floor plan, first floor plan and the massing model of the development are shown in Figure 2, Figure 3 and Figure 4, respectively.

Figure 2: Proposed ground floor plan showing the residential units and residential ancillaries.

Air Quality Assessment
Bird In Hand

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Figure 3: Proposed first floor plan illustrating the residential units.

Figure 4: Massing model at West End Lane.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Local Receptors

Overview of Local Sensitive Receptors

A sensitive receptor is a location that may be affected by the emission of pollutants and / or particulate matter during construction or from the operation of a completed development, including from building plant and transport uses as a result of the new development.

In accordance with the Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction', the need for a detailed assessment of the air quality impacts from construction should be determined where the following receptors are present:

- Where there is a human receptor within:
  - 350m of the boundary of the site; and/or
  - 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- Where there is an ecological receptor within:
  - 50m of the boundary of the site; and/or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

For the purposes of identifying receptors, which may be sensitive to potential air quality impacts of dust and emissions from construction, a 350m radius from the development site is used for human receptors, a 50m radius for ecological receptors and a 500m radius is used for the trackout route for both types of receptors, as shown in Figure 5.

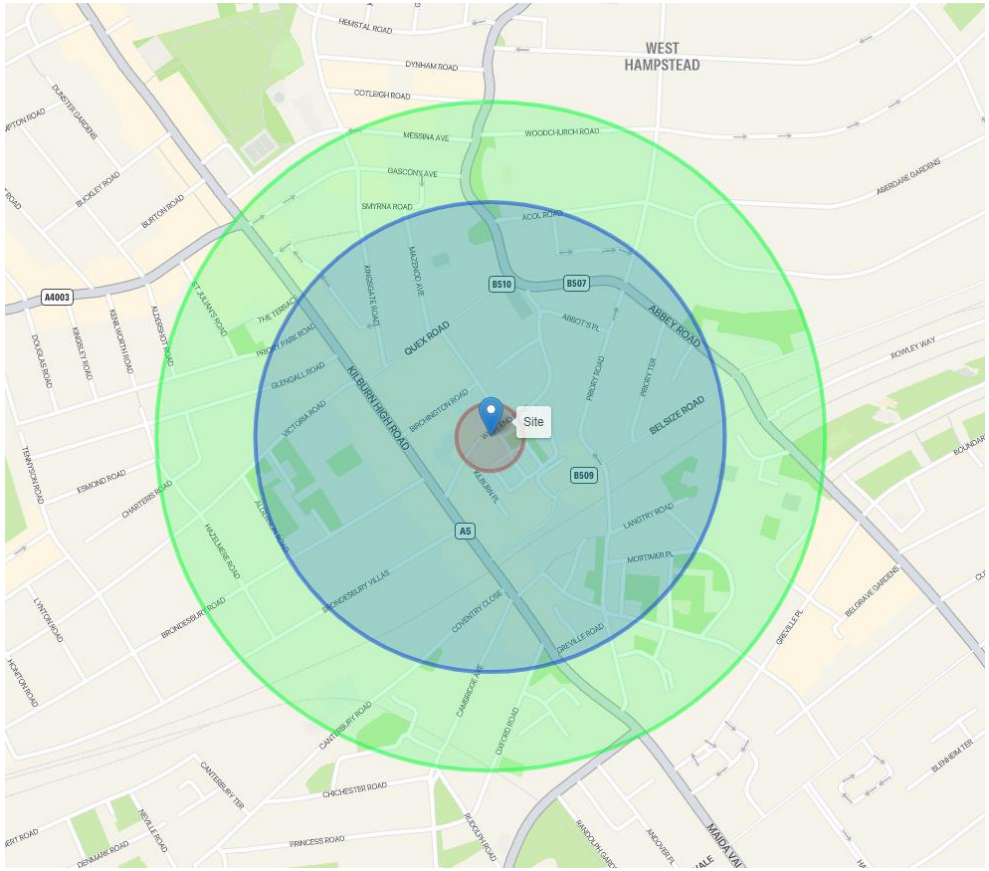

Figure 5: Map view showing a 500m radius (green), a 350m radius (blue) and a 50m radius (red) from the site.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Human Receptors

A human receptor refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM_{10} over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management. In terms of annoyance effects, this will most commonly relate to residential dwellings, but may also refer to other premises such as schools, hospitals, museums, vehicle showrooms, food manufacturers and amenity areas.

The surrounding area consists predominantly of residential buildings. Key human receptors are described below (all distances detailed are approximate).

Schools

The following schools have been identified within 350m of the development or within 500m of the trackout route:

- St Eugene de Mazenod Primary School - approximately 210m north.
- St Mary's C Of E Primary School - approximately 210m north.
- Oxfield School of Education Ltd – approximately 230m south.
- St Paul School, Lonsdale Road – approximately 230m south.
- Kilburn Grange School - approximately 340m north-west.
- 46 Murray School Club's - approximately 460m north-west.

Nurseries

The following nurseries / pre-schools have been identified within 350m of the development or within 500m of the trackout route:

- Teddies Nurseries Ltd - approximately 80m south-west.
- The Learning Tree Nursery - approximately 190m north-west.
- Busy Bees at Kilburn - approximately 250m west.
- Langtry Childrens Centre - approximately 260m east.
- Centro Infantil Menchu - approximately 320m north-west.
- Maria Montessori School – approximately 330m north-east.
- Abacus Ark Nursery Schools, Maida Vale - approximately 340m south.
- Acol Nursery Centre - approximately 380m north-east.
- N Family Club - West Hampstead Nursery - approximately 450m north.
- Bright Horizons West Hampstead Day Nursery and Preschool - approximately 450m north.
- Villas Nursery - approximately 490m west.

Hospitals

No hospitals have been identified within 350m of the development or within 500m of the trackout route.

Doctors

The following doctors have been identified within 500m of the trackout route:

- 15 Brondesbury Road – Medical centre - approximately 190m west.
- Belsize Priory Health Centre - approximately 330m east.
- London Birth Clinic - approximately 400m south.
- North London Clinic - approximately 450m west.
- Kilburn Park Medical Centre - approximately 490m south.

Ecological Receptors

Potential sensitive ecological receptors have been determined using geographic information obtained from MAGIC's website, according to a Guide to the Assessment of Air Quality Impacts On Designated Nature Conservation Sites (IAQM, 2020) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ministry of Housing, Communities & Local Government, 2019).

No statutory or non-statutory ecological sites have been identified within 50m of the development or within 500m of the trackout route:

The following sites that could represent ecological receptors but not defined as either statutory or non-statutory ecological site, have been identified within 500m of the development site:

- Priority Habitat Inventory - Deciduous Woodland (England) - approximately 400m north.
- National Forest Inventory (GB) – approximately 400m north.
- National Forest Inventory (GB) – approximately 480m north-east.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Construction Phase Impacts

Construction phase impacts, as a result of the proposed development, have been assessed using the Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction'. The construction phase impacts have been assessed for their risks in line with section 5 of the IAQM guidance.

Assessment of Construction Impacts

Using the evaluation criteria within the IAQM's guidance, the potential dust emission magnitude has been identified for each stage of the proposed development as shown in Table 3.

Table 3: Dust emission magnitudes for construction activities.

Activity	Dust emission magnitude	Justification
Demolition	Small	The total building volume to be demolished will be less than 20,000 m^3 and demolition activities will occur at no greater than 10 m above ground – **approximately 385m^3.**
Earthworks	Small	The total site area is less than 2,500 m^2. There would be less than 5 heavy earth moving vehicles active at any one time- **approximately 360m^2.**
Construction	Small	The total new building volume will be less than 25,000 m^3 – **approximately 2,479m^3.**
Trackout	Small	It is anticipated that there will be a minimal unpaved site area, which will be used for vehicle trackout. It is considered likely that there would be no more than approximately 8 outward vehicle movements of HDV (>3.5t) vehicles in any one day.

The overall sensitivity of the surrounding area to dust soiling, human health impacts and ecological effects has been determined by reviewing the sensitivity of the receptors and distance from the source. A summary of sensitivity of nearby receptors to dust impacts is given in Table 4.

Table 4: Sensitivity of nearby receptors to dust impacts.

Sensitivity of people to dust soiling	Sensitivity of people to PM_{10} health impacts	Sensitivity to ecological effects
Medium More than 10 residential units have been identified within 50m of the site.	Low More than 100 residential units, and seven nurseries are present within 350m of the development site. Nearby annual mean PM_{10} monitoring was 16 µg/m^3 in 2020.	Low No internationally or nationally designated ecological sites in proximity of the site. It is not established whether there are particularly important or vulnerable plant species in nearby green spaces, therefore precautionary principle is applied.

The dust emission magnitude determined in Table 3 has been combined with the sensitivity assessment in Table 4 to define the risk of impacts for each phase of development in the absence of mitigation measures. The sensitivity of the surrounding area has been defined in accordance with IAQM guidance and the results are given in Table 5.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Table 5: Risk to local sensitive receptors from construction dust impacts.

	Risk without mitigation	Activity			
		Demolition	Earthworks	Construction	Trackout
Potential impact	Dust soiling	Low	Low	Low	Negligible
	Human health	Negligible	Negligible	Negligible	Negligible
	Ecological effects	Negligible	Negligible	Negligible	Negligible
Overall risk of dust impacts with no mitigation		Low risk			

The overall risk of dust impacts from the construction phase without mitigation measures proposed has been assessed as being low risk. The risk across the four construction activities has been determined to be low risk or negligible. The risk of all the activities with regards to ecology is deemed to be negligible. Therefore, no further mitigation measures need specifically be recommended for protecting ecology.

