AIR QUALITY ASSESSMENT

AECOM

247 TOTTENHAM COURT ROAD

JULY 2020

Prudential UK Real Estate Nominee 1 Limited and Prudential Real Estate Nominee 2 Limited

JULY 2020

Quality information

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Revision History

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0	July 2020	Draft	GC	Gareth Collins	Regional Director
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1. Introduction

This Air Quality Assessment has been prepared by AECOM on behalf of Prudential UK Real Estate Nominee 1 Limited and Prudential UK Real Estate Nominee 2 Limited (‘the Applicant’) in support of a planning application at 247 Tottenham Court Road, London, W1T 7HH (‘the Site’) for full planning permission for:-

“Demolition of 247 Tottenham Court Road, 3 Bayley Street, 1 Morwell Street, 2-3 Morwell Street and 4 Morwell Street and the erection of a mixed use office led development comprising ground plus five storey building for office (Class B1) use, flexible uses at ground and basement (Class A1/A2/A3/B1/D1/D2), residential (Class C3) use, basement excavation, provision of roof terraces, roof level plant equipment and enclosures, cycle parking, public realm and other associated works.”

The Proposed Development incorporates mechanical ventilation, photovoltaic cells, residential balconies to the rear and winter gardens facing onto Tottenham Court Road. The heating, cooling and hot water for the residential properties will be provided by air source heat pumps while heating/cooling for the office space will be via a central air source heat pump at roof level and hot water provided by a water source heat pump. For full details and scope of the application, please refer to the submitted Energy Statement, prepared by Watkins Payne.

1.1 Scope of Work

The Site is located within the jurisdiction of the London Borough of Camden (LBC). LBC has declared the entire Borough an Air Quality Management Area (AQMA) due to exceedances of the Air Quality Strategy (AQS) objective for annual mean nitrogen dioxide (NO_2) and daily mean AQS objective for particulate matter (PM_{10}). This assessment will, therefore, focus on the pollutants of primary concern within the LBC administrative area which are NO_2 and particulate matter (PM_{10} and $PM_{2.5}$).

During the construction phase of the Proposed Development, there is the potential for demolition and construction activities to generate fugitive emissions of dust and PM_{10}. There is the risk of such emissions affecting amenity or health at receptors located in proximity to the source of emissions, unless appropriate mitigation measures are adopted. An assessment of the effects from fugitive emissions of dust and PM_{10} from the Proposed Development has been undertaken and where required, suitable dust mitigation measures have been identified for the construction phase.

The air quality assessment considers the operational phase of the Proposed Development and impacts on local air quality due to emissions from road traffic associated with the Proposed Development. No on-site or on-street parking is provided as part of the Proposed Development, with existing parking spaces to be removed. The Proposed Development is car-free. The Proposed Development seeks to minimise the generation of CO_2 by using highly efficient building envelope with high efficiency mechanical and electrical services, along with air source heat pump and photovoltaic cells.

This Report presents the findings of the assessment of the likely effects on air quality as a result of the construction and operation of the Proposed Development and considers site suitability in terms of the location of air intakes serving the mechanical ventilation system and residential balconies.

2. Policy Context

2.1 European Air Quality Directives

The Clean Air for Europe (CAFE) (Ref 1) programme revisited the management of Air Quality within the EU and replaced much of the existing air quality legislation with a single legal act, Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ref 2). This Directive repealed and replaced the EU Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management and its associated Daughter Directives 1999/30/EC (Ref 3), 2000/69/EC (Ref 4), 2002/3/EC (Ref 5), (relating to limit values for ambient air pollutants) and the Council Decision 97/101/EC (Ref 6) which established a reciprocal exchange of information and data within Member States.

2.2 National Air Quality Legislation

2.2.1 UK National Air Quality Strategy

The UK National Air Quality Strategy (Ref 8) (AQS) was initially published in 2000, under the requirements of the Environment Act 1995 (Ref 9). The most recent revision of the strategy (2007) (Ref 10) sets objective values for key pollutants as a tool to help local authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have subsequently been laid out within the Air Quality (England) Regulations 2000 (Ref 11) and later amendments (2015) (Ref 12).

The AQS objective values, referred to below, have been outlined in legislation solely for the purposes of local air quality management. Under the local air quality management regime, the local authority has a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the governing local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. Consequently, it is not unusual for the boundary of an AQMA to include relevant locations where air quality is not at risk of exceeding an AQS objective.

The UK's national AQS objective values for the pollutants of relevance to this assessment are displayed in Table 1 as stated in H.M. Government (2016) Air Quality Standards Regulations 2010 (Ref 7).

Table 1: UK AQS Objectives

Pollutant	Averaging Period	Value	Maximum Permitted Exceedances
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3	None
	Hourly Mean	200 µg/m^3	18 times per year
Particulate Matter (PM_{10})	Annual Mean	40 µg/m^3	None
	24 Hour Mean	50 µg/m^3	35 times per year
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m^3	None

2.2.2 National Clean Air Strategy

In 2019, the UK government released its Clean Air Strategy 2019 (Ref 13), part of its 25 Year Environment Plan. The Strategy places greater emphasis on improving air quality in the UK than has been seen before and outlines how this is to be achieved (including the development of new enabling legislation).

Air quality management focus in recent years has primarily related to one pollutant, NO_2, and its principal source in the UK, road traffic. However, the Strategy broadens the focus to other areas, including domestic emissions from wood burning stoves and from agriculture. This shift in emphasis is part of a goal to reduce the levels of fine particulate matter ($PM_{2.5}$) in the air to below the World Health Organisation guideline level; far lower than the current EU limit value.

The strategy included the provision of a clear effective guidance on how AQMAs, Clean Air Zones (CAZ) and Smoke Control Areas interrelate and how they can be used by local government to tackle pollution.

In relation to NO_X the UK Clean Air Strategy sets the following reduction target:

- Nitrogen oxides (NO_X) – reduce emissions against the 2005 baseline by 55% by 2020, and by 73% by 2030; and
- Primary Particulate Matter ($PM_{2.5}$) - reduce emissions against the 2005 baseline by 30% by 2020, and 46% by 2030.

It is noted within the strategy document that the *“current legislative framework has not driven sufficient action at a local level”*. New legislation will seek to shift the focus towards prevention of exceedances rather than tackling pollution when limits have been surpassed. The shift of focus encourages more of a proactive rather than reactive policy framework at regional and local levels on air quality.

2.2.3 Air Quality Standards Regulations (2010)

Directive 2008/50/EC is transcribed into UK legislation by the Air Quality Standards Regulations 2010 (as amended by the Air Quality Standards (Amendment) Regulations 2016) (Ref 7), which came into force on 11th June 2010. This sets binding limit values or objectives on pollutants with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole.

2.2.4 National Planning Policy

2.2.4.1 National Planning Policy Framework (2019)

The revised National Planning Policy Framework (NPPF) (Ref 14) was published in February 2019 and sets out the Government’s planning policies for England and how these are expected to be applied. The NPPF supersedes the previous NPPF published in March 2012.

Paragraph 103 of the NPPF states that:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health.”

Air quality is considered as an important element of the natural environment. On conserving and enhancing the natural environment, paragraph 170 states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by: …

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality …”

Air quality in the UK has been managed through the Local Air Quality Management (LAQM) regime using national objectives. The effect of a Proposed Development on the achievement of such policies and plans may be a material consideration by planning authorities when making decisions for individual planning applications. Paragraph 181 of the NPPF states that:

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

"The focus of planning policies and decisions should be on whether Proposed Scheme is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

2.2.4.2 Planning Practice Guidance

The Planning Practice Guidance (PPG) (Ref 15) supports the NPPF and was first published online in 2014. With specific reference to air quality the PPG was updated on 1st November 2019. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition, air quality may also be considered to be material if the Proposed Development would be particularly sensitive to poor air quality in its vicinity.

When deciding whether air quality is relevant to a planning application the PPG states that the following criteria may be required to be taken into consideration by:

- the 'baseline' local air quality, including what would happen to air quality in the absence of the development;
- whether the Proposed Scheme could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and
- whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.

On how detailed an air quality assessment needs to be, the PPG states (Ref 15):

"Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locationally specific, will depend on the Proposed Scheme and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented."

2.2.5 A Green Future: Our 25 Year Plan to Improve the Environment

The 25 Year Environment Plan, published in January 2018 and updated in 2019, sets out the actions the UK Government will take to help the natural world regain and retain good health (Ref 16). This references several actions that are being taken to improve air quality, most notably the publication of the Clean Air Strategy (referenced earlier) and tighter controls on Medium Combustion Plant. Emphasis is also placed on the 'Future of Mobility', in the establishment of flexible regulatory framework to encourage new modes of transport and encouraging opportunities to move toward zero emission transport.

The 25 Year Environment Plan reinforces the demand for high environmental standards for all new build development. Resilient buildings and infrastructure will more readily adapt to a changing climate, and by extension have a lesser impact on local air quality.

2.3 Regional Planning Policy

2.3.1 The Mayor's London Plan, Spatial Development Strategy for London

The Mayor's London Plan represents a spatial development strategy for Greater London (Ref 17) and is the overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. It forms part of the development plan for Greater London. London boroughs' local plans need to be in general conformity with the London Plan and its policies guide decisions on planning applications by councils and the Mayor.

Policy 7.14 Improving Air Quality states:

"Development proposals should:

a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3)

b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'

c) be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs)).

d) ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches

e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified".

Policy 5.7 Renewable Energy states that

"all renewable energy systems should be located and designed to […] avoid any adverse impacts on air quality".

Policy 6.13 Parking states that:

"in locations with high public transport accessibility, car-free developments should be promoted (while still providing for disabled people)."

2.3.2 Intend to Publish London Plan 2019

The 'Intend to Publish London Plan 2019' (Ref 18) considers air quality in the following policies:

- Policy Sustainable Infrastructure 1 (SI1) 'Improving Air Quality' states:

  "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.

  To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed;

  1) development proposals should not:

  a. lead to further deterioration of existing poor air quality;

  b. create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits;

  c. create unacceptable risk of high levels of exposure to poor air quality.

  2) In order to meet the requirements in Part 1, as a minimum:

a. Development proposals must be at least air quality neutral

b. Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retrofitted mitigation measures

c. Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

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

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

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

b. What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

3A) major development proposals must be at least air quality neutral and be submitted with an Air Quality Assessment.

4) 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.

5) development proposals should ensure that where emissions need to be reduced, this is done on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated."

- Policy D3 'Optimising site capacity through the design-led approach' states that:

  "Development proposals should:

  9) help prevent or mitigate the impacts of noise and poor air quality."

2.3.3 London Environment Strategy

The London Environment Strategy (Ref 20) was published by the Mayor of London in May 2018 and sets out the Mayor's vision of London's environment to 2050. The London Environment Strategy includes a number of policies and aspirations, with an accompanying implementation plan, setting out actions the Mayor is prioritising for the next five years to implement the aims of this strategy.

Chapter 4 of the Strategy relates to air quality and supersedes the 2010 Mayor's Air Quality Strategy (Ref 21). It sets the ambitious target for London to have the best air quality of any major world city by 2050 and goes further than the previous strategy by requiring developments to be 'air quality positive'. To date, however, the underpinning guidance outlining the method of assessment and the effective approaches to be taken to ensure that larger developments are 'air quality positive', has not been published. Therefore, the minimum requirement must remain for Proposed Development to be air quality neutral, until such time as this guidance is available.

2.3.4 Sustainable Design and Construction SPG

In April 2014, the Mayor of London published a revised Sustainable Design and Construction – Supplementary Planning Guidance (SPG) (Ref 22). This document provides guidance to developers and local authorities on what measures can be included in their designs and operations in order to achieve sustainable development and the objectives set out in the London Plan.

Section 4.3 of the SPG concerns air quality, and sets out the Mayor's priorities, as follows:

- "Developers are to design their scheme so that they are at least 'air quality neutral'.
- Developments should be designed to minimise the generation of air pollution;
- Developments should be designed to minimise and mitigate against increased exposure to poor air quality;
- Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7; and
- Developers and contractors should follow the guidance set out in the Control of Dust and Emissions during Construction and Demolition SPG when constructing their development."

2.3.5 The Control of Dust and Emissions during Construction and Demolition SPG

The Control of Dust and Emissions during Construction and Demolition SPG provides the methodology for assessing construction phase impacts and recommends mitigation measures appropriate to the risk associated with development sites (Ref 23). This methodology has been applied in this air quality assessment.

Non-Road Mobile Machinery (NRMM) is identified as a significant emissions source in the SPG, and NRMM to be used on any construction sites in Greater London need to comply with the latest European emission standards, as set out in the SPG. This policy is enforced through the planning process and compliance with the NRMM standards should be secured by local authorities as a planning condition or a Section 106 agreement. If emissions of NRMM are unknown, developers will be required to provide a written statement of their commitment and ability to meet these standards as part of an Air Quality Statement. An inventory of all NRMM should be kept, stating the emission limits for all equipment, and made available to local authority officers.

2.4 Local Planning Policy

2.4.1 Camden Local Plan

The Camden Local Plan (Ref 24) was adopted on July 2017 replacing the Core Strategy and Camden Development Policies. It sets the overarching vision, strategic objectives and policies for development in the London Borough of Camden from 2016-2031. The Plan identifies a number of spatial development issues across the Borough including accommodating population growth, achieving economic prosperity, tackling climate change, infrastructure provision, community cohesion, and creating and maintaining attractive and distinctive places.

Policy CC4: Air Quality states that:

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

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

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

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

Policy A1: Managing the impact of development states that:

"The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity….The factors we will consider include….odour, fumes and dust"

Policy T2: Parking and car free development states that:

"To promote sustainable transport for all and to make Camden a better place to cycle and walk around, to reduce air pollution, reliance on private cars and congestion and to support and promote new and improved transport links."

2.4.2 Our Camden Plan

Our Camden Plan (Ref 25) is LBC's plan for how they will implement their Camden 2025 vision. It states that LBC will use all the resources at their disposal to play a part in improving air quality. The Camden Plan key objectives are to focus on building communities, strong growth and access to jobs, recognise the needs of the full range of employees and businesses, create safe and open communities, and build clean and sustainable places.

