



AIR QUALITY ASSESSMENT

AT: 91 Station Road

CLIENT: Progress Planning

DATE: October 2021

STROMA PROJECT REF: 05-21-87830

Please find below the link to the online feedback form:

<http://www.stroma.com/built-environment/feedback-sheffield/>

CONTENTS

Contents

1	INTRODUCTION	1
1.1	Scope	1
1.2	Site Description.....	1
2	POLLUTANTS & LEGISLATION	2
2.1	Pollutant Overview	2
2.2	Air Quality Strategy	3
2.3	Local Air Quality Management (LLAQM).....	3
2.3.1	Hillingdon Council.....	4
3	PLANNING POLICY & GUIDANCE	5
3.1	National Planning Policy & Guidance.....	5
3.1.1	National Planning Policy Framework.....	5
3.1.2	Planning Practise Guidance (PPG)	5
3.1.3	Land-Use Planning & Development Control	5
3.2	Regional Planning Policy	6
3.2.1	The Mayor's Air Quality Strategy	6
3.2.2	The New London Plan	6
3.2.3	Supplementary Planning Guidance (SPG).....	7
4	ASSESSMENT METHODOLOGY	8
4.1	Construction Phase.....	8
4.2	Operational Phase (Traffic Emissions)	10
4.2.1	Modelled Scenarios.....	10
4.2.2	ADMS-Roads	10
4.2.3	Emission Factors.....	10
4.2.4	Traffic Data.....	10
4.3	Background Concentrations	11
4.4	Surface Roughness	11
4.5	Meteorological Data	11
4.6	Model Output.....	12
4.6.1	NOx/NO ₂ Relationship	12
4.6.2	Predicted Short Term Concentrations.....	13

4.6.3	Model Verification	13
4.6.4	Receptor Locations	13
4.7	Significance Criteria	15
4.7.1	Construction Phase.....	15
4.7.2	Operational Phase.....	16
5	AIR QUALITY ASSESSMENT	18
5.1	Impact from Construction Activities	18
5.2	Impact of Vehicle Emissions.....	19
5.2.1	Model Verification	19
5.2.2	Model Adjustment.....	19
5.2.3	Nitrogen Dioxide	21
5.2.4	Particulate Matter	21
6	AIR QUALITY NEUTRAL ASSESSMENT	23
6.1	Introduction.....	23
6.2	Building Emissions	23
6.3	Transport Emissions	23
7	CONCLUSIONS AND RECOMMENDATIONS	26
7.1	Impact from Construction Activities	26
7.2	Impact of Vehicle Emissions.....	28

LIST OF TABLES

Table 1 – Overview of NO ₂ and PM ₁₀	2
Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter.....	3
Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads.....	11
Table 4 – Background NO _x , NO ₂ and PM ₁₀ Concentrations	11
Table 5 – Modelled Verification Locations.....	13
Table 6 – Modelled Receptor Locations	13
Table 7 – Dust Emission Magnitude.....	15
Table 8 – Risk of Dust Impacts	16
Table 9 – Air Pollution Exposure Criteria (APEC)	16
Table 10 – Sensitivity of the Surrounding Area	18
Table 11 – Summary of Dust Risk.....	18
Table 12 – Comparison of Modelled and Monitored NO ₂ Concentrations (µg/m ³)	19
Table 13 – Monitored NO _x and NO ₂ concentrations	19
Table 14 – Adjustment of Modelled NO _x Contributions	20
Table 15 – Comparison of Predicted Annual Mean NO ₂ Concentrations (µg/m ³).....	21
Table 16 – Predicted PM ₁₀ Concentrations, Annual Mean (µg/m ³)	22
Table 17 – Transport Emissions Benchmarks (NO _x and PM ₁₀)	24
Table 18 – Total Transport Emissions (NO _x and PM ₁₀).....	24
Table 19 – Comparison of Total Transport Emissions and Transport Emissions Benchmarks	25
Table 20 – Mitigation of Construction Activities.....	27