Effects of Mitigation Measures

A schedule of mitigation measures has been developed for the construction phase, based on the 'Control of Dust and Emissions during Construction and Demolition: Supplementary Planning Guidance' (Mayor of London, 2014). These measures are outlined in the Air Quality & Dust Management Plan (AQDMP) (Appendix A). The measures will be incorporated in the appointed Contractor's Construction Environmental Management Plan.

The recommended AQDMP measures address the key construction activities identified and a summary of the proposed measures to satisfactorily reduce the risks from the respective construction phases is given in Table 6. The implementation of the proposed measures is deemed to mitigate the risk for each activity and thus the residual effects are deemed to be negligible.

Table 6: Summary of proposed AQDMP mitigation measures for construction phase.

Activity	Relevant mitigation measures
General (all activities)	Site management measures 1-10. Preparing and maintaining the site measures 11-23. Operating vehicle/machinery and sustainable travel measures 24-30. Operations measures 31-35. Waste management measure 36-37.
Demolition	Measures 38-41.
Earthworks	Measures 42-44
Construction	Measures 45-48.
Trackout	Measures 49-58.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Existing Air Quality

Current Local Status

The London Borough of Camden was declared an AQMA for the entire borough in 2002. The AQMA has been declared due to annual mean exceedances of NO_2 and 24-hour mean exceedances of PM_{10}. Currently, the borough meets all the NAQOs except for NO_2. Even though the NAQOs for PM_{10} and $PM_{2.5}$ are being met, they remain pollutants of concern. These pollutants are primarily produced by road traffic. However, other contributors include construction, domestic gas use and industry.

The AQAP 2018-2023 identified four Focus Areas, based on modelling using the London Atmospheric Emissions Inventory (LAEI) 2013[2]. Table 7 and Figure 6 illustrate the Focus Areas as determined by LAEI 2016 modelling data. Focus Areas are locations designated as having high levels of pollution and human exposure. The site is located in the Focus Area.

Table 7: List of Focus Areas in Camden based on LAEI 2016.

ID LAEI 2016	Focus Areas
28	Camden High Street from Mornington Crescent to Chalk Farm and Camden Road
29	Holborn and Southampton Row junction
30	Kilburn Town Centre
31	Euston Road

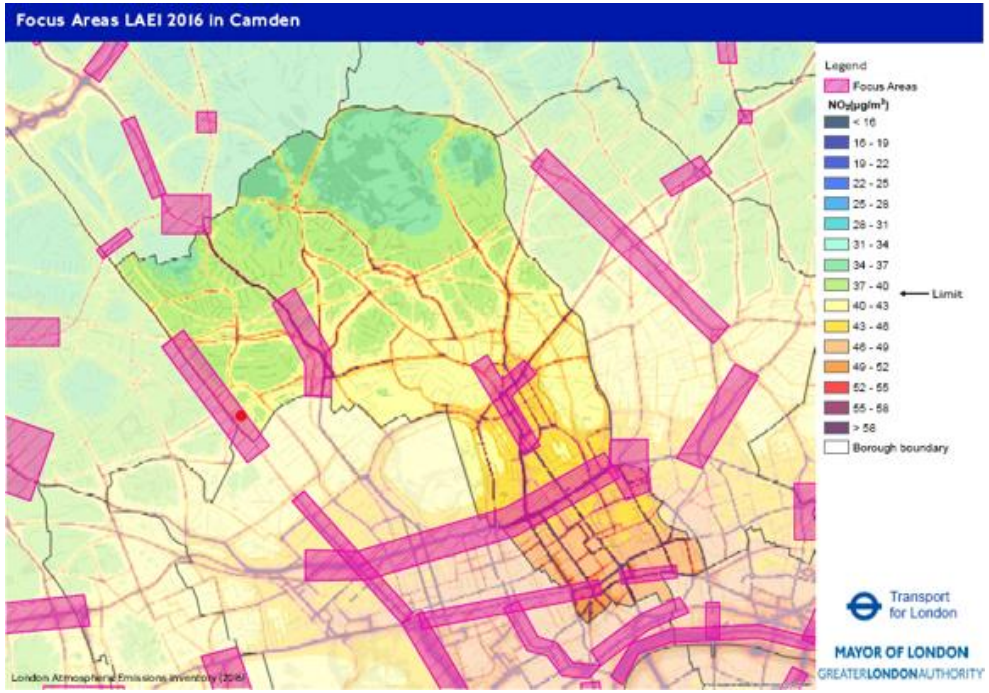

Figure 6: Focus Areas in Camden based on LAEI 2016. The red dot illustrates the approximate location of the development site.

[2] LAEI 2013 datasets were used in the AQAP.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Local Monitoring Stations

Four automatic monitoring sites and 33 non-automatic monitoring sites have been identified in the London Borough of Camden Air Quality Annual Status Report 2020. However, two non-automatic monitoring stations have been identified in the London Borough of Brent Air Quality Annual Status Report 2020 due to lack of Camden monitoring sites in close proximity to the site. Based on their proximity to the development site, completeness of data and relevance to the site, the following monitoring sites are reviewed in Table 8. Two non-automatic monitoring sites have been identified that are considered to be representative of the surroundings of the site.

Table 8: Air quality monitoring stations identified near the site.

Site ID	Site name and type	Pollutants monitored	X (Eastings)	Y (Northings)	Inlet height (m)	Distance from site (m)
BRT57 (Brent)	Kilburn Bridge, diffusion tube, roadside	NO_2	525419	183612	1.5	170
73 (Brent)	Jct Harvist Rd/Salisbury Rd opp Police St, diffusion tube, roadside	NO_2	524607	183267	2.1	980

A map, showing the approximate locations of the closest automatic monitoring stations and NO_2 diffusion tubes, in relation to the development site, is shown in Figure 7.

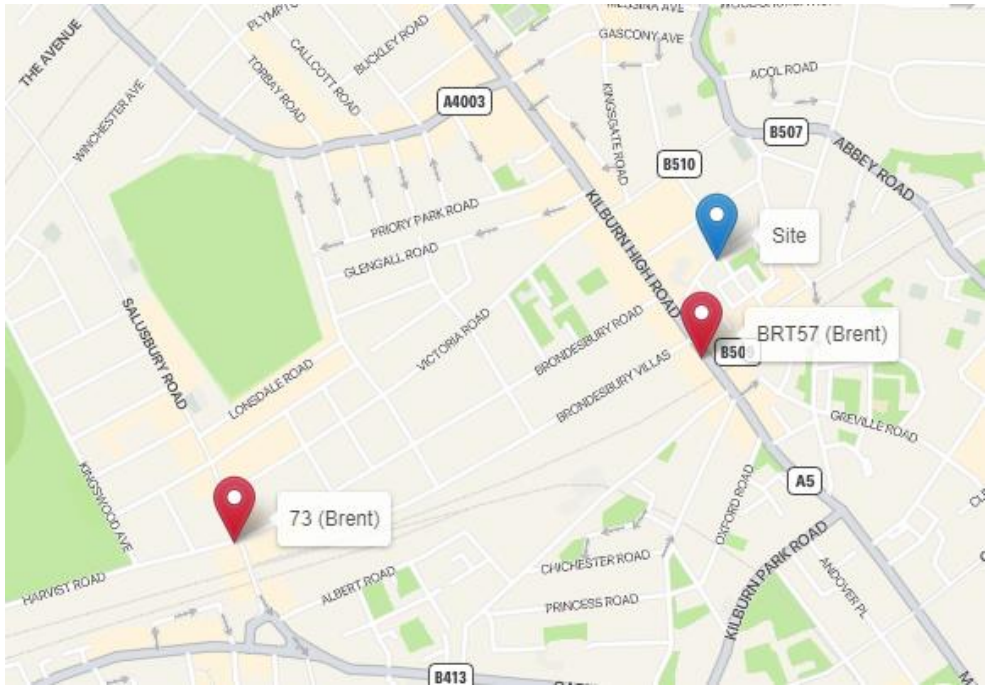

Figure 7: Map showing location of development site (shown in blue) in relation to nearby NO_2 diffusion tubes (shown in red).

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Monitored Nitrogen Dioxide (NO_2)

A summary of the latest monitoring results for NO_2 annual mean concentrations at the closest monitoring stations to the development site is given in Table 9. Exceedances of the NO_2 annual mean AQO of 40µg/m^3 are shown in bold. NO_2 annual means in excess of 60µg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in bold and underlined.

The data show that the NAQO for mean annual NO_2 concentration (for the mean annual concentration to be no more than 40 µg/m^3) closest to the development site, has been achieved at site BRT57 (Brent) for the latest reporting year of 2020. NAQOs at monitoring site 73 (Brent) were also achieved for the latest reporting years of 2019-2020. Although the sites demonstrated some exceedances in years of 2019-2017, there is a decreasing trend in NO_2 levels. Additionally, air quality is predicted to improve in the future with actions such as the introduction of electric vehicles.

Table 9: 2016-2019 NO_2 annual mean concentrations near the site.[3]

Site ID	Monitoring station type	Distance from site (m)	Annual mean concentration (µg/m^3)			
			2020	2019	2018	2017
BRT57 (Brent)	Non-automatic, roadside (0.5 m from kerb)	170	33.8	**41.7**	-	**<u>64.4</u>**
73 (Brent)	Non-automatic, roadside (1.0m from kerb)	980	26.0	34.6	-	-

A summary of the latest monitoring results for the annual exceedances of the NO_2 hourly mean concentration of 200 µg/m^3 is not provided due to lack of automatic monitoring sites in close proximity to the site.