2.4.3 Camden Clean Air Action Plan 2019-2022

The Clean Air Quality Action Plan (AQAP) (Ref 26) was published in 2019. The plan has seven main themes for monitoring air quality, reducing emissions from buildings and new development, reducing emissions from transport, awareness raising and lobbying and partnership working. LBC's commitments 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

2.4.4 Camden Planning Guidance – Air Quality

The Camden Planning Guidance, 2019 (Ref 28) provides information on key air quality issues within the borough and supports Local Plan Policy CC4 Air Quality.

Key messages regarding from the guidance are that:

- 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 in areas of poor air quality 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.
- Air quality neutral assessments are required for all major developments. Major developments are schemes of 10 or more dwellings or buildings where the floorspace created is 1,000 square metres or more.
- All proposals involving demolition and construction should adopt best practice measures to reduce and mitigate emissions.
- On-site monitoring may be required dependant on the scale of demolition and construction.
- Certain developments using Non-Road Mobile Machinery (within the KW range) need to meet standards in the Mayor's Dust and emissions SPD.

- The impact of outdoor air pollution on indoor air quality in new developments needs to be taken into account at the earliest stages of building design.
- Development should take into consideration the location of amenity space and opportunities for appropriate planting 'greening'.
- Development should reduce emissions by being energy efficient (reducing emissions associated with the operation of the building).
- Development should prioritise more sustainable modes of transport and where applicable improve the walking and cycling environment.

2.4.5 Camden's Minimum Requirements

LBC has outlined a series of measures to minimise air pollution and nuisance to those nearby within its Camden's Minimum Requirements document (Ref 30). These include:

- All dusty operations should be identified (and Reported in any CMP / DMP) and establish the best available techniques are required to control dust emissions…
- Consideration should be given to the siting of aggregate stockpiles, based upon such factor as the prevailing winds, proximity of site boundary and proximity of neighbours….
- Areas where there is vehicular movement should have a consolidated surface which should be kept in good repair.
- The main principles for preventing dust emissions are containment of dusty processes and suppression of dust using water or proprietary suppressants. Suppression techniques need to be properly designed, used and maintained, in order to be effective.
- Where there is evidence of airborne dust from the building construction/demolition activities the site, the contractor should make their own inspection and assessment, and where necessary undertake ambient monitoring with the aim of identifying those process operations giving rise to the dust. Once the source of the emission is known, corrective action should be taken without delay.
- Effective preventative maintenance should be employed on all aspects of the construction/demolition works including all plant, vehicles, buildings and the equipment concerned with the control of emissions to air.
- It is useful to have an audited list of essential items.

2.5 Other Relevant Policy, Standard and Guidance

2.5.1 Local Air Quality Management Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) provides and maintains guidance and tools to support local authorities in carrying out their duties under the Environment Act 1995 and subsequent regulations. In order to provide consistency with the Council's own work on air quality, the guiding principles for air quality assessments, as set out in the latest guidance and tools provided by the technical guidance - LAQM.TG(16) (Ref 31), have been followed in this assessment.

2.5.2 Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) Planning Guidance

When determining the significance of the air quality assessment results with the Proposed Development, this assessment follows the non-statutory best practice guidance relating to air quality and development control published by EPUK and IAQM (Ref 32). The guidance ensures that air quality is adequately considered during land-use planning and development control process and is applicable to assessing the effect of changes in exposure of members of the public consequential to residential and mixed-use developments. This is of particular importance in urban areas where air quality is of a poorer standard. The guidance states that:

"Land-use planning can play a critical role in improving local air quality. At the strategic level, spatial planning can provide for more sustainable transport links between the home, workplace, educational, retail and leisure facilities, and identify appropriate areas for potentially polluting industrial development.

For an individual development proposal, there may be associated emissions from transport or combustion processes providing heat and power."

2.5.3 Local Air Quality Management

The whole of the Borough of Camden was declared an AQMA in 2002 due to concern over the achievement of long-term NO_2 AQS objective and short-term PM_{10} AQS objective.

The Greater London Authority (GLA) has also declared 187 Air Quality Focus Areas (AQFAs) in London (Ref 33). These areas have been identified as locations of high levels of human exposure to concentrations of NO_2 above the national air quality objective(s) for NO_2. The Focus Area designation was designed to address concerns relating to forecasted air pollution trends, or those raised during the LAQM review process. It is noted, however, that this does not represent an exhaustive list of London's air pollution hotspot locations, but where the GLA believes problems to be more acute.

LBC has 7 AQFAs which are detailed below:

- Camden High Street from Mornington Crescent to Chalk Farm and Camden Road.
- Holborn and Southampton Row Junction.
- Kilburn Town Centre.
- Marylebone Road from Marble Arch / Euston / King's Cross Junction.
- Oxford Street from Marble Arch to Bloomsbury.
- King's Cross / Caledonian Road.
- Swiss Cottage from South Hampstead to Finchley Road Station.

Although the Site is not located within an AQFA, 2 AQFAs (Oxford Street from Marble Arch to Bloomsbury and Marylebone Road from Marble Arch / Euston / King's Cross Station) are within approximately 50m and 720m of the site boundary, respectively. These are illustrated in Figure 2 in Appendix A.

3. Assessment Methodology

There is currently no statutory guidance on the methodology for air quality impact assessments. Several bodies have published their own guidance relating to air quality and development control, such as that by Defra (Ref 31), the guidance on the Control of Dust and Emissions during Construction and Demolition (Ref 23), Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction (Ref 47) Environmental Protection United Kingdom (EPUK) and IAQM Land-use Planning & Development Control: Planning for Air Quality (Ref 32) which have been used in the preparation of this report.

Receptors potentially sensitive to air quality have been identified through review of mapping and aerial photography of the area surrounding the Proposed Development. This section presents the methodology used to assess the potential effects on air quality during the construction phase and the operational phase of the Proposed Development.

Detailed information of the scenarios to be considered for the assessment of the emissions for the construction and operational phases are described in the following sections. The methods used to determine the significance of effects associated with air quality impacts are described in the 'Significance Criteria' sub-section of this report.

3.1 Construction Phase

3.1.1 Fugitive Emissions of Dust and PM_{10}

Fugitive emissions (i.e. emissions which are not associated with a single fixed release point) of airborne particulate matter are readily produced through the action of abrasive forces on materials. A qualitative construction dust risk assessment has been undertaken in accordance with the SPG on the control of dust and emissions during construction and demolition (Ref 23).

Activities on construction sites with the potential to generate dust and emissions can be categorised into four types of activities, which are:

- Demolition – any activities associated with the removal of existing structures on site;
- Earthworks – includes the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – any activities relating to the provision of new structures on site; and
- Trackout – the transport of dust and dirt from the construction site onto the public road network where it may be deposited and re-suspended by traffic using the network.

The potential for dust emissions has been assessed for each activity that will take place as part of the construction phase. The GLA SPG (Ref 23) has been used to assess the risk and significance of any impacts associated with the construction phase and to identify appropriate mitigation measures to be adopted to reduce any potential impacts.

A detailed assessment is required where a sensitive human receptor is located within 350m from the site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s) or if there is a relevant ecological receptor within 50m of the site boundary. Due to the central location of the site, there are a number of sensitive human receptors located within 350m of the site boundary and hence the assessment is required.

The first step of the detailed assessment is to assess the risk of dust impacts. This is undertaken separately for each of the four activities (demolition, earthworks, construction and trackout) and takes account of:

- The scale and nature of the works, which determines the potential dust emission magnitude; and
- The sensitivity of the area.

These factors are combined following criteria set out in the Guidance to give an estimate of the risk of dust impacts occurring.

The regulation and control of construction dust should focus on the adoption of good working practices as standard. Good practice is a process that is informed by the assessment, which seeks to avoid the potential for adverse effects. Site-specific mitigation, set out in Section 7 of this assessment, is then determined based on the risk of dust impacts identified. These measures are either 'highly recommended', 'desirable' or 'not required', depending on the level of risk identified. For general mitigation measures, the highest risk category should be applied. For example, if the site is medium risk for earthworks and construction, but a high risk for demolition and track-out, the general measures applicable to a high-risk site should be applied.

Where a local authority has issued guidance on measures to be adopted at demolition / construction sites, these should then be taken into account. LBC has published its "Camden's Minimum Requirements" (Ref 30) which has been considered. Professional judgment is employed to examine the residual dust effects assuming mitigation is undertaken to determine significance. It is expected that best practice mitigation measures will be documented within a Construction Management Plan (CMP) (or equivalent). The need for a CMP is generally secured by an appropriately worded planning condition and will need to be agreed with LBC prior to the commencement of construction works. A draft CMP has been prepared by Momentum and submitted separately. With effective mitigation and management commensurate with the level of risk identified in the construct dust assessment, the residual dust effects during demolition and construction works are generally considered to be 'not significant'.

3.1.2 Construction Phase Sensitive Receptors

For the assessment of construction dust emissions, a construction dust receptor is defined simply as a location that may be affected by dust emissions. Human receptors include locations where people spend time and where property may be impacted by dust. Ecological receptors are habitats that might be sensitive to dust.

When assessing the impact of dust emissions generated during construction works, the methodology requires only the quantities of the nearest, highest sensitivity receptors to the boundary of the Site in each direction be considered. These receptors have the potential to experience impacts of greater magnitude, when compared with other more distant receptors, or less sensitive receptors. Moreover, receptors located within 50m of routes to be used by construction vehicles might be impacted by dust originating from the track-out of material onto the road, and as such have been considered in this assessment.

There are a number of existing sensitive human receptors within 200m of the Site boundary, including properties along Bayley Street, Morwell Street, Tottenham Court Road, Bedford Avenue and Bedford Square.

3.1.3 Non-Road Mobile Machinery (NRMM)

Emissions from construction NRMM will have the potential to increase NO_2 and PM_{10} concentrations locally when in use on the construction site associated with the Proposed Development. This source is considered temporary, and localised.

The Mayor of London, through "The Control of Dust and Emissions during Construction and Demolition – SPG" (Ref 23), has put in place a strategy to address emissions from NRMM in the London area. In order to reduce emissions from NRMM, this equipment will need to meet set emission standards. The SPG requires that NRMM of net power between 37 kW and 560 kW used in London has been required to meet emission standards, based upon engine emissions standards set in EU Directive 97/68/EC (Ref 49) and its subsequent amendments (Ref 50). From 1 September 2020, NRMM used on any site within Greater London, including the Proposed Development, will be required to meet Stage IIIB of the Directive as a minimum. NRMM used on any site within the Central Activity Zone or Canary Wharf will be required to meet Stage IV of the Directive as a minimum, however, the Proposed Development falls outside of this zone.

The Local Planning Authorities (LPAs) are responsible for the application and enforcement of this policy through the planning process. The developers will typically be required to prepare a CMP, Air Quality Dust Risk Assessment (AQDRA) and/or Air Quality Dust Management Plan (AQDMP), or similar document, to discharge a planning condition once planning approval is granted and demolition/construction contractors are appointed. The CMP/AQDRA/AQDMP typically has to include a written statement of the developers commitment, and ability of appointed contractors, to meet the NRMM standards to discharge the condition prior to works commencing on site.

Emissions from NRMM will be temporary and localised and will be controlled via the application of the NRMM standards and through best practice mitigation measures. For that reason, the construction phase NRMM emissions should not be significant. These emissions have not been modelled and are not considered any further in this assessment.

3.1.4 Construction Phase Traffic Generation

The demolition and construction phase of the Proposed Development will result in temporary increases in traffic movements associated with site works. Traffic generation due to the construction phase will be controlled using best practice measures, implemented via AQDRA/AQDMP/CMP, will include:

- Compliance with the London Low Emission Zone;
- Reducing vehicle idling;
- Preparation of a construction logistics plan; and
- Preparation of a travel plan.

Given that the Proposed Development is to be car free once the construction phase is complete traffic flows will return to original levels and, as such, the air quality impacts due to construction phase traffic emission are considered to be short-term and impacts are scoped out as insignificant on this basis.

3.2 Operational Phase

3.2.1 Road Traffic Emissions

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, and sulphur dioxide (SO_2), carbon monoxide (CO), PM_{10} and $PM_{2.5}$ in exhaust emissions. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

Although SO_2, CO, benzene and 1,3-butadiene are present in motor vehicle exhaust emissions, detailed consideration of the associated effects on local air quality is not considered relevant in the context of this assessment. This is because road traffic emissions of these substances have been reviewed by the LBC as part of their local air quality management obligations since the introduction of Part IV of the Environment Act (1995), and nowhere within the administrative area is at risk of exceeding these objectives. Emissions of SO_2, CO, benzene and 1,3-butadiene from road traffic are therefore not considered further within this assessment.

At high temperatures and pressures found within vehicle engines, some of the nitrogen in air and fuel is oxidised to form NO_X mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. The presence of NO_2 in the atmosphere is associated with adverse effects on human health. Vehicle emissions can also result in the exposure at sensitive receptors to concentrations of PM_{10} and $PM_{2.5}$.

The Proposed Development is to be car-free. The project's transport consultant, Momentum, has confirmed that the Proposed Development trip generation is anticipated to be 21 servicing vehicle trips per day. The number of vehicle trips associated with the Proposed Development is below the IAQM criteria for potential effects on air quality and, therefore, the potential for significant adverse impacts to occur on nearby sensitive receptors as a result of changes in road traffic movements is considered to be negligible. However, as the site is located within the LBC AQMA, detailed dispersion modelling has been undertaken to consider site suitability and as part of this modelling off-site receptors close to the site have also be included to demonstrate that the impact of the Proposed Development are anticipated to be negligible.

LBC has requested that 2019 vehicle emission factors, used for model verification, be used when modelling the 2024 opening year. This approach is considered to be a very conservative one, as it is generally accepted that vehicle emissions have started to show a reducing trend and that the current Defra emission factors (EFT v9) are now considered to show realistic improvement in future years which coincide with monitored reductions.