LIST OF FIGURES

Figure 1 – Site Location Plan	2
Figure 2 – Dust Assessment Procedure.....	9
Figure 3 – Wind Speed and Direction Data, Heathrow Airport (2019).....	12
Figure 4 – Modelled Ground and First Floor Receptor Locations.....	14
Figure 5 – Assessing the Significance of Air Quality Impacts of a Development Proposal....	17
Figure 6 – Linear Regression of Modelled and Monitored NO ₂	20

1 INTRODUCTION

1.1 Scope

Stroma Built Environment Ltd has been commissioned to undertake an air quality exposure assessment based on the potential impacts of existing and future traffic levels on a proposed development at 91 Station Road, Hillingdon, London. The pollutants modelled as part of this assessment are nitrogen oxides (NO_x) and particulate matter (PM₁₀).

The impacts of vehicle emissions have been assessed using the techniques detailed within Volume 11, Section 3 of the Design Manual for Roads and Bridges (DMRB)¹ and the Local Air Quality Management Technical Guidance (LAQM.TG16)². The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a “*comprehensive tool for investigating air pollution problems due to small networks of roads*”.

It should be noted that the short-term impacts of NO₂ and PM₁₀ emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

An assessment on the potential impact on local air quality from demolition and construction activities at the site has been undertaken. As not all of the information required was available at the time of reporting, worst case scenarios have been assumed for the missing data points.

An Air Quality Neutral assessment for transport emissions has been undertaken in accordance with the London Plan.

1.2 Site Description

The proposed development site, is located at 91 Station Road in the London Borough of Hillingdon, on the site of an takeaway building. The proposed development is for student accommodation.

A location plan can be found in Figure 1.

¹ Design Manual for Roads and Bridges, Vol 11, Section 3, Part 1 – HA207/07, Highways Agency, May 2007

² Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG16), Defra, February 2018

Figure 1 – Site Location Plan



2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on NO_2 and PM_{10} , as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO_2 and PM_{10} .

Table 1 – Overview of NO_2 and PM_{10}

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM_{10})	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO_2)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007³. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM₁₀ and PM_{2.5}) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2010 which came into force on 11th June 2010 and amended in The Air Quality Standards (Amendment) Regulations 2016. Table 2 provides the UK Air Quality Objectives for NO₂ and PM₁₀.

Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as
Nitrogen Dioxide (NO ₂)	200µg/m ³ not to be exceeded more than 18 times a year	1 hour mean
	40µg/m ³	Annual mean
Particles (PM ₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean
	40µg/m ³	Annual mean
Particles (PM _{2.5})	25µg/m ³ (except Scotland)	Annual Mean

Objectives for PM_{2.5} were also introduced by the UK Government and the Devolved Administrations in 2010. However, these are not included in Regulations as the Air Quality Strategy has adopted an “exposure reduction” approach for PM_{2.5} in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas.

As defined in Table 4, background PM_{2.5} concentrations are well below the limit value of 25 µg/m³. As such, no further consideration has been given to PM_{2.5} within this assessment.

2.3 Local Air Quality Management (LLAQM)

At the core of LLAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO₂), particulate matter (PM₁₀) and sulphur dioxide (SO₂). All current Air Quality Management Areas (AQMA) across the UK are declared for one or more of these pollutants, with NO₂ accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

³ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007

2.3.1 Hillingdon Council

The Council has declared an Air Quality Management Area (AQMA) for exceedances of the annual mean objective for Nitrogen Dioxide NO₂. The AQMA covers the majority of the borough, spanning from the southern borough boundary to the A40 corridor.

3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The National Planning Policy Framework (NPPF)⁴ for England, revised and released on 20th July 2021, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF replaces the Planning Policy Statement 23 (PPS23) Planning and Pollution Control⁵.

Paragraph 174 within the NPPF states that “planning policies and decisions should contribute to and enhance the natural and local environment” and that developments “should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans”

It goes on to state in paragraph 186 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”.