Monitored Particulate Matter under 10 µm diameter (PM_{10})

A summary of the latest monitoring results for PM_{10} annual mean concentrations is not provided due to lack of automatic monitoring sites in close proximity to the site.

Monitored Fine Particulate Matter 2.5 µm diameter ($PM_{2.5}$)

A summary of the latest monitoring results for $PM_{2.5}$ concentrations is not provided due to lack of automatic monitoring sites in close proximity to the site.

[3] Data are obtained from the London Borough of Camden Air Quality Annual Status Report 2020 and London Borough of Brent Air Quality Annual Status Report 2020. A National Bias Adjustment Factor of 0.81 is applied to diffusion tubes data for 2020. PM_{10} monitoring does not require correction.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

LAEI 2019 modelled mean annual concentrations of NO_2, PM_{10} and $PM_{2.5}$

The London Atmospheric Emissions Inventory (LAEI)[4] is a database of geographically referenced datasets of pollutant emissions and sources in Greater London. The base year for the latest and current LAEI is 2019 and includes NO_2, PM_{10} and $PM_{2.5}$ as key pollutants.

The LAEI 2019 modelled mean annual concentrations of NO_2 for the site and surrounding area is shown in Table 10. Mean annual NO_2 concentrations were estimated at approximately 31.8 µg/m^3 at the site for 2019. The modelled data indicate that the NAQO (mean annual concentration no greater than 40 µg/m^3) was achieved and WHO guidelines (mean annual concentration no greater than 10 µg/m^3) was exceeded at the site during 2019.

The LAEI 2019 modelled mean annual concentrations of PM_{10} are shown in Table 10. Mean annual PM_{10} concentrations at the site were estimated at approximately 17.5 µg/m^3 for 2019. The modelled data indicate that the NAQO (mean annual concentration no greater than 40 µg/m^3) was achieved at the site for 2019 but the WHO guideline (mean annual concentration no greater than 15 µg/m^3) was exceeded.

The LAEI 2019 modelled mean annual concentrations of $PM_{2.5}$ are shown in Table 10.Mean annual $PM_{2.5}$ concentrations at the site were estimated at approximately 11.3 µg/m^3 for 2019. The modelled data indicate that the NAQO (mean annual concentration no greater than 20 µg/m^3) for 2019 was achieved at the site, but the WHO guideline (mean annual concentration no greater than 5 µg/m^3) was exceeded.

Table 10: 2019 modelled annual mean concentrations at the site.

Site name, address	X (Eastings)	Y (Northings)	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
Bird In Hand, West End Lane, NW6 4NX , London	525440	183780	31.8	17.5	11.3

[4] London Atmospheric Emissions Inventory (LAEI) 2019, Greater London Authority.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Modelled Background Concentrations

Defra provides modelled background concentrations for key pollutants across the UK. The 2020-2025 modelled background concentrations for NO_2, PM_{10} and $PM_{2.5}$ for the area surrounding the site are given in Table 11. The background concentrations for NO_2, PM_{10} and $PM_{2.5}$ consistently achieve the NAQOs and unfailingly decrease between the modelled years of 2020-2025.

Table 11: 2019-2023 modelled background concentrations near the site.[5]

Pollutant/particulate matter	Background concentration (µg/m³)					
	2025	2024	2023	2022	2021	2020
NO_2	21.3	21.8	22.5	23.0	23.7	24.4
PM_{10}	16.5	16.7	16.9	17.1	17.3	17.5
$PM_{2.5}$	10.7	10.8	11.0	11.1	11.3	11.4

Existing Air Quality Conclusions

Nitrogen Dioxide (NO_2)

A total of two NO_2 diffusion tubes, monitoring mean annual NO_2 concentrations, have been identified close to the development site. The data show that the NAQO for mean annual NO_2 concentration (for the mean annual concentration to be no more than 40 µg/m³) closest to the development site, has been achieved at site BRT57 (Brent) for the latest reporting year of 2020. NAQO at monitoring site 73 (Brent) was consistently achieved for reporting years 2019-2020. Although the sites demonstrated some exceedances, there is a decreasing trend in NO_2 levels.

No nearby monitored hourly mean (for no more than 18 exceedances of the 200 µg/m³ hourly mean) were recorded. The LAEI 2019 modelled mean annual NO_2 concentrations were estimated at approximately 31.8 µg/m³ at the site, achieving the NAQO but exceeding WHO guideline. The Defra modelled background concentration of NO_2 is 24.4 µg/m³ for 2020, decreasing to 21.3 µg/m³ by 2025. It is likely that mean annual NO_2 concentrations currently achieve the NAQO but exceed WHO guidelines at the development site.

Coarse particulate matter (PM_{10})

No nearby monitored mean annual PM_{10} concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of PM_{10} at the site were estimated at approximately 17.5 µg/m³, achieving the NAQO but exceeding the WHO guidelines. The Defra modelled background concentration of PM_{10} is 17.5 µg/m³ for 2020, decreasing to 16.5 µg/m³ by 2025. It is likely that the mean annual PM_{10} concentrations at the development site currently achieve the NAQO but exceed the WHO guideline at the site.

Fine particulate matter ($PM_{2.5}$)

No nearby monitored mean annual $PM_{2.5}$ concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of $PM_{2.5}$ are estimated as approximately 11.3 µg/m³, achieving the NAQO but exceeding the WHO guideline. The Defra modelled background concentration of $PM_{2.5}$ is 11.4 µg/m³ for 2020, decreasing to 10.7 µg/m³ by 2025. It is likely that mean annual $PM_{2.5}$ concentrations at the development site currently achieve the NAQO but exceed the WHO guidelines.

[5] Defra Local Air Quality Management – Background Maps. Data are obtained for the London Borough of Camden for the nearest grid square (X coordinate 525500, Y coordinate 184500) for years 2020-2025 (from 2018 baseline).

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Dispersion Modelling

Operational Impacts: Dispersion Modelling

A detailed assessment, of the feasibility of balconies facing Kilburn High Road and openable windows facing West End Lane and of effects of the development onto existing sensitive receptors, has been undertaken using the atmospheric dispersion modelling software, ADMS-Roads Extra[6].

ADMS-Roads is a comprehensive tool for investigating air pollution problems due to networks of roads that may be in combination with industrial sites, for instance small towns or rural road networks. The software uses a steady state gaussian dispersion model and incorporates advanced meteorological pre-processing, along with computation of vertical profiles of wind, turbulence, and temperature.

Model Inputs

A summary of the key model inputs and parameters is given in Appendix B. An overview of the dispersion model scenarios is given in this section of the report.

Modelled scenarios

Three scenarios are modelled as part of the assessment:

- '2019 baseline' – existing baseline traffic flows, 2018 meteorological data, 2019 emissions factors and 2019 background concentrations.
- '2025 no development' – projected 2025 traffic flows, 2018 meteorological data, 2019 emissions factors and 2019 background concentrations.
- '2025 with development' – projected 2025 traffic flows and additional traffic from the proposed Bird In Hand development, 2018 meteorological data, 2019 emissions factors and 2019 background concentrations.

Emissions sources

For the purpose of this assessment, emissions from local roads close to the site, and for which adequate traffic flow data exists, have been modelled. These roads predominantly comprise the primary access routes to the proposed development site. Pollutant concentrations from all other sources, including all non-local emissions and local emissions from all other sources apart from the roads which are predicted to significantly change are derived from the Defra modelled background concentrations.

Traffic flow data

An overview of all traffic flow data is given in Appendix C. Baseline traffic flow data for the average annual daily traffic flow (AADF) for the local road network has been obtained from the Department for Transport (DfT) website[7]. The latest DfT reporting year, 2019, has been selected for the '2019 baseline' scenario.

[6] ADMS-Roads Extra version 5 (Cambridge Environmental Research Consultants (CERC)). Further details can be found on the website.

[7] Department for Transport (DfT) Road Traffic Statistics. Accessed from the website.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Traffic flow data for 2025, the projected opening year of the development, has been obtained using the English and Welsh Regional Traffic Growth and Speed Forecasts (RTFs) and the local TEMPRO factor[8], as illustrated in Table 12. Brent growth factor was used, as roads modelled are located in the London Borough of Brent.

- Final Growth Factor = RTF factor x (Local TEMPRO factor / Regional TEMPRO factor)[9]

Table 12: Traffic growth factor values for the period of 2019-2025.

Growth Factor	Value
RTF 2025	1.0797
TEMPRO Growth Factor for Outer London (2019-2025)	1.0557
TEMPRO Growth Factor for London Borough of Brent (2019-2025)	1.0547
Final Growth Factor for 2025	1.0787

The final growth factor can then be used to predict the AADF in 2025 in the 'no development' scenario.

The scheme can be considered to be car-free with minimal trips for deliveries.

Thus, the final growth factor and the additional trips above are used in the '2025 with development' scenario.

Traffic speeds

Traffic speeds have been estimated based on-site observations and national speed limits. As such, an average traffic speed of 20 miles/hour is applied to all the road sections. Furthermore, it is assumed that the average traffic speeds on the local road network are the same for the opening year of 2025, as they are for the baseline year of 2019. See Appendix C for the full traffic flow data used for each modelling scenario and Appendix D for the layout of roads used in the model.