3.2.2 Traffic Data

Due to the current lockdown due to Covid-19 traffic surveys could not be undertaken to support the assessment. The project's traffic consultants, Momentum, have, therefore, provided traffic data for Morwell Street and Bedford Avenue which has been derived from 2013 data from the 1 Bedford Avenue Transport Statement, while traffic flows on Tottenham Court Road and other major roads have been derived from Department for Transport (DfT) traffic surveys (Table 2) (Ref 38).

Table 2: Traffic Counts

Road	Survey Year	Traffic Flow	%HDV
Morwell Street	2013[1]	158	1.0
Bedford Avenue	2013[1]	838	4.0
New Oxford Street (DfT location 75097)	2018	12677	3.3
Oxford Street (DfT location 46433)	2018	11321	2.0
Bayley Street	2013[1]	174	0.0
Tottenham Court Road (DfT location 8469)	2018	13943	4.0
Gower Street (DfT location 48159)	2018	14191	1.9
Goodge Street (DfT location 38595)	2018	6226	3.3

[1] – Traffic data derived from 1 Bedford Avenue Transport Statement.

The traffic data in Table 2 was factored forwards to give flows in 2019 and 2024 using TEMPro growth factors using a 'Taxi' scenario. The adjusted traffic data for the following scenarios is presented in Table 3:

- 2019 Base – existing situation;
- 2024 Without – future base without the Proposed Development traffic (2024); and
- 2024 With – future base with the Proposed Development traffic (2024).

Table 3: Traffic Data for Modelling

Source ID	Road Type	Traffic Flow	% HDV	Speed (kph)
		2019 Base		
Morwell Street	London - Inner	170	1.0	32.2
Bedford Avenue	London - Inner	901	4.0	32.2
New Oxford Street	London - Inner	12,883	3.3	32.2
Oxford Street	London - Inner	11,505	2.0	32.2
Bayley Street	London - Inner	0	0.0	32.2
Tottenham Court Road	London - Inner	14,170	4.0	32.2
Gower Street	London - Inner	14,422	1.9	32.2
Goodge Street	London - Inner	6,327	3.3	32.2
		2024 Without the Proposed Development		
Morwell Street	London - Inner	180	0.9	32.2
Bedford Avenue	London - Inner	955	3.5	32.2
New Oxford Street	London - Inner	6,957	6.1	32.2
Oxford Street	London - Inner	6,213	3.7	32.2
Bayley Street	London - Inner	0	0.0	32.2

Source ID	Road Type	Traffic Flow	% HDV	Speed (kph)
Tottenham Court Road	London - Inner	7,652	7.3	32.2
Gower Street	London - Inner	7,788	3.4	32.2
Goodge Street	London - Inner	3,417	6.1	32.2
2024 With the Proposed Development				
Morwell Street	London - Inner	184	0.9	32.2
Bedford Avenue	London - Inner	959	3.5	32.2
New Oxford Street	London - Inner	6,961	6.0	32.2
Oxford Street	London - Inner	6,216	3.7	32.2
Bayley Street	London - Inner	0	0.0	32.2
Tottenham Court Road	London - Inner	7,656	7.3	32.2
Gower Street	London - Inner	7,792	3.4	32.2
Goodge Street	London - Inner	3,419	6.1	32.2

Note: road speeds have been adjusted at junction and road crossings to reflect stop start and queuing traffic.

It should be noted that traffic counts decrease between 2019 and 2024, especially on Tottenham Court Road. This is due to the committed development of the West End Project (Ref 51). This project has also resulted in Tottenham Court Road change from a one-way road to a two-way road in 2020.

3.2.3 Road Modelling and Vehicle Emissions Factors

This assessment has used the latest version dispersion modelling software 'ADMS-Roads'. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (Ref 40).

Details of general model conditions set up in ADMS-Roads are provided in Table 4. Some of these conditions are summarised in detail below.

Table 4: General ADMS-Roads Model Conditions

Variables	ADMS-Roads Model Input: Road Traffic Model
Surface roughness at source	1.5m
Surface roughness at Meteorological Site	1.0m
Minimum Monin-Obukhov length	100m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = various.
Emissions	NO_X, PM_{10}, $PM_{2.5}$
Emission factors	Defra's Emission Factor Toolkit (EFT) version 9.0 (Ref 48), using the "London" vehicle fleet composition and the "Basic Split" traffic format. LBC have requested that 2019 emission factors used for model verification, be used when modelling the 2024 opening year.
Meteorological data	1 year (2019) hourly sequential data from London City Airport meteorological station.
Receptors	Facades of selected sensitive receptors.
Model output	Annual mean NO_X, PM_{10} and $PM_{2.5}$ concentrations.

The dispersion modelling has taken account of 'canyon effects' due to the tall buildings that line the roads which limit dispersion and result in higher pollutant concentration as the facades of buildings. Canyon effects are modelled in ADMS-Roads by calculating the distance between building on each side of the road and comparing it to the height of the building. This methodology is detailed in the ADMS-Roads user manual (Ref 52). The modelling of roads as 'street canyons' makes a significant difference to predicted roadside pollutant concentrations especial for roads lined by very tall buildings.

3.2.4 NO_X to NO_2 Conversion

The proportion of NO_2 in NO_X varies greatly with location and time according to a number of factors including the amount of ozone available and the distance from the emission source.

Defra have produced a NO_X to NO_2 Calculator (Ref 48) spreadsheet tool which provides a methodology for converting modelled road NO_X concentrations to NO_2 concentrations for any given year up to 2030. This conversion methodology has been used for the purpose of this assessment for all scenarios as the best representation of the NO_2/NO_X relationship for the study area. Version v7.1 of the NO_X to NO_2 Calculator has been used and is designed to be used in combination with Defra's 2017-reference year background maps and Emission Factors Toolkit version 9.0. The traffic mix option used was the 'All London traffic' option. The local authority area used was selected based on the location of the modelled receptors and diffusion tube locations.

3.2.5 NO_2 Hourly Mean AQS Objective

LLAQM.TG(16) (Ref 42) states that the hourly mean NO_2 objective is unlikely to be exceeded if annual mean concentrations are less than 60 $\mu g/m^3$. The assessment, therefore, evaluates the likelihood of exceeding the hourly mean NO_2 objective by comparing predicted annual mean NO_2 concentrations at all receptors to an annual mean equivalent threshold of 60 $\mu g/m^3$. Where predicted concentrations are below this value, it can be concluded that the hourly mean NO_2 objective (200 $\mu g/m^3$ NO_2 not more than 18 times per year) is likely to be achieved.

3.2.6 Air Quality Predicting the Number of Days in which the PM_{10} 24-hour Mean Objective is Exceeded

The guidance document LLAQM.TG(16) (Ref 42) sets out the method by which the number of days in which the PM_{10} 24-hour objective is exceeded can be obtained based on a relationship with the predicted PM_{10} annual mean concentration. The formula is:

$$\text{No. of } Exceedances = 0.0014 * C^3 + \frac{206}{C} - 18.5$$

Where C is the annual mean concentration of PM_{10}.

Based on this formula an annual mean PM_{10} concentration of 32 $\mu g/m^3$ is broadly equivalent to 35 days of exceedance and, as such, if the predicted annual mean is less than 32 $\mu g/m^3$ the short-term (daily) PM_{10} AQS objective can be considered to have been achieved.

3.2.7 Meteorological Data

One year (2019) of hourly sequential observation data from London City Airport meteorological station has been used in the dispersion modelling. London City Airport is located approximately 13 km east of the Proposed Development and is considered representative of the meteorological conditions on the and around the Application Site. Figure 1 in Appendix A shows that the dominant direction of wind is from the south-west, as is typical for the UK. The wind speed ranges from 0-18 knots (0- ~9.3 m/s).

3.2.8 Receptors

The concentration of road traffic emitted pollutants at the roadside or at sensitive receptors is influenced by a number of factors. These include background pollution levels and the amount of traffic emissions, which is dictated by traffic flow rates, composition and speed.

The AQS objective values for pollutants associated with road traffic were set by the Expert Panel of Air Quality Standards (and subsequently adopted as UK AQS objectives) at a level below the lowest concentration at which the more sensitive members of society have been observed to be adversely affected by exposure to each pollutant (Ref 45). Therefore, all receptors that represent exposure of the public are of equal sensitivity as any member of the public could be present at those locations.

Commercial properties are not considered sensitive to changes in ambient pollutant concentrations and are legislated separately as part of occupational health and safety regulations. These are, therefore, not included in the assessment and the focus is on proposed and existing residential buildings and sensitive receptors, such as schools, hospitals and care homes, as these are considered most sensitive to changes in air quality.

Annual NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted at a selection of receptors, representing the façades of buildings closest to Tottenham Court Road and Oxford Street. Receptors have been selected from aerial photography and publicly available mapping. The selected receptors are set out in Table 5 and illustrated in Figure 3 and Figure 4 in Appendix A.

LBC has requested that air quality at the proposed residential balconies be assessed so receptors have been modelled representing each proposed balcony. LBC has also requested that the air quality at mechanical ventilation air intake points be assessed. Currently the location of these air intakes has not been determined; however, receptors have been selected which represent each facade of the building as well as the balconies, winter gardens and the rooftop terrace have been included in the model so that the location of air intakes and need for NO_X filtration can be considered. The location of these receptors is illustrated in Figure 4. Receptors have been modelled representing each floor of the building from ground floor (1.5 m) to Rooftop (25.05 m) and the modelled pollutant concentration at each receptor/floor is presented in Table 21 in Appendix B. The receptor heights presented in Table 5, below, are the lowest height at which there is relevant exposure, i.e. lowest floor with a residential balcony or terrace on each façade.

Table 5: Summary of Receptors

ID	Receptor	Height (m)	Use (lowest floor)
R1	6 Gower Street	4	Residential
R2	24 Tottenham Court Road	4	Residential
R3	91 New Oxford Street	4	Residential
R4	41 Oxford Street	4	Residential
R5	13 Bayley Street	4	Residential
R6	10 Bayley Street	4	Residential
R7	26A Morwell Street	1.5	Residential
R8	24 Morwell Street	1.5	Residential
R9	27 Tottenham Court Road	4	Residential
R10	51 Morwell Street	4	Residential
R11	1 Bedford Avenue	4	Office
R12	4-1 Morwell Street	4	Residential
P1	Retail entrance from Bayley Street	1.5	Retail
P2	Office entrance from Bayley Street	1.5	Office
P3	Retail entrance from Tottenham Court Road (1)	1.5	Retail
P4	Retail entrance from Tottenham Court Road (2)	1.5	Retail
P5	Small Winter Garden southwest facing	5.7	Residential
P6	Terrace on 5th floor	19.7	Residential
P7	Large Terrace on 4th floor	16.2	Residential
P8	Small Terrace on 4th floor	16.2	Residential
P9	Residential lobby	1.5	Residential

ID	Receptor	Height (m)	Use (lowest floor)
P10	Large Balcony northeast facing	5.7	Residential
P11	Large Winter Garden southwest facing	5.7	Residential
P12	Small Balcony northeast facing	5.7	Residential
P13	Large Terrace on Green Roof	26.6	Residential

Note: R = Existing Receptor, P = Proposed Receptor.

3.2.9 Model Verification

Predicted results from an air quality dispersion model may differ from measured concentrations for a number of reasons, including uncertainties associated with traffic flows and emissions factors, meteorology and limitations inherent to the modelling software. In light of this, and in accordance with advice in LLAQM.TG(16, for roads-based air quality assessments, it is best-practice to perform a comparison of modelled results with local monitoring data to minimise these modelling uncertainties. This provides a verification factor, by which the output of the ADMS-Roads 5 model is adjusted, to gain greater confidence in the final results. The verification of the modelling output was carried out as prescribed in Chapter 7 of LLAQM.TG(16) (Ref 42).

Available air quality monitoring sites in Camden and Westminster were reviewed and it was concluded that there were two diffusion tube sites within the study area; CA11 and CA21, that could potentially be used for verification, along with the Oxford Street East automatic monitor. These sites were located at roadside / kerbside locations on the Tottenham Court Road, Gower Street / Bloomsbury Street and Oxford Street close to the Proposed Development and are illustrated in Figure 5 in Appendix A. However, CA21 is located adjacent to a bus stop and was, therefore, discounted from the model verification.

A model verification was undertaken using the 2019 traffic data in Table 3. The unadjusted model has a root mean squared error (RMSE) of 13.8 $\mu g/m^3$ and fractional bias of 0.3. After applying an adjustment factor of 3.76 the RMSE reduced to 0.4 $\mu g/m^3$ and the fractional bias to 0.0. All modelled NO_2, PM_{10} and $PM_{2.5}$ results have, therefore been adjusted using this factor.

3.2.10 Significance Criteria and Effects

Air quality impacts are considered to be significant if a development leads to significant impacts at existing sensitive receptors or if air quality objectives / EU limit values are predicted to be exceeded at proposed sensitive receptor locations. Guidance on land-use planning and development control (Ref 32) suggests that a two-stage approach should be adopted to determine whether or not a Proposed Development has a significant impact on local air quality:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- professional judgement on the overall significance of the effects.

In order to assess the potential impacts of a proposed development on local air quality, a description of the impact is given based on the magnitude of change as a percentage of a relevant Air Quality Assessment Level (AQAL). Account must also be taken of predicted pollutant concentrations and their relationship to the Air Quality Objective / EU limit value for the pollutants of concern. Table 6 summarises the impact descriptors for annual mean NO_2 and PM_{10} concentrations and Table 7 annual $PM_{2.5}$ concentrations. The impact descriptors may be adverse or beneficial depending upon whether concentrations are predicted to increase or decrease.