3.1.2 Planning Practise Guidance (PPG)

As defined within section 2, the UK Government has legally binding limits for concentrations of outdoor air pollutants. Development of any size can influence air quality through the construction and in use phases. The PPG for air quality outlines the considerations for developments in relation to air quality and the scenarios to be considered where appropriate. Furthermore the PPG outlines that any assessment needs to be “proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions”. Once these considerations and assessments have been undertaken, mitigation which is specific to the locality should be agreed between the planning authority and developer “to ensure new development is appropriate for its location and unacceptable risks are prevented”.

3.1.3 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes⁶.

⁴ National Planning Policy Framework, Secretary of State for Ministry of Housing, Communities and Local Government, February 2019

⁵ Planning Policy Statement 23: Planning and Pollution Control, Office of the Deputy Prime Minister (ODPM), November 2004

⁶ Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other forms of development where a proposal could affect local air quality and for which no other guidance exists.

3.2 Regional Planning Policy

3.2.1 The Mayor's Air Quality Strategy

In October 2010, the Mayor's Air Quality Strategy⁷ was released. The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, as well as raising awareness of air quality issues and its impact on health.

3.2.2 The New London Plan

The New London Plan was adopted by the Greater London Authority in February 2021 with the aim of providing a strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The Plan brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

Policy SI1 Improving Air Quality relates specifically to improving air quality and states the following:

“Poor air quality is a major issue for London which is failing to meet requirements under legislation. Poor air quality has direct impacts on the health, quality of life and life expectancy of Londoners. The impacts tend to be most heavily felt in some of London's most deprived neighbourhoods, and by people who are most vulnerable to the impacts. London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced.”

It goes on to state the following with regards to planning decisions:

1. Development proposals should not:
 - a. lead to further deterioration of existing poor air quality
 - b. create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
 - c. create unacceptable risk of high levels of exposure to poor air quality.
2. In order to meet the requirements in Part 1, as a minimum:
 - a. Development proposals must be at least air quality neutral
 - b. Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures
 - c. Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1

⁷ Clearing the Air: The Mayor's Air Quality Strategy. October 2010

- d. Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people, which do not demonstrate that design measures have been used to minimise exposure should be refused.

3.2.3 Supplementary Planning Guidance (SPG)

Control of Dust and Emissions during Construction and Demolition SPG

The Greater London Authority (GLA) released the “Control of Dust and Emissions during Construction and Demolition” SPG in July 2014⁸. The guidance seeks to reduce emissions of dust and PM₁₀ from construction and demolition activities in London. It also aims to manage emissions of nitrogen oxides (NOx) from construction and demolition machinery. The SPG:

- Provides more detailed guidance on the implementation of all relevant policies in the London Plan and the Mayor’s Air Quality Strategy to neighbourhoods, boroughs, developers, architects, consultants and any other parties involved in any aspect of the demolition and construction process;
- Sets out the methodology for assessing the air quality impacts of construction and demolition in London; and
- Identifies good practice for mitigating and managing air quality impacts that is relevant and achievable, with the overarching aim of protecting public health and the environment.

The principles of the SPG apply to all developments in London as their associated construction and demolition activity may all contribute to poor air quality unless properly managed and mitigated.

Sustainable Design and Construction SPG

The Greater London Authority (GLA) released the “Sustainable Design and Construction” SPG in July 2014⁹. The SPG aims to support developers, local planning authorities and neighbourhoods to achieve sustainable development. It provides guidance on how to achieve the London Plan objectives effectively, supporting the Mayor’s aims for growth, including the delivery of housing and infrastructure. In relation to air quality the SPG provides guidance on the following key areas:

- assessment requirements;
- construction and demolition;
- design and occupation;
- air quality neutral policy for buildings and transport; and
- emissions standards for combustion plant

⁸ The Control of Dust and Emissions during Construction and Demolition SPG. Greater London Authority, July 2014

⁹ Sustainable Design and Construction SPG. Greater London Authority, July 2014

4 ASSESSMENT METHODOLOGY

4.1 Construction Phase

Based on the “*Control of Dust and Emissions during Construction and Demolition*” SPG discussed in the previous section, the main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM₁₀ concentrations, as a result of dust generating activities on site; and
- An increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment on site.

In relation to the most likely impacts, the guidance states the following:

“The most common impacts are dust soiling and increased ambient PM₁₀ concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of particulate matter in all size fractions.