Street canyon effect

Narrow streets with tall buildings on either side have the potential to create a confined space, which can interfere with the dispersion of pollution from traffic and may result in heightened pollutant concentrations in these streets. In dispersion modelling, these narrow streets are described as street canyons, defined as 'narrow streets where the height of buildings on both sides of the road is greater than the road width'. ADMS-Roads includes a street canyon module to account for the additional turbulent flow patterns occurring inside such a narrow street, with relatively tall buildings on both sides. Street canyon effects have not been incorporated in the dispersion model.

[8] The TEMPRO factor is obtained from Trip End Model Presentation Program (TEMPro) (Department for Transport).

[9] The methodology is obtained from LAQM.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Modelled pollutants

Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled. Note that NO_2 concentrations have been modelled as NO_x and converted to NO_2, using the Defra NO_x to NO_2 Calculator[10], in accordance with Local Air Quality Management: Technical Guidance (TG19) (Defra, 2021).

Meteorological data

Hourly meteorological data from the London City Airport meteorological station, as the closest and most applicable station, has been used. Wind speed and direction data from London City Airport meteorological station has been plotted as a wind rose in Figure 8. Most frequent wind is from south-west with most frequent wind speed 5.1-8.2 m/s

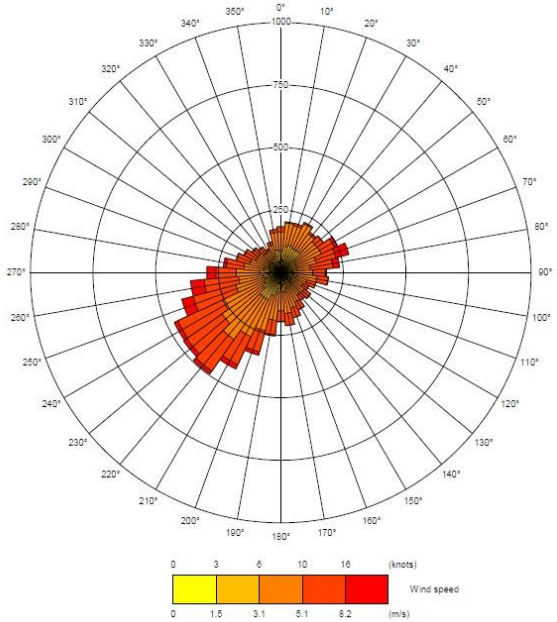

Figure 8: Wind rose for London City Airport (2018).

[10] Defra (2020) NO_x to NO_2 Calculator v8.1. Accessed from the website.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Background concentrations

Background concentrations of pollutants and particulate matter have been obtained from Defra as listed in Table 11. Defra provides a breakdown of the contribution of background concentrations from specific source types for most pollutants. The background concentration contributed by road transport from within the local area has been removed, to isolate the modelled effects of the road transport emissions on concentrations.

2019 background concentrations are used for the '2019 baseline', '2025 no development' and '2025 with development' scenarios.

Model Outputs

Dispersion models cannot predict short-term concentrations as accurately as mean annual concentrations. Furthermore, model verification for short-term concentrations is challenging, particularly with limited monitoring stations capable of recording short-term concentrations. As such, only mean annual concentrations of NO_2 and PM_{10} and $PM_{2.5}$ will be modelled. TG19 (Defra, 2021) provides guidance on estimating NO_2 hourly NAQO and PM_{10} 24-hourly NAQO exceedances, where it is not possible to model the hourly and 24-hourly impacts, respectively. See the sections 'Results for NO_2' and 'Results for PM_{10}' for further details.

Model Verification

Systematic errors in dispersion modelling results may arise from a range of factors, such as uncertainties in vehicle traffic flows, speeds, and the composition of the vehicle fleet. Such errors can be addressed and corrected for by making comparisons with monitoring data. The accuracy of the future year modelling results is relative to the accuracy of the base year results. Therefore, greater confidence can be placed in the future year concentrations if good agreement is found for the base year.

Verification of the dispersion model has been undertaken, by comparing modelled pollutant concentrations to monitored pollutant concentrations for the baseline year. Model verification is used to determine the performance of the model against 'real-world' monitored pollutant concentrations and has been undertaken in accordance with the Local Air Quality Management: Technical Guidance (TG19) (Defra, 2021).

Discrepancies between modelled and measured concentrations can arise for a number of reasons, for example:

- Traffic data uncertainties, including uncertainties in emissions factors caused by discrepancies between test cycle and real-world emissions.
- Background concentration estimates.
- Meteorological data uncertainties.
- Sources not explicitly included within the model e.g. car parks and bus stops.
- Overall model limitations, including treatment of roughness and meteorological data, treatment of traffic speeds, slowing down and idling at junctions).
- Uncertainty in monitoring data, particularly diffusion tubes.

Dispersion models may perform differently when comparing results for kerbside, roadside and background monitoring sites. For example, models may predict reasonable concentrations towards background sites, but under-predict at locations closer to the roadside. In addition to the consideration of kerbside, roadside and background sites during model verification, the different types of locations should be considered when comparing modelled and monitored concentrations. For example, modelling undertaken for roadside sites in urban areas (including areas with street canyons) may require a different adjustment to modelling undertaken for roadside sites near motorways or trunk roads in open settings.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Model refinement
Initially, the dispersion model was run using all the receptors identified in Table 8. The roads identified were A5 – Kilburn High Road and B451. Several refinements were carried out and the final model consisted only of monitoring sites BRT57 (Brent) and 73 (Brent).

Comparison
Mean annual NO_2 concentrations have been used for model verification. A comparison of monitored and modelled concentrations is given in Table 13.

Table 13: Comparison of modelled and monitored concentrations for NO_x and NO_2 (µg/m^3).

Site ID	2019 monitored NO_2	2019 monitored road contribution NO_x	2019 modelled road contribution NO_x	Ratio of monitored to modelled road contribution NO_x
BRT57 (Brent)	41.7	38.56	4.97	7.77
73 (Brent)	34.6	21.44	4.01	5.34

The mathematical relationship between monitored and modelled road contribution NO_x is given in Figure 9, with a trendline passing through zero and its derived equation.

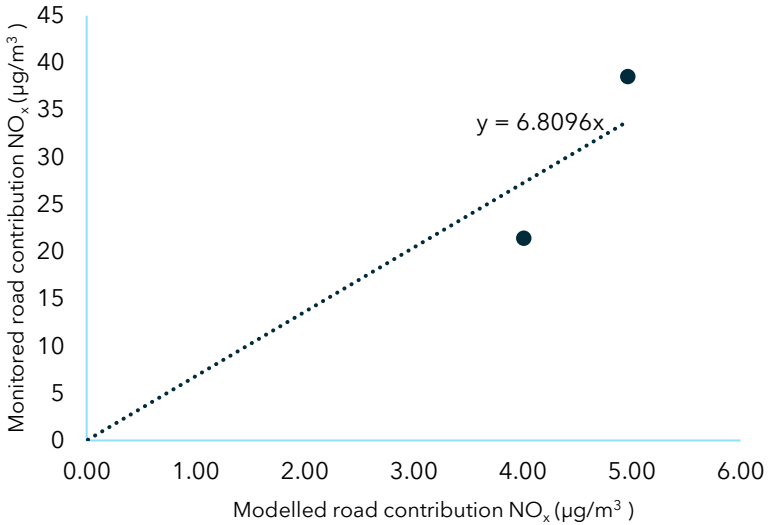

Figure 9: Comparison of monitored and modelled road contribution of NO_x at monitoring sites.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Adjustment

The adjustment factor derived from Figure 9 (6.8096) has been applied to the modelled road contribution NO_x concentrations before being converted to annual mean NO_2 concentrations using the Defra NO_x to NO_2 calculator (Table 14).

Table 14: Model verification results for NO_x and NO_2 ($\mu g/m^3$).

Site ID	Road contribution NO_x adjustment factor	Adjusted 2019 modelled road contribution NO_x	2019 modelled total NO_2	2019 monitored NO_2	% difference modelled to monitored NO_2
BRT57 (Brent)	6.8096	15.09	39.8	41.7	4.8%
73 (Brent)	6.8096	12.41	37.11	34.6	-6.8%

The correlation between modelled and monitored NO_2 concentrations at the monitoring sites has been achieved by applying a model correction factor, detailed in Table 14. The final adjusted model results in modelled concentrations that are within 10% of the monitored concentrations, as required by TG19 (Defra, 2021). This demonstrates that the adjusted model predictions are in line with the 'real-world' monitoring concentrations.

The NO_x adjustment process and derived road contribution NO_x adjustment factor has subsequently been applied to predicted concentrations at receptors for the '2019 baseline', '2025 no development' and '2025 with development' scenarios. The road contribution NO_x adjustment factor (6.8096) has subsequently been applied to all predicted concentrations of PM_{10} and $PM_{2.5}$, in accordance with TG19 (Defra, 2021).

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Modelled Receptors

Dispersion modelling determines the concentrations of pollutants at specified receptors. Receptors have been modelled at the façades facing West End Lane, balconies facing Kilburn High Road and at existing sensitive receptors but at different heights as detailed in Table 15. A plan of the modelled receptor locations is given in Figure 10.

Table 15: Summary of modelled receptors.