Table 6: Effects Descriptors at Individual Receptors – Annual Mean NO_2 and PM_{10}

Annual Mean Concentration at Receptor in Assessment Year		Change in Concentration Relative to AQAL[a]				
		0%	1%	2% – 5%	6% – 10%	> 10%
As % of AQAL	NO_2 / PM_{10} (µg/m³)[b]	<0.2 µg/m³	0.2 – <0.6 µg/m³	0.6 – <2.2 µg/m³	2.2 – ≤4.0 µg/m³	>4.0 µg/m³
≤75%	≤30.2	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94%	30.2 – 37.8	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102%	37.8 – 41.0	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109%	41.0 – 43.8	Negligible	Moderate	Moderate	Substantial	Substantial
≥110%	≥43.8	Negligible	Moderate	Substantial	Substantial	Substantial

Notes: [a] The percentage change in pollutant concentration is calculated and rounded to the nearest whole number to make it clearer which column the impacts fall within. Changes of less than 0.5% are rounded down to zero and therefore described as negligible. [b] Concentrations quoted were obtained from EPUK/IAQM.

Table 7: Effects Descriptors at Individual Receptors – Annual Mean $PM_{2.5}$

Annual Mean Concentration at Receptor in Assessment Year		Change in Concentration Relative to AQAL[a]				
		0%	1%	2% – 5%	6% – 10%	> 10%
As % of AQAL	$PM_{2.5}$ (µg/m³)[b]	<0.1 µg/m³	0.1 – <0.4 µg/m³	0.4 – <1.4 µg/m³	1.4 – ≤2.5 µg/m³	>2.5 µg/m³
≤75%	≤18.9	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94%	18.9 - 23.6	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102%	23.6 - 25.6	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109%	25.6 - 27.4	Negligible	Moderate	Moderate	Substantial	Substantial
≥110%	≥27.4	Negligible	Moderate	Substantial	Substantial	Substantial

Notes: [a] The percentage change in pollutant concentration is calculated and rounded to the nearest whole number to make it clearer which column the impacts fall within. Changes of less than 0.5% are rounded down to zero and therefore described as negligible. [b] Concentrations quoted were obtained from EPUK/IAQM.

For determining the air quality impacts of a development on short-term PM_{10} concentrations (i.e. the number of days where the daily mean PM_{10} concentration is greater than 50 µg/m³) the significance criteria in Table 8 has been adapted to derive a value for the AQS objective equivalent to 35 days per year of PM_{10} concentrations greater than 50 µg/m³. An annual mean PM_{10} concentration of 32 µg/m³ is broadly equivalent to 35 days of exceedance; and as such this value has been used as the AQS objective and has been used to calculate the changes in concentration thresholds for assessing the air quality impacts on short-term (daily) PM_{10} concentrations, as set out in Table 8.

Table 8: Local Air Quality Impact Descriptors for Daily PM_{10} Concentrations at Individual Receptors

Mean Concentration at Receptor in Assessment Year		Change in Annual Mean Concentration of PM_{10} (µg/m³) and Percentage (%) as a Proportion of the AQS Objective				
		0%	1%	2% – 5%	6% – 10%	> 10%
As % of AQAL	PM_{10} (µg/m³)[b]	<0.2 µg/m³	0.2 – <0.5 µg/m³	0.5 – <1.8 µg/m³	1.8 – ≤3.5 µg/m³	>3.2 µg/m³
≤75%	<24.2	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94%	24.2 – <30.2	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102%	30.2 – <32.8	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109%	32.8 – <35.0	Negligible	Moderate	Moderate	Substantial	Substantial
≥110%	>=35.0	Negligible	Moderate	Substantial	Substantial	Substantial

Notes: Adapted from the EPUK/IAQM Air Quality Guidance. For the assessment of short-term PM_{10} impacts, a value of 32 µg/m³ has been calculated as being equivalent to the AQS objective of 35 days per year not to exceed 50 µg/m³.

The descriptors presented in Table 6 to Table 8 are ascribed to impacts at individual sensitive receptor locations; however they are not, of themselves, a clear and unambiguous guide to reaching a conclusion on overall significance. The guidance on land-use planning and development control (Ref 32) makes it clear that the assessment of significance of the overall effect should be based on professional judgement. Whilst it may be that there are ‘slight’, ‘moderate’ or ‘substantial’ impacts at one or more receptors, the overall effect may not necessarily therefore be judged as being significant in some circumstances. A ‘moderate’ or ‘substantial’ impact may not have a significant effect if it is confined to a very small area.

Where a single development can be judged in isolation, it is likely that a ‘moderate’ or ‘substantial’ impact will give rise to a significant effect and a ‘negligible’ or ‘slight’ impact will not have a significant effect, but such judgements are always more likely to be valid at the two extremes of impact severity. The EPUK/IAQM guidance also advises that for new occupants of a proposed development, the impacts are best described in relation to whether or not an air quality objective / limit value will be met or is at risk of not being met. An exceedance of the objective / limit value is likely to be considered significant.

The EPUK/IAQM guidance notes that overall significance is determined using professional judgement and should consider:

- The existing and future air quality in the absence of development;
- The extent of current and future population exposure to any air quality impacts associated with a proposed development;
- The influence and validity of any assumptions made in the assessment approach;
- The cumulative effects arising from other committed developments in the study area; and
- The introduction of new occupants into the proposed development and the levels of air pollution to which they are likely to be exposed.

3.2.11 Assumptions, Constraints and Limitations

The following assumptions have been made in undertaking this assessment:

- Road traffic emissions modelling has used traffic data taken data from old surveys undertaken in the area as well as DfT traffic counts and factored to verification and assessment years (2019 and 2024);
- Road traffic emissions related impact predictions have been checked against baseline monitoring data to capture and adjusted for variations in model performance. By carrying out model verification

and adjusting the results in line with measured 2019 NO_2 concentrations according to Defra's published guidance, the uncertainty in the predictions for the current baseline is reduced;

- Worst case receptor locations have been assumed, which represent the location of maximum exposure to air pollutants within an area; and
- A greater level of uncertainty is associated with predictions for future years than for the base year, with greater uncertainty the further into the future the predictions are made. LBC have requested that the 2024 opening year background air quality and road traffic emission be modelled using the verified 2019 data, as such, the assessment has taken no account of future improvements in air quality which is considered to be a very conservative approach.

3.2.12 Air Quality Neutral Assessment

Using the GLA's Sustainable Design and Construction SPG (Ref 22), an Air Quality Neutral Assessment has been undertaken using the latest information about the Proposed Development. The methodology and emission factors are taken from the Air Quality Neutral Planning Support document (Ref 34). The methodology assesses two sources of emissions: road traffic and energy production.

The Air Quality Neutral Assessment for the road traffic associated with the Proposed Development compares the road traffic related emissions against calculated benchmark values which are based upon land use, the number of anticipated trips per year, and the average distance travelled per trip, in accordance with the Air Quality Neutral Planning Support (Ref 34).

The Transport Emissions Benchmarks (TEB) for the Proposed Development are calculated using default NO_X and PM_{10} emission factors per square metre, which have been determined for the different land use classes, and for each of the three areas within London, as defined in the guidance. In this assessment, Central Activity Zone (CAZ) emission factors have been used.

For building emissions, Building Emissions Benchmarks (BEB) for NO_X and PM_{10} are calculated using information relating to energy supply and demand considerations for different land use classes, as defined in the guidance. The Proposed Development does not include any on-site centralised combustion plant. The heating, cooling and hot water for the residential properties will be provided by air source heat pumps while heating/cooling for the office space will be via a central air source heat pump at roof level and hot water provided by a water source heat pump.

4. Baseline Conditions

4.1 Local Monitoring Data

Under the requirements of Part IV of the Environment Act (1995) (Ref 9), LBC has carried out a review and assessment of local air quality. Currently, LBC monitors NO_2, PM_{10} and $PM_{2.5}$ with monitoring conducted using both automatic continuous monitors and non-automatic NO_2 diffusion tubes. The Council undertake automatic continuous monitoring at 3 locations and NO_2 diffusion tube monitoring at 14 monitoring locations which are illustrated in Figure 6 in Appendix A.

NO_2 concentrations measured at the monitoring sites within 1km of the Proposed Development are presented in Table 9. This includes monitoring undertaken by the neighbouring Borough, the City of Westminster. All monitoring data has been taken from LBC's and City of Westminster's respective 2019 Annual Status Reports (ASRs) (Ref 35 and Ref 53).

Table 9: LBC and Westminster Annual Mean NO_2 Monitoring Results

ID	Location	OS X, Y Coordinate	Approx. Distance to Site (km)	Monitor Type	Location Type	Annual Mean NO_2 concentration ($\mu g/m^3$)				
						2015	2016	2017	2018	2019
LB	London Bloomsbury	530500, 182500	0.5	CM	Urban Background	**48**	**42**	38	36	32
CD9	Euston Road	529500, 182500	1.0	CM	Roadside	**<u>90</u>**	**<u>88</u>**	**<u>83</u>**	**<u>82</u>**	**<u>70</u>**
CA10	Tavistock Gardens	529500, 182500	0.7	DT	Urban Background	**45**	40	**46**	35	33
CA11	Tottenham Court Road	529580, 181764	0.2	DT	Kerbside	**<u>86</u>**	**<u>84</u>**	**<u>74</u>**	**<u>66</u>**	**<u>61</u>**
CA21	Bloomsbury Street	529959, 181622	0.2	DT	Kerbside	**<u>71</u>**	**<u>72</u>**	**<u>71</u>**	**59**	**48**
CA29	Endsleigh Gardens	529500, 182500	0.8	DT	Roadside	-	-	-	-	**48**
OSE	Oxford Street East	529495, 181330	0.3	CM	Roadside	-	-	-	**<u>76</u>**	**51**

Numbers in bold show the concentrations exceeding the annual mean AQS objective (40 $\mu g/m^3$) while values bold and underlined (equal to or greater than 60 $\mu g/m^3$) indicate potential exceedance of the short-term NO_2 AQS objective. DT = Diffusion Tube, CM = Continuous Monitor.

In 2019, NO_2 concentrations were above the annual mean NO_2 objective of 40 $\mu g/m^3$ at five of the seven monitoring locations within 1 km of the Proposed Development.

4.2 Defra Mapped Background Pollutant Concentrations

A large number of small sources of air pollutants exist, which individually may not be significant, but collectively, over a large area, need to be considered in the modelling process. Pollutant emissions from these sources contribute to background air quality, which when added to modelled emissions allow estimates of total ambient pollutant concentrations to be made.

Defra has produced maps of background pollutant concentrations covering the whole of the UK for use by local authorities and consultants in the completion of LAQM reports and Air Quality Assessments where local background monitoring is unavailable or inappropriate for use. The current Defra maps are based on projections from 2017 monitoring data and provide background pollutant concentrations for each 1-km grid square within the UK for all years between 2017 and 2030 (Ref 45).

Table 10 presents a comparison between the 2019 monitored urban background NO_2 concentrations reported by LBC, City of Westminster and the Defra mapped background values for the corresponding grid square in 2019.

Table 10: LBC Urban Background Monitoring vs Defra Mapped Background Concentrations in 2019

Monitoring Location	Defra Grid Square (X,Y)	Monitored Annual Mean NO_2 (µg/m³)	Mapped Annual Mean NO_2 (µg/m³)
London Bloomsbury	530500, 182500	32	35.7
Tavistock Gardens	529500, 182500	33	34.2

Table 10 shows that the Defra Mapped background is more conservative than the monitored concentrations within the grid squares. To ensure that this assessment uses a conservative background, the modelling will be based on the Defra mapped background concentrations.

4.3 Backgrounds Used in Dispersion Modelling

Defra mapped background NO_2, PM_{10} and $PM_{2.5}$ concentrations for 2019 are presented in Table 11. Within grid square road contributions from motorways and primary A roads have been discounted from the Defra mapped background concentrations in accordance with the methodology set out in LLAQM.TG(16) and using the Defra NO_2 source apportionment calculator to avoid double counting (Ref 31) as the major roads close to the Proposed Development are included within the dispersion model. Emission from minor roads and roads outside the Defra grid square have not been removed.

LBC has requested that the opening year background air pollution concentrations be modelled without assuming any future improvement in air quality. As such, the 2019 background data in Table 11 has also been used in the 2024 opening year modelling. This is considered to be a very conservative approach however as both the background and roadside monitoring data presented in Table 9 does show that NO_2 concentrations have generally reduced over the past 5 years.

Table 11: Defra Mapped Background Pollutant Concentrations (µg/m³) in 2019

Receptor	Grid Square (X, Y)	Annual Mean Concentrations (µg/m³)			
		NO_X	NO_2	PM_{10}	$PM_{2.5}$
All receptors	529500, 181500	68.0	37.4	19.2	12.9

5. Results

5.1 Construction Phase

5.1.1 Predicted Effects during Demolition and Construction

An Air Quality Dust Risk Assessment has been undertaken based on currently available information concerning construction phase activities, in accordance with GLA supplementary planning guidance (Ref 23). There are no relevant ecological receptors (nationally designated sites) within 50m of the site boundary, 50m of the route used by construction traffic or within 500m of the site entrance. Therefore, ecological receptors have been scoped out of the dust risk assessment.

The sensitivity of the receptors identified within the vicinity of the site has been assessed as shown in Table 12 as per the GLA's Control of Dust and Emissions SPG (Ref 23).

Table 12: Sensitivity of Receptors

Area Affected	Sensitivity	Justification
Dust Soiling	High	There are between 10 to 100 high sensitivity receptors, i.e. residential properties, within 20m of the site boundary.
Human Health	Medium	There are between 10 to 100 high sensitivity receptors, i.e. residential properties, within 20m of the site boundary, however, annual mean PM_{10} concentrations are below 24 µg/m^3.

5.1.2 Demolition

The Site is currently occupied by 5 separate buildings which will require demolition prior to construction work commencing on the Proposed Development. The total building volume of the buildings to be demolished is approximately 9,244m^3, however, they are constructed of potential dusty materials, i.e. concrete, and works will take place between 10m - 20m above ground level. As such the potential dust emission magnitude for demolition activities is, therefore, considered to be medium. Taking account of the sensitivity of receptor in the area the Site is considered to be medium risk in terms of dust soiling and low risk in terms of human health.