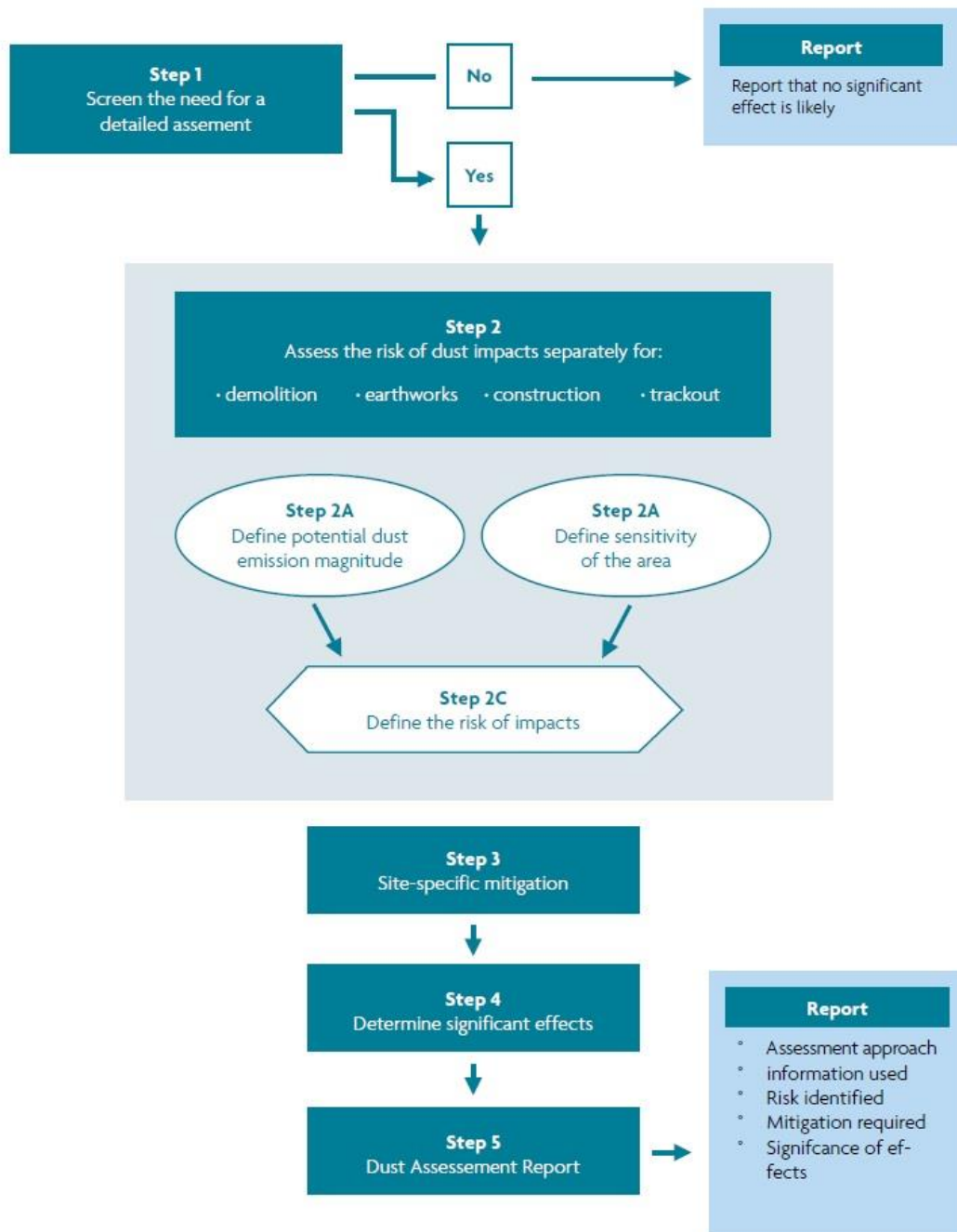
Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed”.

The guidance continues by providing an assessment procedure. This includes sub-dividing construction activities into four types to reflect their different potential impacts. These are as follows:

- Demolition;
- Earthworks;
- Construction; and
- Track out.