Receptor ID	X coordinate	Y coordinate	Description	Height (m)
RA1	525443	183783	Façade of a pub facing W End Ln, ground floor	2.5
RA2	525443	183783	Façade of a pub facing West End Lane, first floor	5.5
FF1	525450	183774	Façade facing West End Lane, ground floor	2.5
FF2	525450	183774	Façade facing West End Lane, first floor	5.5
FF3	525450	183774	Façade facing West End Lane, second floor	8.5
FF4	525450	183774	Façade facing West End Lane, third floor	11.5
FF5	525450	183774	Façade facing West End Lane, fourth floor	14.5
BA1	525451	183766	Balcony facing Kilburn High Road, ground floor	2.5
BA2	525451	183766	Balcony facing Kilburn High Road, first floor	5.5
BA3	525451	183766	Balcony facing Kilburn High Road, second floor	8.5
BA4	525451	183766	Balcony facing Kilburn High Road, third floor	11.5
BA5	525451	183766	Balcony facing Kilburn High Road, fourth floor	14.5
EA1	525431	183762	Existing sensitive receptor, 11 West End Lane, ground floor	2.5
EA2	525431	183762	Existing sensitive receptor, 11 West End Lane, first floor	5.5
EA3	525431	183762	Existing sensitive receptor, 11 West End Lane, second floor	8.5
EB1	525434	183794	Existing sensitive receptor, 17 West End Lane, ground floor	2.5
EB2	525434	183794	Existing sensitive receptor, 17 West End Lane, first floor	5.5
EB3	525434	183794	Existing sensitive receptor, 17 West End Lane, second floor	8.5

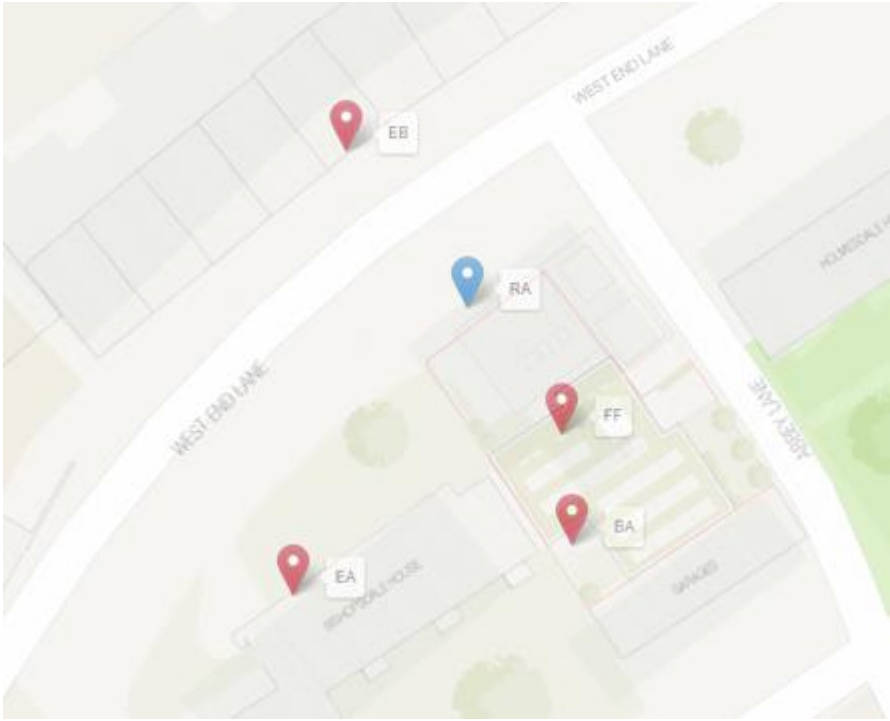

Figure 10: Plan of modelled receptors at the Bird In Hand development and existing sensitive receptors.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Significance of Effects

The significance of effects from the operational phase of the development may be assessed by comparing the change in mean annual concentrations at receptors between the modelled scenarios, in accordance with the EPUK and IAQM's 'Land-Use Planning & Development Control: Planning For Air Quality' (2017) guidance. Significance of the effects of changing concentrations is defined in accordance with the qualitative descriptors and thresholds defined in Table 16.

The significance of effects is a measure of both the pre-development concentration at a receptor (for the '2025 no development' scenario), and the change from the pre-development concentration to post-development ('2025 with development' scenario), against the relevant Air Quality Assessment Level (AQAL). In this case, the AQAL is the respective National Air Quality Objective (NAQO) for NO_2, PM_{10} and $PM_{2.5}$. Note that changes of 0% or less (i.e. less than 0.5%) are described as 'negligible'.

Table 16: Significance of effects matrix.

Long-term average concentration at receptor	% change in mean annual concentration relative to AQAL			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Results for NO_2

Table 17: Results of NO_2 annual mean concentrations ($\mu g/m^3$) for '2019 baseline', '2025 no development' and '2025 with development'.

Receptor ID	2019 baseline	2025 no development	2025 with development
RA1	27.8	29.5	29.5
RA2	27.7	29.2	29.2
FF1	27.8	29.5	29.5
FF2	27.7	29.1	29.1
FF3	27.4	28.7	28.7
FF4	27.1	28.2	28.2
FF5	26.8	27.6	27.6
BA1	27.9	29.6	29.6
BA2	27.8	29.2	29.2
BA3	27.5	28.8	28.8
BA4	27.2	28.2	28.2
BA5	26.8	27.6	27.6
EA1	28.6	30.4	30.4
EA2	28.4	29.9	29.9
EA3	28.0	29.3	29.3
EB1	27.8	29.6	29.6
EB2	27.7	29.2	29.2
EB3	27.4	28.8	28.8

Table 18: Significance of effects from NO_2 concentrations for '2025 with development'.

Receptor ID	NO_2 concentrations for '2025 with development'
RA1	Negligible
RA2	Negligible
FF1	Negligible
FF2	Negligible
FF3	Negligible
FF4	Negligible
FF5	Negligible
BA1	Negligible
BA2	Negligible
BA3	Negligible
BA4	Negligible
BA5	Negligible
EA1	Negligible
EA2	Negligible
EA3	Negligible
EB1	Negligible
EB2	Negligible
EB3	Negligible

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

NO_2 annual mean concentration

Table 17 provides an overview of the predicted mean annual NO_2 concentrations for all modelled receptors at the development site:

- NO_2 concentrations for the '2019 baseline' were significantly below the NAQO (mean annual NO_2 concentration of 40 µg/m^3) and below 36 µg/m^3, accounting for a potential 10% margin for error at all receptors.
- NO_2 concentrations for the '2025 no development' and '2025 with development' scenarios are predicted to be significantly below the NAQO and below 36 µg/m^3, accounting for a potential 10% margin for error at all receptors. The WHO limit (mean annual NO_2 concentration of 10 µg/m^3) is exceeded at all receptors.
- Residents using the amenity spaces and existing sensitive receptors are predicted not to be exposed to high level of NO_2 annual mean concentrations.

NO_2 hourly mean NAQO exceedances

Research undertaken on behalf of Defra in 2003[11] identified that exceedances of the NO_2 hourly mean NAQO are unlikely to occur where the annual mean is below 60 µg/m^3. In accordance with TG19 (Defra, 2021), this assumption is still considered to be valid, particularly for roadside locations, where road traffic is the primary source of emissions. The dispersion modelling predicts that this would be achieved at all receptors for the '2025 no development' and '2025 with development' scenarios.

Significance of impacts

With reference to the EPUK and IAQM's (2017) guidance, the significance of effects from NO_2 concentrations on the proposed development is 'negligible' at all modelled receptors, as shown in Table 18. As the percentage change in relation to NAQO is never greater than, or equal to, 0.5%, the significance of effects at all receptors is defined as 'negligible'. The impact of NO_2 concentrations on the development and existing sensitive receptors is not deemed to be significant.

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

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Results for PM_{10}

Table 19: Results of PM_{10} annual mean concentrations ($\mu g/m^3$) for '2019 baseline', '2025 no development' and '2025 with development'.

Receptor ID	2019 baseline	2025 no development	2025 with development
RA1	18.6	18.7	18.7
RA2	18.6	18.6	18.6
FF1	18.6	18.7	18.7
FF2	18.6	18.6	18.6
FF3	18.5	18.6	18.6
FF4	18.5	18.5	18.5
FF5	18.4	18.4	18.4
BA1	18.7	18.7	18.7
BA2	18.6	18.7	18.7
BA3	18.6	18.6	18.6
BA4	18.5	18.5	18.5
BA5	18.4	18.4	18.4
EA1	18.8	18.9	18.9
EA2	18.8	18.8	18.8
EA3	18.7	18.7	18.7
EB1	18.6	18.7	18.7
EB2	18.6	18.6	18.6
EB3	18.5	18.6	18.6

Table 20: Significance of effects from PM_{10} concentrations for '2025 with development'.