5.1.3 Earthworks

The Proposed Development site area is under 2,500m^2 and given the limited size of the site is anticipated that there will be less than 10 heavy earth moving vehicles active at any one time. The potential dust emissions magnitude associated with earthworks is estimated to be small. Taking account of the sensitivity of receptor in the area the Site is considered to be low risk in terms of dust soiling and negligible risk in terms of human health.

5.1.4 Construction

The building volume of the Proposed Development is between 25,000m^3 and 100,000m^3 (45,000m^3), so would be classified as medium risk due to construction volume. Taking account of the sensitivity of receptor in the area the Site is considered to be medium risk in terms of dust soiling and low risk in terms of human health.

5.1.5 Trackout

The number of construction-related heavy-duty vehicle (HDV) movements generated by the Proposed Development is likely to be between 10 and 50 vehicle movements per day at its peak. Considering the size of the site, the potential dust emissions class for trackout is conservatively assumed to be medium. Taking account of the sensitivity of receptor in the area the Site is considered to be medium risk in terms of dust soiling and low risk in term of human health.

The dust risk assessment discussed above is summarised in Table 13 and Table 14.

Table 13: Summary of Potential Dust Emission Magnitudes for Construction Phase Activities

Activity	Risk Magnitude	Justification
Demolition	Medium	Total building volume to be demolished is <20,000 m^3. However, the buildings are made of potentially dust materials, i.e. concrete, and demolition activities will occur between 10-20m above ground level.
Earthworks	Small	Earthworks site area is <2,500m^2 with limited heavy earth moving vehicles present on site.
Construction	Medium	The construction volume is approximately 45,000m^3 so falls within the medium range (25,000m^3 to 100,000m^3).
Trackout	Medium	The peak number of construction-related heavy-duty vehicle (HDV) movements generated by the Proposed Development may be between 10 and 50 so the risk magnitude is considered to be medium.

Table 14: Summary Dust Risk Table

Potential Impact	Risk of Dust Impacts			
	Demolition	Earthworks	Construction	Track out
Dust Soiling	Medium Risk	Medium Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk

Overall, the Dust Risk Assessment conservatively identifies the Site as having a 'medium risk' of causing impacts during demolition and construction activities on the site and mitigation measures consistent with a medium-risk site should therefore be implemented. Proposed mitigation measures are, therefore presented in Table 20.

5.2 Operational Phase

The following Sections present the results of the air quality assessments at selected receptors, providing the predicted levels Without and With the Proposed Development.

5.2.1 Existing Receptor Locations

Predicted NO_2 concentrations, presented in Table 15, are above the respected AQS objective of 40 µg/m^3 in the base year, 2019, at all modelled receptor locations. The highest concentration of NO_2, PM_{10} and $PM_{2.5}$, 60.0 µg/m^3, 24.1 µg/m^3 and 15.8 µg/m^3 respectively, occurs at Receptor R3.

Predicted PM_{10} and $PM_{2.5}$ concentrations are well below their respected AQS objectives. Predicted NO_2 concentrations at receptors R1-R4 and R9 are within or meet the AQS of 60 µg/m^3 and, as such, it is likely that the hourly mean AQS objective for NO_2 will be achieved at these receptors with the exception of Receptor R3.

Table 15: Annual Mean Air Quality Results Baseline Results, 2019

Receptor	Locations	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
R1	6 Gower Street	**56.0**	23.1	15.3
R2	24 Tottenham Court Road	**56.3**	23.2	15.3
R3	91 New Oxford Street	**<u>60.0</u>**	24.1	15.8
R4	41 Oxford Street	**57.9**	23.6	15.6
R5	13 Bayley Street	**42.7**	20.3	13.5
R6	10 Bayley Street	**40.7**	19.9	13.3
R7	26A Morwell Street	**41.6**	20.0	13.4
R8	24 Morwell Street	**40.6**	19.8	13.3
R9	27 Tottenham Court Road	**56.4**	23.2	15.3
R10	51 Morwell Street	**41.8**	20.1	13.4
R11	1 Bedford Avenue	**44.8**	20.7	13.8
R12	4-1 Morwell Street	**42.0**	20.1	13.5

Numbers in bold show the concentrations exceeding the annual mean NO_2 and PM_{10} AQS objective (40 µg/m^3) while values bold and underlined (equal to or greater than 60 µg/m^3) indicate potential exceedance of the short-term NO_2 AQS objective.

Table 16 provides the predicted annual mean concentrations for the future opening year of 2024 (with 2019 EFT) Without and With the Proposed Development. The results are presented for the lowest floor with relevant exposure.

Annual mean NO_2 concentrations are predicted to be above the AQS objective both Without and With the Proposed Development at all receptors except for R6, R7 and R8. The highest NO_2 concentration is predicted to be 50.1 µg/m^3 at Receptor R3 (91 New Oxford Street). The change in annual mean NO_2 concentrations as a result of the Proposed Development is predicted to be less than 0.1 µg/m^3 at all receptors and, as such, is considered negligible. Predicted NO_2 concentrations at all modelled receptors are below 60 µg/m^3 and, as such, it is unlikely that the hourly mean AQS objective for NO_2 will be exceeded at any receptors.

Annual mean PM_{10} and $PM_{2.5}$ concentrations were predicted to be below the relevant AQS objective values in 2024 both Without and With the Proposed Development at all modelled receptors. The changes in annual mean PM_{10} and $PM_{2.5}$ concentrations as a result of the Proposed Development are less than 0.1 µg/m^3 and, as such, are considered to be negligible. Predicted annual mean PM_{10} concentrations are predicted to be below 32 µg/m^3 and, as such, the daily PM_{10} AQS objective of 50 µg/m^3, not be to be exceeded more than 35 times per year, is likely to be achieved at all modelled receptor locations.

The total modelled annual NO_2 concentrations and change as a result of the Proposed Development have been illustrated graphically in Figure 7 and Figure 8 in Appendix A.

Table 16: Annual Mean Concentrations With and Without the Proposed Development in 2024

Receptor ID	Locations	NO_2 (µg/m^3)				PM_{10} (µg/m^3)				$PM_{2.5}$ (µg/m^3)			
		Without	With	Change	Effect Descriptor	Without	With	Change	Effect Descriptor	Without	With	Change	Effect Descriptor
R1	6 Gower Street	**47.5**	**47.5**	<0.1	Negligible	21.4	21.4	<0.1	Negligible	14.3	14.3	<0.1	Negligible
R2	24 Tottenham Court Road	**48.1**	**48.1**	<0.1	Negligible	21.5	21.5	<0.1	Negligible	14.3	14.3	<0.1	Negligible
R3	91 New Oxford Street	**50.1**	**50.1**	<0.1	Negligible	22.0	22.0	<0.1	Negligible	14.6	14.6	<0.1	Negligible
R4	41 Oxford Street	**48.6**	**48.6**	<0.1	Negligible	21.7	21.7	<0.1	Negligible	14.4	14.4	<0.1	Negligible
R5	13 Bayley Street	**40.4**	**40.4**	<0.1	Negligible	19.8	19.8	<0.1	Negligible	13.3	13.3	<0.1	Negligible
R6	10 Bayley Street	39.2	39.2	<0.1	Negligible	19.6	19.6	<0.1	Negligible	13.1	13.1	<0.1	Negligible
R7	26A Morwell Street	39.9	39.9	<0.1	Negligible	19.7	19.7	<0.1	Negligible	13.2	13.2	<0.1	Negligible
R8	24 Morwell Street	39.2	39.2	<0.1	Negligible	19.6	19.6	<0.1	Negligible	13.1	13.1	<0.1	Negligible
R9	27 Tottenham Court Road	**48.1**	**48.1**	<0.1	Negligible	21.6	21.6	<0.1	Negligible	14.3	14.3	<0.1	Negligible
R10	51 Morwell Street	**40.1**	**40.1**	<0.1	Negligible	19.8	19.8	<0.1	Negligible	13.2	13.2	<0.1	Negligible
R11	1 Bedford Avenue	**42.8**	**42.8**	<0.1	Negligible	20.4	20.4	<0.1	Negligible	13.6	13.6	<0.1	Negligible
R12	4-1 Morwell Street	**40.2**	**40.2**	<0.1	Negligible	19.8	19.8	<0.1	Negligible	13.3	13.3	<0.1	Negligible

Numbers in bold show the concentrations exceeding the annual mean NO_2 and PM_{10} AQS objective (40 µg/m^3) while values bold and underlined (equal to or greater than 60 µg/m^3) indicate potential exceedance of the short-term NO_2 AQS objective.

5.2.2 Proposed Receptor Locations

Table 21 in Appendix B presents the predicted pollutant concentrations at the facades of the Proposed Development in the opening year 2024 and at the residential balconies on each floor. Annual mean NO_2 concentrations are predicted to be above the AQS objective at all modelled receptors for the Proposed Development site on the ground floor. Receptors P3, P4, P5 and P11 exceed the annual NO_2 objective at all floors.

The highest NO_2 concentration is predicted to be 47.6 µg/m^3 at P3. Predicted NO_2 concentrations at all modelled receptors are below 60 µg/m^3 and, as such, it is unlikely that the hourly mean AQS objective for NO_2 will be exceeded at any receptors.

Receptor P13 (Roof Terrace), Receptors P10 and P12 (large and small balconies facing northeast) and Receptors P6 and P7 (large and small terraces facing northeast) do not exceed the annual mean NO_2 AQS objective at height. Therefore, winter gardens are not needed at these locations. The receptors facing Tottenham Court Road (P5 and P11) are predicted to exceed the NO_2 annual mean AQS objectives, as such, Winter Gardens will be provided rather than open balconies. If mechanical ventilation air intakes are to be located on this façade then NO_X filtration will be required to protect internal air quality.

Annual mean PM_{10} and $PM_{2.5}$ concentrations were predicted to be below the relevant AQS objective values at the facades of the Proposed Development in the opening year 2024. Predicted annual mean PM_{10} concentrations are predicted to be significantly below 32 µg/m^3 and, as such, the daily PM_{10} AQS objective of 50 µg/m^3, not be to be exceeded more than 35 times per year, is likely to be achieved at all modelled receptor locations.

While the modelling predicts that the annual mean AQS objective for NO_2 will be exceeded at all heights on the west façade of the Proposed Development facing Tottenham Court Road, and on the lowest levels of the rear-facing Morwell Street façade, it should be noted that the modelling methodology employed is very conservative as, in accordance with the approach requested by LBC. It takes no account of future improvement in background pollutant concentrations or vehicle fleet emission rates.

The local air quality monitoring, as shown in the Baseline section of this report, suggests that there has been a downward trend in both background and roadside annual mean NO_2 concentrations over the last 5 years, which would be expected to continue due to the phasing out of older more polluting vehicles, reduction in diesel car sales, hybrid/electric vehicle uptake, implementation of the London Low and Ultra Low Emission Zones and congestion zone charging along with wider government policies favouring green transport. Additional modelling results are presented in Appendix C, which has used the 2019 background concentration but the Defra EFT 2024 fleet emission rates, rather than 2019. This approach is still considered conservative, as it does not consider reductions in background pollutant concentrations. These show that whilst the west facing façade still exceeds the AQS objective at all modelled receptors (albeit to a lesser extent), the east facing façade is predicted to achieve the AQS objective at all heights.

As the annual mean AQS objective for PM_{10}, and the short-term AQS objectives for NO_2 and PM_{10}, will be achieved at all modelled receptors representative of the Proposed Development, the site is considered appropriate for its proposed use, subject to the application of appropriate mitigation measures as described above.

It should be noted that the commercial office areas are to be future proofed with natural ventilation apertures located behind screened louvres adjacent to the windows within each bay of the office areas from 1st floor level and above. These apertures will allow the commercial office space to operate a mixed mode ventilation and cooling strategy if improvements to the Tottenham Court Road air quality and noise allow in the future. Based on the modelling undertaken and presented in Table 21 even assuming worst-case assumptions, i.e. that there is no improvement in air quality between 2019 and 2024, the modelling at façade locations has demonstrated that while the annual mean AQS objective for NO_2 is predicted to be exceeded the concentration is below 60 µg/m^3 indicating that the short-term AQS objective, which applies at offices etc, will not be exceeded. Air quality may already be acceptable to allow the office element of the development to operate in mixed mode.

This is further supported by the modelling presented in Table 22 which shows predicted concentrations in 2024 assuming that road vehicle emissions decrease in line with Defra estimates between 2019 and 2024 but that there is no improvement in background air quality. This assumption is still considered conservative given that LBCs monitoring in the Borough has shown decrease in both background and roadside NO_2 concentrations over the past 5 years. The results in Table 22 illustrates that the annual mean NO_2 objective of 40 $\mu g/m^3$ is only marginally exceeded (maximum of 43.7 $\mu g/m^3$) in 2024 when road emission improvement are considered.

6. Air Quality Neutral Results

6.1 Introduction

In order to address the GLA's policy for new developments to be 'air quality neutral', and in-line with the relevant requirements of its Sustainable Design and Construction SPG (Ref 22), emissions for the Proposed Development were estimated, and used to evaluate its performance against site-specific benchmark values from the SPG.

The Proposed Development is mixed use with 8 residential dwellings (land use category C3), 1,350 m^2 of retail space (land use category A1/A2/A3/D2) and 7,717 m^2 of office space (land use category B1) combined with 656 m^2 of Flexible Class (land use category D1/B1). The Proposed Development does not contain an energy centre. The heating, cooling and hot water for the residential properties will be provided by air source heat pumps while heating/cooling for the office space will be via a central air source heat pump at roof level and hot water provided by a water source heat pump.

6.2 Transport Related Emissions

The Proposed Development is car-free, with the exception of limited disability parking, so though there will be some vehicle movements for other modes of transport i.e. taxi and service vehicle trips which have been considered within this transport Section of the Air quality neutral assessment. The trips generated as a result of the Proposed Development amount to 21 servicing vehicle trips per day.

As both the NO_X and PM_{10} transport emissions for the Proposed Development are smaller than the calculated benchmark emissions for NO_X and PM_{10}, the Proposed Development is considered to be air quality neutral with regard to transport-related emissions. The results of the air quality neutral assessment are presented in Table 17, Table 18 and Table 19 below.