With regards to the proposed development the potential for dust emissions is assessed for each activity that is likely to take place. The assessment procedure assumes no mitigation measures are applied. The conditions with no mitigation thus form the baseline or “do-nothing” situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in Figure 2.

Figure 2 – Dust Assessment Procedure



4.2 Operational Phase (Traffic Emissions)

4.2.1 Modelled Scenarios

A modelled baseline year of 2019 has been used as this corresponds with the latest year of monitoring undertaken by the Council. The future year has also been chosen (2023) representing the first full year with the proposed development in place. Two scenarios have been adopted as part of the assessment. These are as follows:

- **Scenario 1** – existing levels of air quality / model verification (2019); and
- **Scenario 2** – future impact of traffic emissions on the proposed development i.e. introduction of new exposure (2023).

Predicted concentrations will be compared to the Air Quality Strategy objectives. Background pollutant concentrations and vehicle emission rates for all modelled years are based on the latest data issued by Defra. These background concentrations and emission factors are discussed further in the following sections.

4.2.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model¹⁰. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.2.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 10.1) which incorporates updated NO_x emissions factors and vehicle fleet information¹¹. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment emission factors for 2019 have been used for all modelled years.

4.2.4 Traffic Data

Baseline flows along the local roads are available from the London Atmospheric Emissions Inventory (LAEI). Baseline (2016) data from the LAEI has been projected to 2019 and 2023. Projection of traffic data has been undertaken using growth factors specific to the local authority, obtained from TEMPro. The projected flow rates are provided in Table 3. It is assumed that the percentage HDV and speed will remain unchanged in future years. Where a link approaches a junction a speed of 20 kmph has been modelled in order to represent queuing traffic at a junction. This is the approach recommended by the London Local Air Quality Management Technical Guidance (LLAQM.TG16) for modelling queuing traffic at junctions by way of reducing the modelled vehicle speeds.

Roads within 200m of the verification sites have been modelled for the purposes of model verification.

¹⁰ Model Version: 5.0.01. Interface Version 5.0.0.5313 (16/03/2020)

¹¹ https://laqm.defra.gov.uk/documents/EFT2020_v10.1.xlsb

Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads

Link Name	AADT 2019	AADT 2023	HDV (%)	Speed (kmph)
Station Road	21,378	22,188	7.0	20.8
Swan Road	6,986	7,253	6.1	35.7

4.3 Background Concentrations

Background NO_x, NO₂ and PM₁₀ concentrations have been obtained from Defra¹². These 1 km x 1 km grid resolution maps are derived from a base year of 2018 (for NO_x, NO₂ and PM₁₀), which are then projected to future years up to 2030. Background concentrations of NO₂, NO_x PM₁₀ derived from Defra are provided in Table 4.

Table 4 – Background NO_x, NO₂ and PM₁₀ Concentrations

Location	Pollutant	X	Y	2019
Proposed Development	NO ₂	506500	179500	23.3
	NO _x			34.9
	PM ₁₀			16.6

In order to undertake a worst-case assessment, 2019 background concentrations have been assumed for all modelled scenarios.