Receptor ID	Significance for '2025 with development'
RA1	Negligible
RA2	Negligible
FF1	Negligible
FF2	Negligible
FF3	Negligible
FF4	Negligible
FF5	Negligible
BA1	Negligible
BA2	Negligible
BA3	Negligible
BA4	Negligible
BA5	Negligible
EA1	Negligible
EA2	Negligible
EA3	Negligible
EB1	Negligible
EB2	Negligible
EB3	Negligible

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

PM_{10} annual mean concentration

Table 19 provides an overview of the predicted mean annual PM_{10} concentrations for all modelled receptors at the development site:

- PM_{10} concentrations for the '2019 baseline' were significantly below the NAQO (mean annual PM_{10} concentration of 40 µg/m^3) and below 36 µg/m^3, accounting for a potential 10% margin for error at all receptors. The WHO guideline (mean annual PM_{10} concentration of 15 µg/m^3) was exceeded at all receptors.
- PM_{10} concentrations are predicted to be well below the NAQO (mean annual PM_{10} concentration of 40 µg/m^3) and below 36 µg/m^3, accounting for a potential 10% margin for error, for the '2025 no development' and '2025 with development' scenarios at all receptors. The WHO limit (mean annual PM_{10} concentration of 15 µg/m^3) is exceeded at all receptors.
- Residents using the amenity spaces and existing sensitive receptors are predicted not to be exposed to high level of PM_{10} annual mean concentrations.

PM_{10} 24-hour mean NAQO exceedances

TG19 (Defra, 2021) provides a methodology to estimate the likely 24-hourly concentrations for PM_{10} from annual mean concentrations as shown in the equation below. The highest PM_{10} concentration for the '2025 baseline' scenario (18.7 µg/m^3) results in an estimated number of annual occurrences of the 24-hourly mean above 200 µg/m^3 of 2.0 (significantly less than the NAQO of 18). It is therefore concluded that this NAQO would be achieved at the site.

$$likely\ 24\ hourly\ PM_{10}\ concentrations\ = -18.5 + 0.00145 \times Annual\ Mean^3 + \frac{206}{Annual\ Mean}$$

Significance of impacts

The significance of effects of PM_{10} concentrations on the proposed development and existing sensitive receptors is deemed to be 'negligible' at all receptors, as demonstrated in Table 20.

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Results for $PM_{2.5}$

Table 21: Results of $PM_{2.5}$ annual mean concentrations ($\mu g/m^3$) for '2019 baseline', '2025 no development' and '2025 with development'.

Receptor ID	2019 baseline	2025 no development	2025 with development
RA1	12.1	12.1	12.1
RA2	12.0	12.1	12.1
FF1	12.1	12.1	12.1
FF2	12.0	12.1	12.1
FF3	12.0	12.0	12.0
FF4	12.0	12.0	12.0
FF5	11.9	11.9	11.9
BA1	12.1	12.1	12.1
BA2	12.1	12.1	12.1
BA3	12.0	12.1	12.1
BA4	12.0	12.0	12.0
BA5	11.9	11.9	11.9
EA1	12.2	12.2	12.2
EA2	12.1	12.2	12.2
EA3	12.1	12.1	12.1
EB1	12.1	12.1	12.1
EB2	12.0	12.1	12.1
EB3	12.0	12.0	12.0

Table 22: Significance of effects from $PM_{2.5}$ concentrations for '2025 with development'.

Receptor ID	NO_2 concentrations for '2023 with development'
RA1	Negligible
RA2	Negligible
FF1	Negligible
FF2	Negligible
FF3	Negligible
FF4	Negligible
FF5	Negligible
BA1	Negligible
BA2	Negligible
BA3	Negligible
BA4	Negligible
BA5	Negligible
EA1	Negligible
EA2	Negligible
EA3	Negligible
EB1	Negligible
EB2	Negligible
EB3	Negligible

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

$PM_{2.5}$ annual mean concentration

Table 21 provides an overview of the predicted mean annual $PM_{2.5}$ concentrations for all modelled receptors at the development site:

- $PM_{2.5}$ concentrations for the '2019 baseline' were significantly below the NAQO (mean annual $PM_{2.5}$ concentration of 20 µg/m^3) and below 18 µg/m^3, accounting for a potential 10% margin for error at all receptors. However, the WHO guideline was not achieved.
- $PM_{2.5}$ concentrations are predicted to be well below the NAQO (mean annual $PM_{2.5}$ concentration of 20 µg/m^3) and below 18 µg/m^3, accounting for a potential 10% margin for error for 2025 no development' and '2025 with development' scenarios at all receptors. The WHO limits (mean annual $PM_{2.5}$ concentration of 5 µg/m^3) are exceeded at all modelled receptors.
- Residents using the amenity spaces and existing sensitive receptors are predicted not to be exposed to high level of PM2.5 annual mean concentrations.

Significance of impacts

The significance of effects from $PM_{2.5}$ concentrations on the proposed development and existing sensitive receptors is deemed to be 'negligible' at all receptors, as demonstrated in Table 22.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Air Quality Neutral

Operational Impacts: Air Quality Neutral

Policy SI 1 in the London Plan 2021, 'Improving air quality' requires that development proposals should not lead to further deterioration of exiting poor air quality and that they must be at least Air Quality Neutral (AQN). The proposed development has been assessed for its performance against the AQN guidance and benchmarks, for both transport and building-related emissions.

Air Quality Neutral: Transport Emissions

The AQN guidance provides a methodology for calculating the Transport Emissions Benchmark (TEB) for specific land use types. The TEB has been calculated for the development (Table 23) using the factors for Class C3 (residential).

The development proposal does not include any additional car parking spaces. Therefore, traffic related air quality impacts are assessed to be negligible.

Table 23: Transport Emissions Benchmark (TEB).

Development metric	Residential
Applicable planning use class for TEB	Dwelling Houses (C3)
Gross Internal Area (m^2)	575.8
Number of dwellings – residential only	9
Location (CAZ/inner/outer)	Outer
NO_x TEB factor (g/m^2/year) – non-residential	0.0
NO_x TEB factor (g/dwelling/year) - residential	1553.0
Total NO_x TEB (kg/year)	**14.0**
PM_{10} TEB factor (g/m^2/year) – non-residential	0.0
PM_{10} TEB factor (g/dwelling/year) - residential	267.0
Total PM_{10} TEB (kg/year)	**2.4**

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Table 24: Comparison of calculated transport emissions against TEBs.

Development metric	Residential
Applicable planning use class for TEB	Dwelling Houses (C3)
Daily trips by car	0
Annual car trips by car	0
Location (CAZ/inner/outer)	Outer
Average distance travelled per car trip (km)	11.4
Annual distance travelled by car (km/year)	0.0
NO_x emissions factor (g/km)	0.353
Total NO_x emissions (kg/year)	0.0
Difference from NO_x TEB to actual	-14.0
Transport NO_x AQN result	Pass
PM_{10} emissions factor (g/km)	0.0606
Total PM_{10} emissions (kg/year)	0.0
Difference from PM_{10} TEB to actual	-2.4
Transport PM_{10} AQN result	Pass

The development passes the AQN test for transport emissions based on the proposed trip generations (Table 24).

Air Quality Neutral: Building Emissions

The AQN guidance provides a methodology for calculating the Building Emissions Benchmark (BEB) for specific land use types. The BEB has been calculated for the development (Table 25) using the factors for Class C3.

Table 25: Building Emissions Benchmark (BEB).

Development metric	Residential
Applicable planning use class for BEB	Dwelling Houses (C3)
Gross internal area (m^2)	575.8
NO_x BEB factor (g/m^2/year)	26.2
Total NO_x BEB (kg/year)	**15.1**
PM_{10} BEB factor (g/m^2/year)	2.28
Total PM_{10} BEB (kg/year)	**1.3**

An Energy Statement was produced by Eight Associates in April 2022, which is based on a strategy to reduce energy demand as far as practically and economically possible, by implementing energy efficiency measures before applying low carbon and renewable energy technologies. The use of biomass, combined heat and power (CHP) and gas boilers have been excluded from the scheme. The residential units are served by air source heat pumps to provide heating and hot water along with photovoltaic solar panels for on-site electricity generation, where space is available.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Since the energy consumption will all be electricity-based, the development, therefore, passes the AQN test for building emissions (Table 26).

Table 26: Comparison of calculated building emissions against BEBs.

Development metric	Residential
Applicable planning use class for BEB	Dwelling Houses (C3)
Total annual gas consumption from boilers (mg/kWh)	0
Boilers NO_x emissions factor (mg/kWh)	38
Total NO_x emissions from boilers (kg/year)	0.0
Total annual gas consumption from CHP (kWh/year)	0.0
CHP NO_x emissions factor (mg/kWh)	0.0
Total NO_x emissions from CHP (kg/year)	0.0
Total NO_x emissions (kg/year)	0.0
Difference from NO_x BEB to actual	-15.1
Building NO_x AQN result	**Pass**
Total annual oil or solid fuel consumption (kWh/year)	0.0
PM_{10} emissions factor (mg/kWh)	0.0
Total PM_{10} emissions (kg/year)	0.0
Difference from PM_{10} BEB to actual	-1.3
Building PM_{10} AQN result	**Pass**

Air Quality Neutral Statement

The Sustainable Design and Construction SPG issued by the Mayor of London, sets out the requirement for all major developments in Greater London to undertake an AQN Test and be designed so that they are at least 'air quality neutral'. A development is considered to be AQN if it can be demonstrated that both emissions from the operation of a proposed development and transport as a result of the proposed development achieve the relevant emissions benchmarks provided in the AQN guidance.

The development achieves both the TEB and BEB and, therefore, passes the AQN test. No additional mitigation for the purposes of AQN is required.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Mitigation Measures

Pollution Mitigation Hierarchy

The development passes the AQN test for transport and building emissions. Additionally, the impact of NO_2, PM_{10} and $PM_{2.5}$ concentrations on the development are deemed to be insignificant at the façade facing West End Lane as per the air dispersion modelling. Therefore, no additional mitigation or offsetting measures for the operational phase of the development will be required.