Table 17: Calculation of Benchmarked Transport Emissions

Land Use	Quantity	NO_X Transport Emission Benchmark (g/m²/annum)	Total NO_X Transport Emissions Benchmark (kg)
Retail (A1/A2/A3/D2)	1,350 m^2	169	228.2
Office (B1) and Flexible Class (B1/D1)*	8,373 m^2	1.27	10.6
Residential (C3)	8 dwellings	234	1.9
Total NO_X Benchmarked Transport Emissions			**240.7**
Land Use	**Quantity**	**PM_{10} Transport Emission Benchmark (g/m²/annum)**	**Total PM_{10} Transport Emissions Benchmark (kg)**
Retail (A1/A2/A3/D2)	1,350 m^2	29.3	39.6
Office (B1) and Flexible Class (B1/D1)*	8,373 m^2	0.22	1.8
Residential (C3)	8 dwellings	40.7	0.3
Total PM_{10} Benchmarked Transport Emissions			**41.7**

Note * flexible class B1/D1 has been taken to be B1 use for calculation purposes.

Table 18: Calculation of Total Transport Emissions

Land Use	Total Average Distance travelled per year (km/yr^2)	NO_X Transport Emission Factor (gNO_X/vehicle-km)	Total NO_X Transport Emissions (kg/yr)
Retail (A1/A2/A3/D2)	71,285	0.4224	30.1
Office (B1) and Flexible Class (B1/D1)*	22,995	0.4224	9.7
Residential (C3)	32,960	0.4224	13.9
Total NO_X Transport Emissions			**53.7**
Land Use	**Total Average Distance travelled per year (km/yr)**	**PM_{10} Transport Emission Factor (gPM_{10}/vehicle-km)**	**Total PM_{10} Transport Emissions (kg/yr)**
Retail (A1/A2/A3/D2)	13,578	0.0733	5.2
Office (B1) and Flexible Class (B1/D1)*	4,380	0.0733	1.7
Residential (C3)	6,278	0.0733	2.4
Total PM_{10} Transport Emissions			**9.3**

Note * flexible class B1/D1 has been taken to be B1 use for calculation purposes.

Table 19: Comparison Between Total Transport Emissions and Benchmarked Transport Emissions

NO_X	
Total Transport Emissions (kg/yr)	53.7
Total Benchmarked Transport Emissions (Assessment Criteria) (kg/yr)	240.7
Difference (kg/yr)	**-186.9**
PM_{10}	
Total Transport Emissions (kg/annum)	9.3
Total Benchmarked Transport Emissions (Assessment Criteria) (kg/annum)	41.7
Difference (kg/annum)	**-32.4**

Traffic related NO_X and PM_{10} emissions are below the relevant Transport Emission Benchmark for a mixed use development with comparable number of residential properties and retail/office floor space. As such the development is considered air quality neutral.

7. Mitigation Measures

7.1 Construction Phase Mitigation Measures

Based on the results of the dust risk assessment, the following mitigation measures are recommended by The Control of Dust and Emissions during Construction and Demolition – Supplementary Planning Guidance (Ref 23) for Medium Risk Sites. It is recognised that not all of the recommended measures maybe be appropriate or feasible for all high-risk sites. It is provided to recommend the desirable mitigation and is intentionally designed not to limit mitigation that is finally selected by the demolition/construction company to avoid issues once the planning is agreed. The dust controls are generally agreed after planning as a condition with the requirement that the demolition/construction company issue a dust management plan (DMP) or Construction Environmental Management Plan (CEMP) prior to works commencing on site.

Table 20: Mitigation Measures

Mitigation Measure	Highly Recommended (H) / Desirable (D)
Site Management	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
Develop a Dust Management Plan.	H
Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.	H
Display the head or regional office contact information.	H
Record and respond to all dust and air quality pollutant emissions complaints.	H
Make a complaint log available to the local authority when asked.	H
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.	H
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.	H
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 logbook.	H
Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.	
Preparing and Maintaining the Site	
Plan site layout: machinery and dust causing activities should be located away from receptors.	H
Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.	H
Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H
Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.	D
Avoid site runoff of water or mud.	H
Keep site fencing, hoarding, barriers and scaffolding clean using wet methods.	H
Remove materials from site as soon as possible.	H
Cover, seed or fence stockpiles to prevent wind whipping.	H

Mitigation Measure	Highly Recommended (H) / Desirable (D)
Avoid double handling of material wherever reasonably practicable.	H
Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.	D
Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust.	
Agree monitoring locations with the Local Authority.	H
Where possible, commence baseline monitoring at least three months before phase begins.	H
Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	H
Operating Vehicle/Machinery and Sustainable Travel	
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.	H
Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.	H
Ensure all vehicles switch off engines when stationary – no idling vehicles.	H
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where possible.	H
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).	D
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	H
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	H
Loading of material into lorries within designated bay.	H
Plant working on site to have exhausts positioned such that the risk of re-suspension of ground dust is minimised (exhausts should preferably point upwards), where reasonably practicable.	H
Ensure all vehicles carrying loose or potentially dusty material to or from the site are fully sheeted.	H
Use ultra-low sulphur fuels in plant and vehicles.	H
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H
Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).	H
Use enclosed chutes, conveyors and covered skips.	H
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H
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.	H

Mitigation Measure	Highly Recommended (H) / Desirable (D)
Waste Management	
Reuse and recycle waste to reduce dust from waste materials	H
Avoid bonfires and burning of waste materials.	H
Measures Specific to Demolition	
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)	D
Ensure water suppression is used during demolition operations.	H
Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H
Bag and remove any biological debris or damp down such material before demolition.	H
Measures Specific to Earthworks	
No specific measures are recommended as the site is Low Risk, however, general good practice measures should be implemented.	-
Measures Specific to Construction	
Avoid scabbling (roughening of concrete surfaces) if possible	D
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	H
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.	D
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	D
Measures Specific to Trackout	
Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.	H
Avoid dry sweeping of large areas.	H
Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.	H
Record all inspections of haul routes and any subsequent action in a site logbook.	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.	H
Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable	H
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
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.	H
Access gates to be located at least 10m from receptors where possible.	H
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site	D

7.1.1 Camden's Minimum Construction Dust Mitigated Requirements

- Consideration should be given to the siting of aggregate stockpiles, based upon such factor as the prevailing winds, proximity of site boundary and proximity of neighbours. Minimisation of drop height is very important in stockpiling to reduce wind whipping of particulates. When designing storage bays, internal walls separating storage bays should be at least ½ metre lower than external walls of the bays.

- Areas where there is vehicular movement should have a consolidated surface which should be kept in good repair.
- The main principles for preventing dust emissions are containment of dusty processes and suppression of dust using water or proprietary suppressants. Suppression techniques need to be properly designed, used and maintained, in order to be effective. For example, where water is used for dust suppression, processes require an adequate supply of water and all water suppression systems need adequate frost protection.
- Where there is evidence of airborne dust from the building construction/demolition activities the site, the contractor should make their own inspection and assessment, and where necessary undertake ambient monitoring with the aim of identifying those process operations giving rise to the dust. Once the source of the emission is known, corrective action should be taken without delay.
- Effective preventative maintenance should be employed on all aspects of the construction/demolition works including all plant, vehicles, buildings and the equipment concerned with the control of emissions to air.
- Important management techniques for effective control of emissions include; proper management, supervision and training for process operations; proper use of equipment; effective preventative maintenance on all plant and equipment concerned with the control of emissions to the air; and it is good practice to ensure that spares and consumables are available at short notice in order to rectify breakdowns rapidly. This is important with respect to arrestment plant and other necessary environmental controls. It is useful to have an audited list of essential items.

7.2 Operational Phase Mitigation Measures

To address concentrations predicted above the NO_2 thresholds, NO_X filtration systems are recommended for any air intake vents that will be facing Tottenham Court Road and Bayley Street. They could also be considered on the façade facing Morwell Street due to concentrations being within 10% of the Air Quality Objectives. NO_X filtration systems and green infrastructure, such as the roof top gardens, are included within Camden's Clean Air Action Plan 2019-2022.

In addition to these measures, winter gardens (enclosed balconies) are recommended instead of open balconies due to the NO_2 exceedances predicted on the façade facing Tottenham Court Road. This will reduce exposure of residents to NO_2 within the development at all heights on the side facing Tottenham Court Road.

It should be noted that the commercial office areas are to be future proofed with natural ventilation apertures located behind screened louvres adjacent to the windows within each bay of the office areas from 1st floor level and above. These apertures will allow the commercial office space to operate a mixed mode ventilation and cooling strategy if improvements to the Tottenham Court Road air quality and noise allow in the future. Based on the modelling undertaken and presented in Table 21 even assuming worst-case assumptions, i.e. that there is no improvement in air quality between 2019 and 2024, the modelling at façade locations has demonstrated that while the annual mean AQS objective for NO_2 is predicted to be exceeded the concentration is below 60 $\mu g/m^3$ indicating that the short-term AQS objective, which applies at offices etc, will not be exceeded. Air quality may already be acceptable to allow the office element of the development to operate in mixed mode.

This is further supported by the modelling presented in Table 22 which shows predicted concentrations in 2024 assuming that road vehicle emissions decrease in line with Defra estimates between 2019 and 2024 but that there is no improvement in background air quality. This assumption is still considered conservative given that LBCs monitoring in the Borough has shown decrease in both background and roadside NO_2 concentrations over the past 5 years. The results in Table 22 illustrates that the annual mean NO_2 objective of 40 $\mu g/m^3$ is only marginally exceeded (maximum of 43.7 $\mu g/m^3$) in 2024 when road emission improvement are considered.

8. Summary and Conclusions

This air quality assessment has been undertaken in order to assess the potential air quality impacts associated with the demolition and construction of the development at 247 Tottenham Court Road ('The Site') within the jurisdiction of the London Borough of Camden (LBC).

LBC has declared the entire Borough an Air Quality Management Area (AQMA) due to exceedances of the Air Quality Strategy (AQS) objective for annual mean NO_2 and daily mean objective for PM_{10}.

The results of the construction phase assessment indicate that, in the absence of mitigation, construction phase impacts associated with the Proposed Development, such as removal / demolition of existing structures, earthworks, construction and track-out, can be described as low to medium risk with regard to dust soiling, and negligible to low risk in terms of human health impacts. There are a range of mitigation measures which can be followed to reduce the nuisance and human-health impacts of the dust and PM_{10} which, if effectively implemented, can reduce impacts to an insignificant level. Appropriate mitigation measures are set out in Table 20 and should be implemented through a Dust Management Plan or CEMP.

The operational impact of the Proposed Development on local air quality was assessed at 12 off-site receptor locations representing existing sensitive receptors. Predicted NO_2 concentrations are predicted to be above the annual mean air quality objective of 40 µg/m^3 at all the receptors except for R6, R7 and R8 for both the Without and With Development operational traffic scenarios. Annual mean PM_{10} and $PM_{2.5}$ concentrations are predicted to be below the EU limit value of 40 µg/m^3 and 25 µg/m^3 respectively at all modelled receptors for both the Without and With Development operational traffic scenarios. Air quality impacts due to the Proposed Development at all existing receptor locations are predicted to be negligible, according to the EPUK/IAQM significance criteria. Overall, the Proposed Development operational traffic impacts on local air quality are considered to be not significant.

Thirteen additional receptors were modelled to represent the facades, balconies and terraces of the Proposed Development. PM_{10} and $PM_{2.5}$ concentrations are predicted to be below the annual mean AQS objective and EU limit value at all modelled receptors. The annual mean NO_2 objective is predicted to be exceeded at all receptors at ground floor, therefore any air flow intakes at ground level will need to consider NO_X filtration systems. Receptors P3, P4, P5 and P11 are predicted to exceed the annual mean NO_2 objective at all floors. Receptor P13 (Roof terrace) does not exceed the annual mean NO_2 objective at roof height and receptors P10 and P12 (large and small balconies facing northeast) and receptors P6 and P7 (large and small terraces facing northeast) do not exceed the objective at height.

Winter Gardens will be provided rather than balconies on the residential properties facing Tottenham Court Road (P5 and P11). If mechanical air intakes are to be located on the building façade facing Tottenham Court Road, then these will need to be fitted with NO_X filtration systems to protect internal air quality.

The Proposed Development does not contain an energy centre. The heating, cooling and hot water for the residential properties will be provided by air source heat pumps while heating/cooling for the office space will be via a central air source heat pump at roof level and hot water provided by a water source heat pump. The Proposed Development is, therefore, considered air quality neutral in terms of building emissions. Transport related emissions associated with the Proposed Development have been calculated in accordance with the Sustainable Design and Construction SPG (Ref 22). This has demonstrated that the Proposed Development's transport related emission are significantly below the calculated emissions for a development of a similar size and land-use class (residential, office and retail). As such, the Proposed Development is considered to be air quality neutral.

It should be noted that the commercial office areas are to be future proofed with natural ventilation apertures located behind screened louvres adjacent to the windows within each bay of the office areas from 1st floor level and above. These apertures will allow the commercial office space to operate a mixed mode ventilation and cooling strategy if improvements to the Tottenham Court Road air quality and noise allow in the future. Based on the modelling undertaken and presented in Table 21 even assuming worst-case assumptions, i.e. that there is no improvement in air quality between 2019 and 2024, the modelling at façade locations has demonstrated that while the annual mean AQS objective for NO_2 is predicted to be exceeded the concentration is below 60 µg/m^3 indicating that the short-term

AQS objective, which applies at offices etc, will not be exceeded. Air quality may already be acceptable to allow the office element of the development to operate in mixed mode.

This is further supported by the modelling presented in Table 22 which shows predicted concentrations in 2024 assuming that road vehicle emissions decrease in line with Defra estimates between 2019 and 2024 but that there is no improvement in background air quality. This assumption is still considered conservative given that LBCs monitoring in the Borough has shown decrease in both background and roadside NO_2 concentrations over the past 5 years. The results in Table 22 illustrates that the annual mean NO_2 objective of 40 μg/m^3 is only marginally exceeded (maximum of 43.7 μg/m^3) in 2024 when road emission improvement are considered.