4.4 Surface Roughness

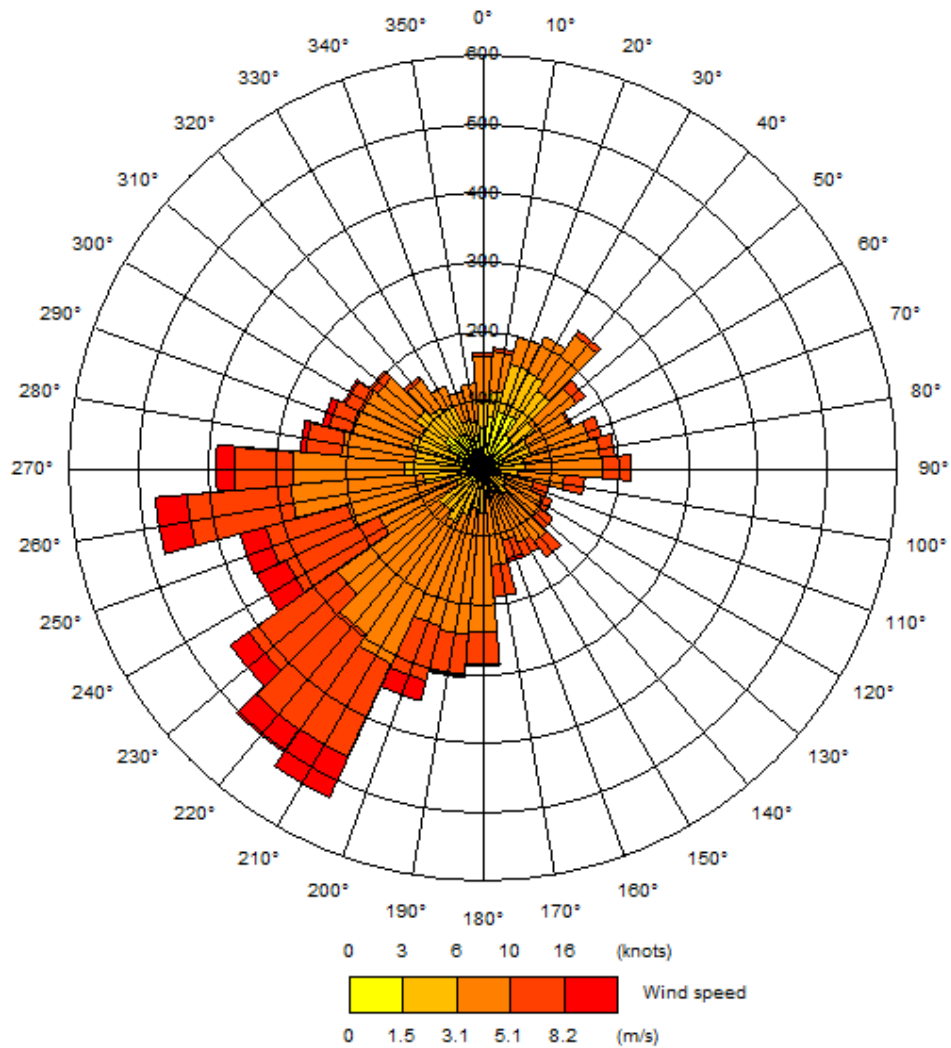
A surface roughness of 1.5 metres has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for large urban areas. This value has been used across the modelled domain.

4.5 Meteorological Data

Hourly sequential meteorological data from the Heathrow Airport meteorological station has been used. Wind speed and direction data from the Heathrow Airport meteorological station has been plotted as a wind rose in Figure 3.

¹² <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Figure 3 – Wind Speed and Direction Data, Heathrow Airport (2019)



4.6 Model Output

4.6.1 NO_x/NO₂ Relationship

Following recent evidence that shows the proportion of primary NO₂ in vehicle exhaust has increased¹³. As such, a new NO_x to NO₂ calculator has been devised¹⁴. This new calculator has been used to determine NO₂ concentrations for this assessment, based on predicted NO_x concentrations using ADMS-Roads. Converted NO₂ concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable then the NO_x concentrations are adjusted before conversion to NO₂.

¹³ Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007

¹⁴ https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v8.1.xlsm

4.6.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO₂ and PM₁₀. Research undertaken in 2003¹⁵ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³.

For PM₁₀, a relationship between the annual mean and the number of 24-hour mean exceedances has been devised and is as follows:

- No. 24-hour mean exceedances = $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$

This relationship has been applied to the modelled annual mean concentrations in order to estimate the number of 24-hourly exceedances.

4.6.3 Model Verification

The monitoring sites listed in Table 5 have been used for the purposes of model verification. These are the closest monitoring sites to the proposed development.

Table 5 – Modelled Verification Locations

Site ID	X	Y	Height (m)
HILL11	505737	177748	1.5
HILL28	509329	179605	1.5
HILL31	511113	181090	2.2

4.6.4 Receptor Locations

In order to assess the potential impact of the proposed development, selected locations around the perimeter and representative of the openable windows of the proposed development have been modelled.