However, the principles of the pollution mitigation hierarchy, outlined in the Institute of Air Quality Management (IAQM) 'Mitigation of Development Air Quality: Position Statement', have been applied to the proposed development to minimise the exposure of future building users and occupants.

1. Prevention and Avoidance

Preference should be given to preventing or avoiding exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives.

Cycle storage

Cycling will be promoted by the inclusion of cycle storage of 22 spaces in the apartment block and 2 spaces accessed separately in the house

Sustainable energy technologies

The Energy Statement excluded any use of biomass, combined heat and power (CHP) and gas-fired boilers for the scheme. The residential units are served by air source heat pumps to provide heating and hot water along with photovoltaic solar panels for on-site electricity generation, where space is available.

2.a Reduction and Minimisation: Mitigation Measures that act on the Source

Reduction and minimisation of exposure/impacts should next be considered, once all options for prevention/avoidance have been implemented so far as is reasonably practicable (both technically and economically).

No mitigation measures are proposed.

2.b. Reduction and Minimisation: Mitigation Measures that act on the Pathway

Urban greening

The proposed development will include soft landscaping within the amenity spaces of the development. These strategies of urban greening will help alleviate pollution, benefitting the air quality of the development. In addition, it will introduce a new biodiversity to the development, contributing to the ecology of the area.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

2.c. Reduction and Minimisation: Mitigation Measures at or Close to the Point of Receptor Exposure

Ventilation strategy

The ventilation strategy for the development will use mechanical ventilation with heat recovery. Intakes for the mechanical ventilation system should be located as far as possible from the primary sources of pollution. In accordance with the latest BREEAM New Construction 2018 Hea 02 Ventilation guidance, fresh air intakes should preferably be at least 10m away from all external pollution sources, as well as at least 10m away from ventilation exhausts (to prevent recirculation of air).

All mechanical ventilation systems should be designed in accordance with BS EN 16798:2017 'Energy Performance of Buildings – Ventilation for Buildings' and BS EN ISO 16890:2016 'Air Filters for General Ventilation'. In accordance with these standards, consideration must be given to the quality of the outdoor air at the proposed location of the building and the design should incorporate the following mitigation measures:

- Air intakes should be located where the outdoor air is least polluted, where outdoor air pollution concentrations are not uniform around the building.
- Some form of filtration and/or air cleaning should be applied, where outdoor air pollution concentrations are significant. Tables 16 and 17 of BS EN 16798:2017 (Part 3) should be followed to determine the appropriate required level of filtration efficiency for particulate and gaseous filtration systems.

To verify that the filtration system continues to operate as designed, the records of air filtration maintenance must be obtained, including evidence that filters have been properly maintained as per the manufacturer's recommendations. Additionally, activated carbon filters or combination particulate/carbon filters may be considered for installation in the main air ducts to filter recirculated air.

3. Off-setting

Off-setting a new development's air quality impact by proportionately contributing to air quality improvements elsewhere (including those identified in Air Quality Action Plans and low emission strategies) should only be considered once the solutions for preventing/avoiding, and then for reducing/minimising, the development-specific impacts have been exhausted. Even then, offsetting should be limited to measures that are likely to have a beneficial impact on air quality in the vicinity of the development site. It is not appropriate to attempt to offset local air quality impacts by measures that may have some effect remote from the vicinity of the development site.

The mitigation measures proposed are appropriate to the scale and nature of the development (see sections 1. to 2.c. above). No additional off-setting measures are proposed.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Conclusion

Conclusions

The unmitigated risk to local sensitive receptors from emissions of dust and pollution from construction is deemed to be low. However, the risk will be mitigated further through the measures set out in the Air Quality & Dust Management Plan (AQDMP), which will be implemented through the contractor's Construction Environmental Management Plan. With the mitigation measures in place, the residual effects arising from the construction phase of the proposed development would be deemed 'not significant'.

The entire borough was declared as an Air Quality Management Area (AQMA) in 2002 for exceedances of the NAQOs for the annual mean NO_2 and 24-hour mean exceedance for PM_{10}. The site is located in a NO_2 Focus Area.

A review of the latest monitoring data for NO_2 at the closest locations to the development indicates that the NAQO at the closest monitoring station has been achieved for the latest reporting year of 2020, but exceeded for 2017-2019. NAQO at another monitoring site was consistently achieved for reporting years 2019-2020. Although the sites demonstrated exceedances, there is a decreasing trend in NO_2 levels. The LAEI 2019 modelled mean annual NO_2 concentrations were estimated at approximately 31.8 µg/m^3 at the site, achieving the NAQO but exceeding the WHO guideline.

No nearby monitored mean annual PM_{10} concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of PM_{10} at the site were estimated at approximately 17.5 µg/m^3, achieving the NAQO but exceeding the WHO guidelines.

No nearby monitored mean annual $PM_{2.5}$ concentrations were recorded. The LAEI 2019 modelled mean annual concentrations of $PM_{2.5}$ are estimated as approximately 11.5 µg/m^3, achieving the NAQO but exceeding the WHO guideline.

Since the development is located in a NO_2 Focus Area, atmospheric dispersion modelling was carried out. The performance of the modelled receptors at all modelled façades indicates the effects of NO_2, PM_{10} and $PM_{2.5}$ concentrations in the three different scenarios, 'Baseline 2019', '2025 no development' and '2025 with development' are not significant. Therefore, residents having access to amenity spaces will not be exposed to high level of pollution.

For developments within London, the AQA methodology includes the requirement to undertake an assessment against the Air Quality Neutral (AQN) guidance. The scheme has been assessed for both the impacts of transport and building operation against the AQN guidance and it meets the requirements for AQN.

Even though further mitigation measures to reduce exposure of future occupants to pollutants are not explicitly required, the design mitigation hierarchy has been applied nonetheless, to maximise air quality for occupants, where feasible. Measures include, provision of sustainable transport modes, such as cycling, integration of low carbon energy technologies, urban greening and a well-designed mechanical ventilation system.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Appendix A

Air Quality & Dust Management Plan: Roles and Responsibilities

The Site Manager will have overall responsibility for dust management during construction and will ensure that all site personnel are effectively briefed and given adequate resources to undertake the air quality and dust management requirements, as set out in this Air Quality & Dust Management Plan (AQDMP).

Key roles and responsibilities for the Site Manager and site personnel are outlined in Table A-1.

Table A-1: Schedule of AQDMP responsibilities.

Role	Responsibilities
Site manager	Ensure that the mitigation and monitoring requirements outlined in the AQDMP are carried out during works on site.
	Ensure that staff are aware of the requirements of the AQDMP and have access to the document. Regular training of staff should be implemented.
	Undertake and record dust inspections of the site as required by the AQDMP.
	Ensure that site documentation (including method statements and risk assessments) include adequate dust mitigation.
	Act on complaints and dust alerts as detailed in the AQDMP.
	Maintain up-to-date site log of air quality events and complaints.
	Investigate the cause of air quality events and apply additional mitigation are required.
	Act as the key point of contact for queries and complaints regarding air quality emissions from site.
	Report observations of dust events or deviations from the AQDMP procedures.

Table A-1: Schedule of AQDMP responsibilities (continued).

Role	Responsibilities
Site personnel	Carry out the works in accordance with the AQDMP requirements.
	Report observations of dust events or deviations from the AQDMP procedures.
	Attend environmental management training.

Hours of Work

Normal working hours for Bird In Hand construction site will be as follows:

- Monday – Friday: 08:00 - 18:00.
- Saturday: 08:00 - 13:00.

There will not typically be any construction activities undertaken outside of the stated working hours, including on Sundays, Public Holidays or Bank Holidays. In the event that construction activities are sought to be undertaken outside of the normal working hours, these will be agreed in writing with the local planning authority in advance.

Measures Relevant for Demolition, Earthworks, Construction and Trackout

Robust site management will be required to control the dust emissions from construction activities. Mitigation methods, in accordance with 'The Control of Dust and Emissions during Construction and Demolition' SPG (Mayor of London, 2014) have been proposed for the site.

All 'required' mitigation measures must be implemented. We would strongly recommend that all 'recommended' measures are implemented, along with those that are 'not required' where feasible.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

It is recommended that these measures, as detailed in Table A-2, be set out in the site-specific Construction Environmental Management Plan, which will form part of the proposed development's overall Construction Management Plan.

Table A-2: Schedule of construction phase mitigation measure requirements.