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Appendix A - Figures

Figure 1: Wind Rose from London City Airport Meteorological Station, 2019

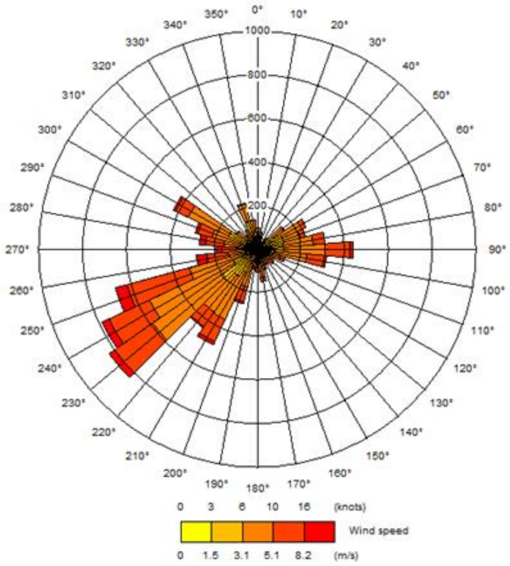

Figure 2: Air Quality Focus Areas

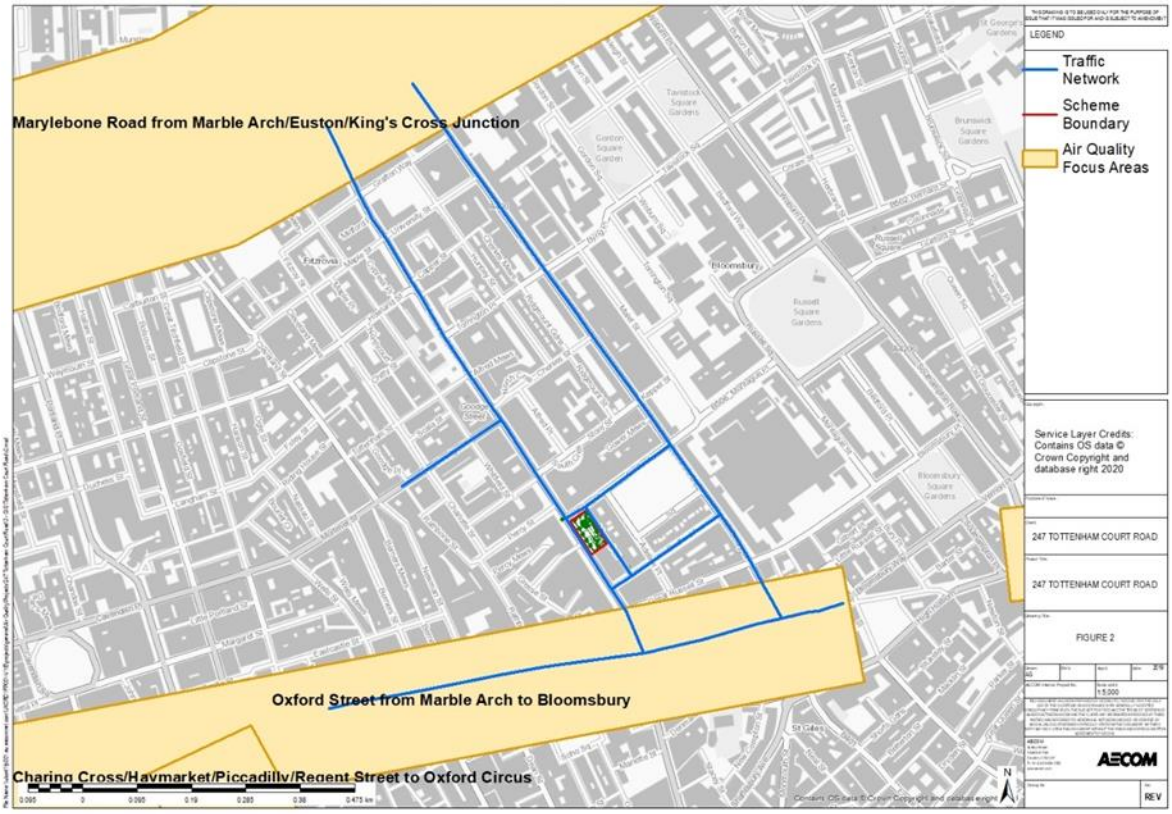

Figure 3: Modelled Road and Off-Site Receptors Locations

Figure 4: Modelled Road and Proposed On-site Receptors

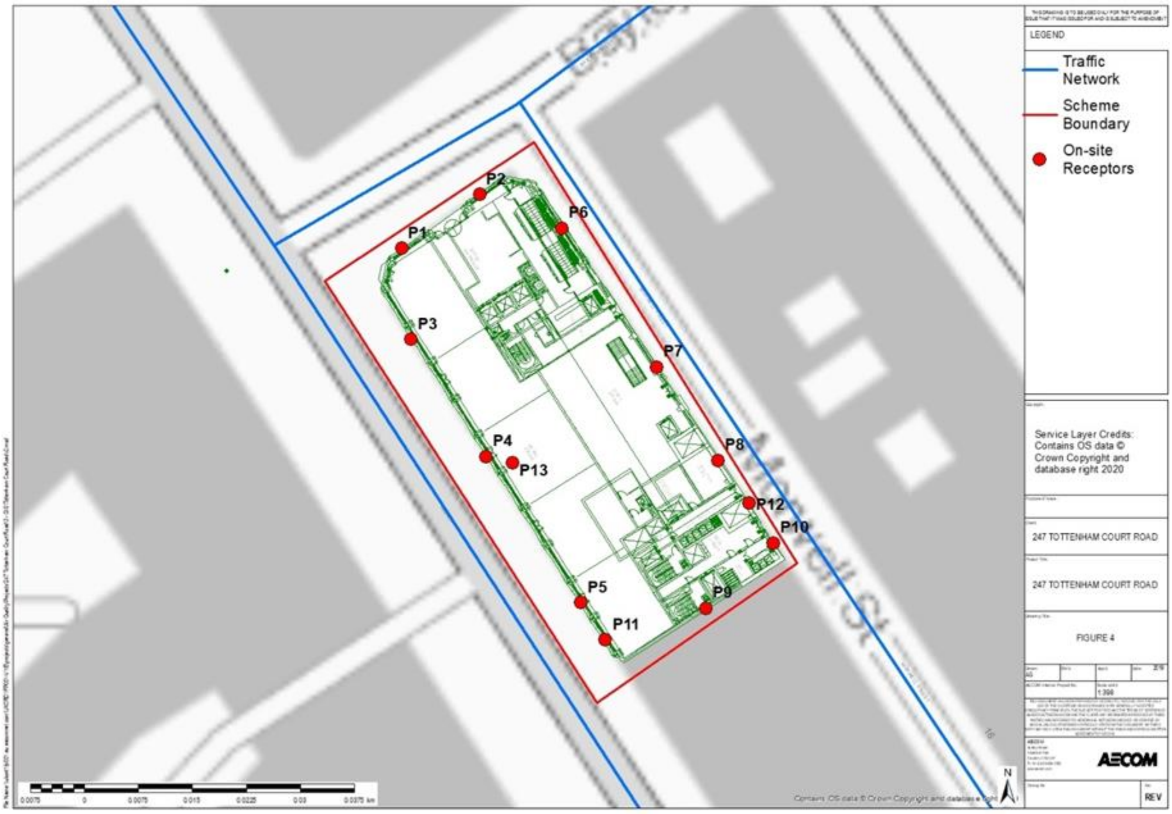

Figure 5: Model Verification - Modelled Roads and Monitoring Locations

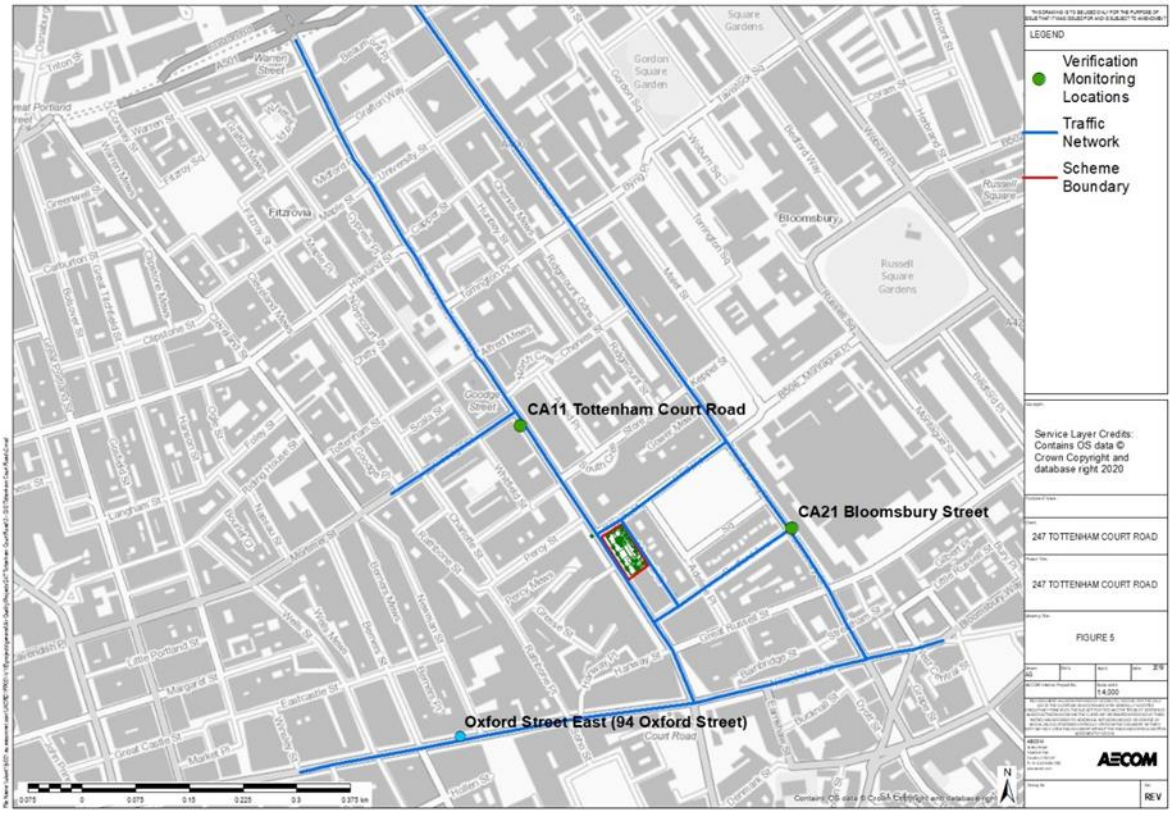

Figure 6: LBC Monitoring Locations

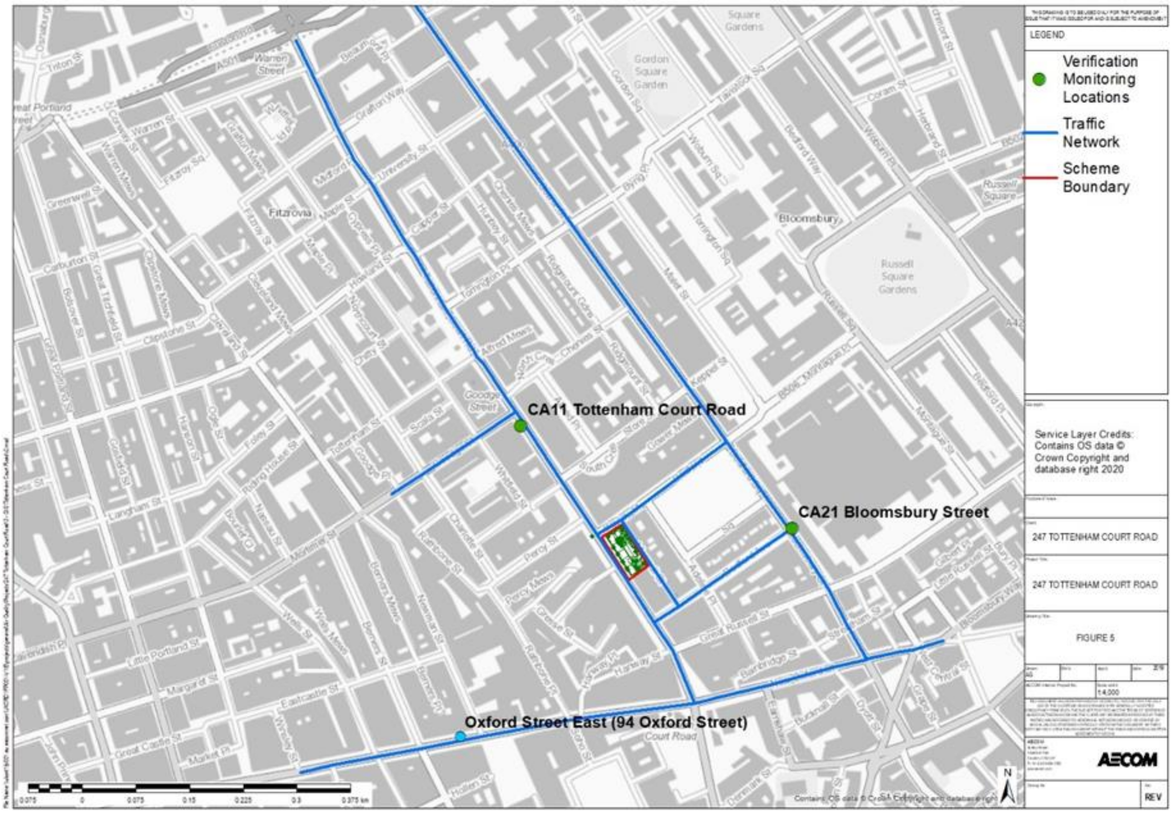

Figure 7: Change in NO_2 Concentrations Between Without and With Scenarios

Figure 8: NO_2 Concentrations With Proposed Development at Receptor Locations

Appendix B - On-Site Receptor Results

Table 21: Onsite Receptor Results

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m³)		
				NO_2	PM_{10}	$PM_{2.5}$
P1a	529703	181616	1.5	**42.0**	20.1	14.1
P1b	529703	181616	5.65	**40.1**	19.7	14.1
P1c	529703	181616	9.15	38.9	19.5	14.4
P1d	529703	181616	12.65	38.3	19.4	14.2
P1e	529703	181616	16.15	38.1	19.3	13.2
P1f	529703	181616	19.65	37.9	19.3	13.1
P1g	529703	181616	23.15	37.8	19.3	13.2
P2a	529715	181623	1.5	**40.3**	19.8	13.1
P2b	529715	181623	5.65	39.6	19.6	14.1
P2c	529715	181623	9.15	38.9	19.5	13.2
P2d	529715	181623	12.65	38.4	19.4	13.5
P2e	529715	181623	16.15	38.1	19.4	13.2
P2f	529715	181623	19.65	38.0	19.3	13.4
P2g	529715	181623	23.15	37.8	19.3	13.2
P3a	529706	181601	1.5	**47.6**	21.3	13.1
P3b	529706	181601	5.65	**47.4**	21.2	13.0
P3c	529706	181601	9.15	**47.2**	21.2	13.0
P3d	529706	181601	12.65	**47.0**	21.1	13.0
P3e	529706	181601	16.15	**46.8**	21.1	13.0
P3f	529706	181601	19.65	**46.7**	21.1	13.2
P3g	529706	181601	23.15	**46.7**	21.0	13.2
P4a	529716	181586	1.5	**47.1**	21.1	13.1
P4b	529716	181586	5.65	**47.0**	21.1	13.0
P4c	529716	181586	9.15	**46.9**	21.1	13.0
P4d	529716	181586	12.65	**46.7**	21.1	13.0
P4e	529716	181586	16.15	**46.6**	21.0	13.0
P4f	529716	181586	19.65	**46.5**	21.0	14.1
P4g	529716	181586	23.15	**46.4**	21.0	14.0
P5a	529730	181565	1.5	**47.2**	21.2	14.0
P5b	529730	181565	5.65	**47.1**	21.1	14.0
P5c	529730	181565	9.15	**46.9**	21.1	14.0
P5d	529730	181565	12.65	**46.8**	21.1	14.0
P5e	529730	181565	16.15	**46.7**	21.1	13.9
P5f	529730	181565	19.65	**46.6**	21.0	14.0
P5g	529730	181565	23.15	**46.5**	21.0	14.0

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m^3)		
				NO_2	PM_{10}	$PM_{2.5}$
P6a	529728	181617	1.5	**40.2**	19.8	14.0
P6b	529728	181617	5.65	39.8	19.7	13.9
P6c	529728	181617	9.15	39.4	19.6	13.9
P6d	529728	181617	12.65	39.0	19.5	13.9
P6e	529728	181617	16.15	38.2	19.4	13.9
P6f	529728	181617	19.65	38.0	19.3	14.0
P6g	529728	181617	23.15	37.9	19.3	14.0
P7a	529741	181598	1.5	**40.2**	19.8	14.0
P7b	529741	181598	5.65	39.9	19.7	14.0
P7c	529741	181598	9.15	39.4	19.6	13.9
P7d	529741	181598	12.65	39.0	19.5	13.9
P7e	529741	181598	16.15	38.2	19.4	13.9
P7f	529741	181598	19.65	38.0	19.3	13.2
P7g	529741	181598	23.15	37.9	19.3	13.2
P8a	529749	181585	1.5	**40.2**	19.8	13.1
P8b	529749	181585	5.65	39.9	19.7	13.1
P8c	529749	181585	9.15	39.4	19.6	13.0
P8d	529749	181585	12.65	39.0	19.5	13.0
P8e	529749	181585	16.15	38.2	19.4	13.0
P8f	529749	181585	19.65	38.0	19.3	13.2
P8g	529749	181585	23.15	37.9	19.3	13.2
P9a	529746	181564	1.5	**40.8**	19.9	13.1
P9b	529746	181564	5.65	39.9	19.7	13.1
P9c	529746	181564	9.15	39.0	19.5	13.0
P9d	529746	181564	12.65	38.5	19.4	13.0
P9e	529746	181564	16.15	38.2	19.4	13.0
P9f	529746	181564	19.65	38.0	19.3	13.2
P9g	529746	181564	23.15	37.9	19.3	13.2
P10a	529757	181574	1.5	**40.3**	19.8	13.1
P10b	529757	181574	5.65	39.9	19.7	13.1
P10c	529757	181574	9.15	39.4	19.6	13.0
P10d	529757	181574	12.65	39.0	19.5	13.0
P10e	529757	181574	16.15	38.2	19.4	13.0
P10f	529757	181574	19.65	38.0	19.3	13.3
P10g	529757	181574	23.15	37.9	19.3	13.2
P11a	529733	181560	1.5	**47.3**	21.2	13.1
P11b	529733	181560	5.65	**47.2**	21.2	13.0
P11c	529733	181560	9.15	**47.0**	21.1	13.0

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m^3)		
				NO_2	PM_{10}	$PM_{2.5}$
P11d	529733	181560	12.65	**46.9**	21.1	13.0
P11e	529733	181560	16.15	**46.8**	21.1	13.0
P11f	529733	181560	19.65	**46.7**	21.1	13.2
P11g	529733	181560	23.15	**46.6**	21.0	13.2
P12a	529753	181579	1.5	**40.2**	19.8	13.1
P12b	529753	181579	5.65	39.9	19.7	13.1
P12c	529753	181579	9.15	39.4	19.6	13.0
P12d	529753	181579	12.65	39.0	19.5	13.0
P12e	529753	181579	16.15	38.2	19.4	13.0
P12f	529753	181579	19.65	38.0	19.3	14.0
P12g	529753	181579	23.15	37.9	19.3	14.0
P13a	529723	181586	1.5	**42.0**	20.1	14.0
P13b	529723	181586	5.65	**40.2**	19.7	14.0
P13c	529723	181586	9.15	38.9	19.5	14.0
P13d	529723	181586	12.65	38.4	19.4	13.9
P13e	529723	181586	16.15	38.1	19.4	13.9
P13f	529723	181586	19.65	37.9	19.3	13.2
P13g	529723	181586	23.15	37.8	19.3	13.2
P13g	529723	181586	27.55	37.8	19.3	13.1

Numbers in bold show the concentrations exceeding the annual mean NO_2 and PM_{10} AQS objective (40 µg/m^3) while values bold and underlined (equal to or greater than 60 µg/m^3) indicate potential exceedance of the short-term NO_2 AQS objective.

Appendix C - On-Site Receptor Results (Sensitivity Test using 2024 EFT Emission Rates)