Site management	
Mitigation measure	Compliance requirements
1) Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Not required
2) Develop a Dust Management Plan.	Not required
3) Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.	Required
4) Display the head or regional office contact information.	Required
5) Record and respond to all dust and air quality pollutant emissions complaints.	Required
6) Make a complaint log available to the local authority when asked.	Required
7) Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.	Required
8) Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.	Required
9) Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.	Required

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Site management	
Mitigation measure	Compliance requirements
10) Hold regular liaison meetings with other high-risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.	Not required
Preparing and maintaining the site	
Mitigation measure	Compliance requirements
11) Plan site layout: machinery and dust causing activities should be located away from receptors	Required
12) Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.	Required
13) Full enclosure of the site or specific operations where there is a high potential for dust production and the site is active for an extensive period..	Recommended
14) Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.	Not required
15) Avoid site runoff of water and mud.	Required
16) Keep site fencing, barriers and scaffolding clean using wet methods.	Recommended
17) Remove materials from site as soon as possible.	Recommended
18) Cover, seed or fence stockpiles to prevent wind whipping.	Not required
19) Carry out regular dust soiling checks of buildings within 100 m of site boundary and cleaning to be provided if necessary.	Not required

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Preparing and maintaining the site	
Mitigation measure	Compliance requirements
20) Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust.	Not required
21) Agree monitoring locations with the Local Authority.	Not required
22) Where possible, commence baseline monitoring at least three months before phase begins.	Not required
23) Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	Not required

Operating vehicles/machinery and sustainable travel	
Mitigation measure	Compliance requirements
24) Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.	Required
25) Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.	Required
26) Ensure all vehicles switch off engines when stationary – no idling vehicles.	Required
27) Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where possible.	Required
28) Impose and signpost a maximum-speed-limit of 10mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	Recommended

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Operating vehicles/machinery and sustainable travel	
Mitigation measure	Compliance requirements
29) Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	Not required
30) Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	Required

Operations	
Mitigation measure	Compliance requirements
31) 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.	Required
32) Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).	Required
33) Use enclosed chutes, conveyors and covered skips.	Required
34) Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Required
35) Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Not required

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Waste management	
Mitigation measure	Compliance requirements
36) Reuse and recycle waste to reduce dust from waste materials.	Required
37) Avoid bonfires and burning of waste materials.	Required

Measures Specific to Demolition

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Demolition	
Mitigation measure	Compliance requirements
38) Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Recommended
39) Ensure water suppression is used during demolition operations.	Required
40) Avoid explosive blasting, using appropriate manual or mechanical alternatives.	Required
41) Bag and remove any biological debris or damp down such material before demolition.	Required

Measures Specific to Earthworks

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Earthworks	
Mitigation measure	Compliance requirements
42) Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces.	Not required
43) Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.	Not required
44) Only remove secure covers in small areas during work and not all at once.	Not required

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Measures Specific to Construction

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Construction	
Mitigation measure	Compliance requirements
45) Avoid scabbling (roughening of concrete surfaces) if possible.	Recommended
46) 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.	Recommended
47) Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Not required
48) For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Not required

Measures Specific to Trackout

Table A-2: Schedule of construction phase mitigation measure requirements (continued).

Trackout	
Mitigation measure	Compliance requirements
49) Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.	Recommended
50) Avoid dry sweeping of large areas.	Recommended
51) Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.	Recommended
52) Record all inspections of haul routes and any subsequent action in a site logbook.	Not required
53) Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.	Not required
54) Inspect haul routes for integrity and instigate necessary repairs to the surface, as soon as reasonably practicable.	Not required
55) Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Recommended
56) Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Not required
57) Access gates to be located at least 10m from receptors, where possible.	Not required
58) Apply dust suppressants to locations where a large volume of vehicles enters and exit the construction site.	Not required

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Appendix B

Dispersion Model Inputs

Table B- 1: Summary of inputs and parameters used in dispersion model.

Parameter	Description	Input value
Software type	ADMS-Roads Extra version 5	-
Coordinate system	Setting to align geographical data with a coordinate system.	*OSGB 1936 / British National Grid* used.
Chemistry	Settings to calculate the atmospheric chemical reactions between nitric oxide (NO), ozone (O_3) and volatile organic compounds (VOCs).	No atmospheric chemistry parameters included.
Meteorology	Representative meteorological data from a local source.	*London City Airport meteorological station*, hourly sequential data used.
Surface roughness	Setting to define the surface roughness of the model area based on its location and surface characteristics.	*1.5m* selected, representing a typical surface roughness for *large urban areas*.
Latitude	Setting to allow the location of the model area to be defined.	*52°* selected for United Kingdom.
Advanced dispersion site data	Settings to define specific surface albedo, minimum Monin-Obukhov length, Priestley-Taylor parameter and precipitation factor for site.	Advanced dispersion site parameters included for Minimum Monin-Obukhov length, and model defaults used for all other parameters.
Elevation of roads	Setting to allow the height of road links above ground level to be specified.	All road links set to ground level at *0m*.
Road width	Setting to allow the width of the road links to be specified.	Road widths selected for individual road links based on data obtained from OS map data.
Topography	Setting to allow complex terrain data to be included within the model in order to account for topographical effects on turbulence and plume spread.	No regional topographical data files available to complex terrain data inputs not used.
Time varied emissions	Setting to enable daily, weekly or monthly variations in emissions to be applied to emissions sources.	Time varied emissions data inputs are not used.
Road type	Setting to allow the effect of different types of roads to be assessed.	London (outer) road type selected.
Road speeds	Setting to accommodate the effects of road speeds on different roads on emissions sources.	Individual road speeds based on national speed limits and observations from street images.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Table B- 1: Summary of inputs and parameters used in dispersion model (continued).

Parameter	Description	Input value
Street canyon modelling	Settings to enable both 'basic' and 'advanced' street canyon modelling of road links.	Street canyon modelling is not relevant for this site.
Road source emissions	Settings to input road source emissions based on road traffic emission calculation method.	UK Emissions Factor Toolkit (EFT) version 11.0 selected for the respective baseline and proposed operational years of the development.
Point source emissions	Settings to input point sources, for example from industrial sources and energy centres.	No point source emissions included.

eight associates
+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Appendix C

Dispersion Model Traffic Inputs

Table C- 1: Traffic flow data [average speed, annual average daily traffic flow (AADT) and % contribution of heavy duty vehicles (HDVs) to AADT] for each modelled scenario.

Road name	Speed (km/h)	2019 baseline		2025 no development		2025 with development	
		AADT	% HDV	AADT	% HDV	AADT	% HDV
A5	32	13,935	15%	15,032	15%	15,032	15%
B451	32	5,461	1%	5,891	1%	5,891	1%

eight associates

+44 (0)20 7043 0418
www.eightassociates.co.uk
info@eightassociates.co.uk

Appendix D

Dispersion Model Area

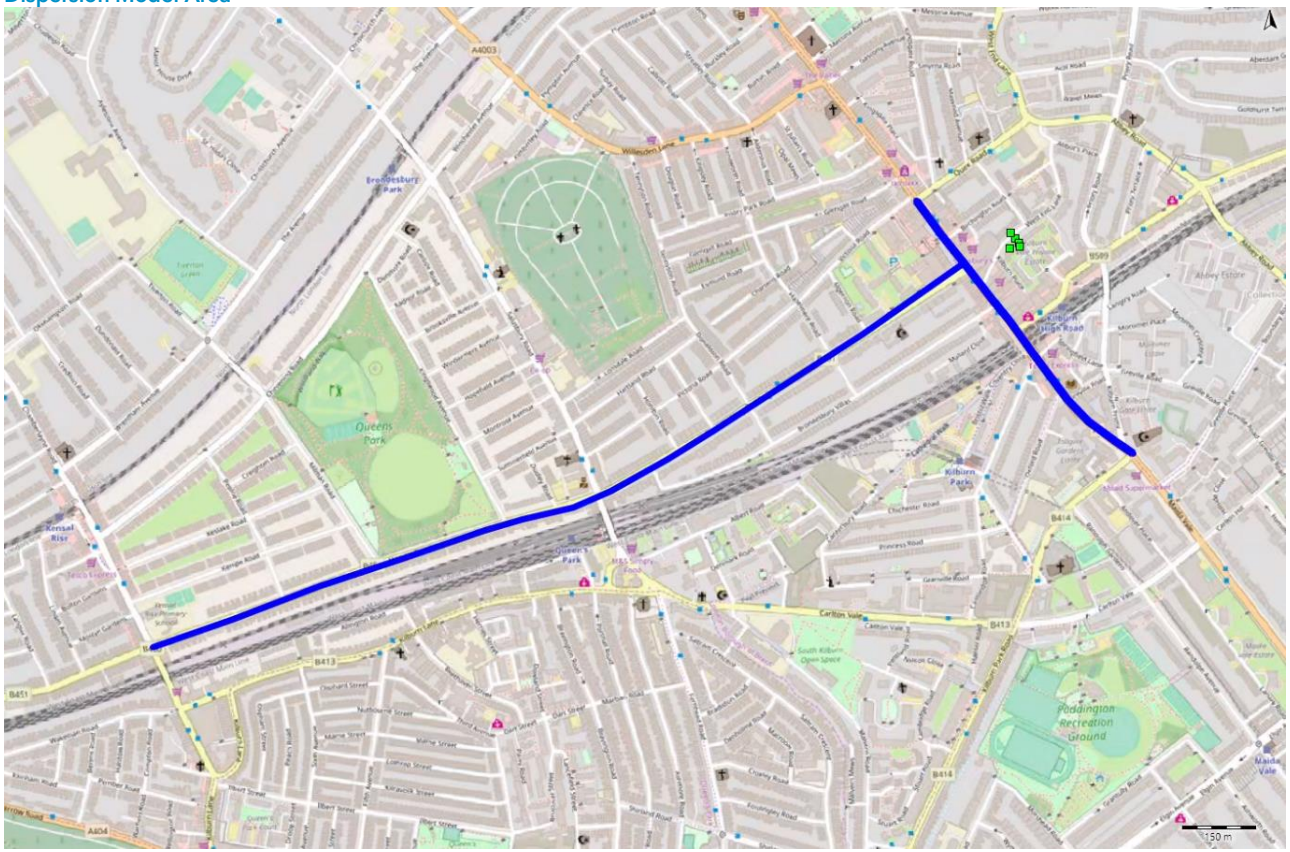

Figure D- 1: Dispersion model area, showing road emissions sources (in blue) and modelled receptors around the development (in green).