As a sensitivity test to show the impact of predicted improvements in vehicle fleet emission rates, results have been presented below showing predicted annual mean concentrations at on site receptors using EFT v9.0 projections of emission rates, but keeping 2019 background concentrations, which still provides a conservative methodology, as background concentrations are expected to decrease in line with historical trends and projections of improvements to the vehicle fleet. Additionally, the EFT v9.0 is considered to be more realistic than previous versions of the toolkit, which often overestimated the rate of vehicle fleet improvements in relation to emissions, so the results based on this sensitivity test may be more realistic whilst still being conservative.

Table 22: Onsite Receptor Results (Sensitivity Test, using EFT 2024 Emission Rates)

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m^3)		
				NO_2	PM_{10}	$PM_{2.5}$
P1a	529703	181616	1.5	**40.2**	20.1	13.4
P1b	529703	181616	5.65	39.1	19.7	13.2
P1c	529703	181616	9.15	38.3	19.5	13.1
P1d	529703	181616	12.65	38.0	19.4	13.0
P1e	529703	181616	16.15	37.8	19.3	13.0
P1f	529703	181616	19.65	37.7	19.3	13.0
P1g	529703	181616	23.15	37.7	19.3	13.0
P2a	529715	181623	1.5	39.1	19.8	13.2
P2b	529715	181623	5.65	38.7	19.6	13.2
P2c	529715	181623	9.15	38.3	19.5	13.1
P2d	529715	181623	12.65	38.0	19.4	13.0
P2e	529715	181623	16.15	37.9	19.4	13.0
P2f	529715	181623	19.65	37.8	19.3	13.0
P2g	529715	181623	23.15	37.7	19.3	13.0
P3a	529706	181601	1.5	**43.7**	21.3	14.1
P3b	529706	181601	5.65	**43.6**	21.2	14.0
P3c	529706	181601	9.15	**43.4**	21.2	14.0
P3d	529706	181601	12.65	**43.3**	21.1	14.0
P3e	529706	181601	16.15	**43.2**	21.1	14.0
P3f	529706	181601	19.65	**43.1**	21.1	14.0
P3g	529706	181601	23.15	**43.1**	21.0	13.9
P4a	529716	181586	1.5	**43.4**	21.1	14.0
P4b	529716	181586	5.65	**43.3**	21.1	14.0
P4c	529716	181586	9.15	**43.2**	21.1	14.0
P4d	529716	181586	12.65	**43.1**	21.1	13.9
P4e	529716	181586	16.15	**43.1**	21.0	13.9
P4f	529716	181586	19.65	**43.0**	21.0	13.9
P4g	529716	181586	23.15	**43.0**	21.0	13.9

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m^3)		
				NO_2	PM_{10}	$PM_{2.5}$
P5a	529730	181565	1.5	**43.4**	21.2	14.0
P5b	529730	181565	5.65	**43.4**	21.1	14.0
P5c	529730	181565	9.15	**43.3**	21.1	14.0
P5d	529730	181565	12.65	**43.2**	21.1	14.0
P5e	529730	181565	16.15	**43.1**	21.1	13.9
P5f	529730	181565	19.65	**43.1**	21.0	13.9
P5g	529730	181565	23.15	**43.0**	21.0	13.9
P6a	529728	181617	1.5	39.1	19.8	13.2
P6b	529728	181617	5.65	38.9	19.7	13.2
P6c	529728	181617	9.15	38.6	19.6	13.1
P6d	529728	181617	12.65	38.4	19.5	13.1
P6e	529728	181617	16.15	37.9	19.4	13.0
P6f	529728	181617	19.65	37.8	19.3	13.0
P6g	529728	181617	23.15	37.7	19.3	13.0
P7a	529741	181598	1.5	39.2	19.8	13.2
P7b	529741	181598	5.65	38.9	19.7	13.2
P7c	529741	181598	9.15	38.6	19.6	13.1
P7d	529741	181598	12.65	38.4	19.5	13.1
P7e	529741	181598	16.15	37.9	19.4	13.0
P7f	529741	181598	19.65	37.8	19.3	13.0
P7g	529741	181598	23.15	37.7	19.3	13.0
P8a	529749	181585	1.5	39.2	19.8	13.2
P8b	529749	181585	5.65	38.9	19.7	13.2
P8c	529749	181585	9.15	38.6	19.6	13.1
P8d	529749	181585	12.65	38.4	19.5	13.1
P8e	529749	181585	16.15	37.9	19.4	13.0
P8f	529749	181585	19.65	37.8	19.3	13.0
P8g	529749	181585	23.15	37.7	19.3	13.0
P9a	529746	181564	1.5	39.5	19.9	13.3
P9b	529746	181564	5.65	38.9	19.7	13.2
P9c	529746	181564	9.15	38.4	19.5	13.1
P9d	529746	181564	12.65	38.1	19.4	13.0
P9e	529746	181564	16.15	37.9	19.4	13.0
P9f	529746	181564	19.65	37.8	19.3	13.0
P9g	529746	181564	23.15	37.7	19.3	13.0
P10a	529757	181574	1.5	39.2	19.8	13.2
P10b	529757	181574	5.65	38.9	19.7	13.2
P10c	529757	181574	9.15	38.7	19.6	13.1

Receptor name	X co-ordinate	Y co-ordinate	Height (m)	Annual Mean Concentrations (µg/m^3)		
				NO_2	PM_{10}	$PM_{2.5}$
P10d	529757	181574	12.65	38.4	19.5	13.1
P10e	529757	181574	16.15	37.9	19.4	13.0
P10f	529757	181574	19.65	37.8	19.3	13.0
P10g	529757	181574	23.15	37.7	19.3	13.0
P11a	529733	181560	1.5	**43.5**	21.2	14.0
P11b	529733	181560	5.65	**43.4**	21.2	14.0
P11c	529733	181560	9.15	**43.3**	21.1	14.0
P11d	529733	181560	12.65	**43.3**	21.1	14.0
P11e	529733	181560	16.15	**43.2**	21.1	14.0
P11f	529733	181560	19.65	**43.1**	21.1	13.9
P11g	529733	181560	23.15	**43.1**	21.0	13.9
P12a	529753	181579	1.5	39.2	19.8	13.2
P12b	529753	181579	5.65	38.9	19.7	13.2
P12c	529753	181579	9.15	38.7	19.6	13.1
P12d	529753	181579	12.65	38.4	19.5	13.1
P12e	529753	181579	16.15	37.9	19.4	13.0
P12f	529753	181579	19.65	37.8	19.3	13.0
P12g	529753	181579	23.15	37.7	19.3	13.0
P13a	529723	181586	1.5	**40.2**	20.1	13.4
P13b	529723	181586	5.65	39.1	19.7	13.2
P13c	529723	181586	9.15	38.3	19.5	13.1
P13d	529723	181586	12.65	38.0	19.4	13.0
P13e	529723	181586	16.15	37.8	19.4	13.0
P13f	529723	181586	19.65	37.7	19.3	13.0
P13g	529723	181586	23.15	37.7	19.3	13.0
P13g	529723	181586	27.55	37.6	19.3	13.0

Numbers in bold show the concentrations exceeding the annual mean NO_2 and PM_{10} AQS objective (40 µg/m^3) while values bold and underlined (equal to or greater than 60 µg/m^3) indicate potential exceedance of the short-term NO_2 AQS objective.

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