The location of these model points, together with their height above ground level is provided in Table 6 and represented in Figure 4.

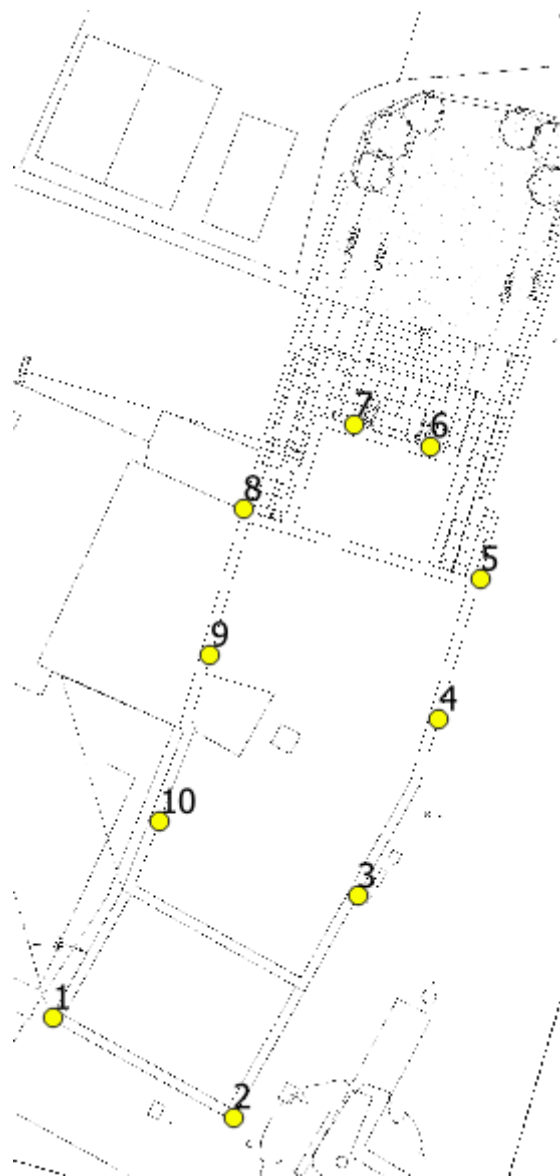
Table 6 – Modelled Receptor Locations

Air Quality Assessment ID	X	Y	Height (m)
Ground Floor			
GF_D1	506166	179828	1.5
GF_D2	506173	179825	1.5
GF_D3	506177	179833	1.5
GF_D4	506180	179839	1.5
GF_D5	506182	179844	1.5
GF_D6	506180	179849	1.5
GF_D7	506177	179850	1.5
GF_D8	506173	179847	1.5

¹⁵ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

GF_D9	506172	179841	1.5
GF_D10	506170	179835	1.5
First Floor			
1F_D1	506166	179828	4.5
1F_D2	506173	179825	4.5
1F_D3	506177	179833	4.5
1F_D4	506180	179839	4.5
1F_D5	506182	179844	4.5
1F_D6	506180	179849	4.5
1F_D7	506177	179850	4.5
1F_D8	506173	179847	4.5
1F_D9	506172	179841	4.5
1F_D10	506170	179835	4.5

Figure 4 – Modelled Ground and First Floor Receptor Locations



4.7 Significance Criteria

4.7.1 Construction Phase

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A development is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (see Table 7); and
- the sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity.

These two factors are combined to determine the risk of dust impacts with no mitigation applied (see Table 8). The risk category assigned to the development can be different for each of the four potential activities (demolition, earthworks, construction and trackout).

Table 7 – Dust Emission Magnitude

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level	Total building volume 20,000 – 50 000m ³ , potentially dusty construction material, demolition activities 10-20 m above ground level	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area 2,500 – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes	Total site area <2,500 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	Total building volume >100,000 m ³ , piling, on site concrete batching; sandblasting	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100 m;	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 8 – Risk of Dust Impacts

Construction Activity	Sensitivity of Area	Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track out	High	High Risk	Low Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

4.7.2 Operational Phase

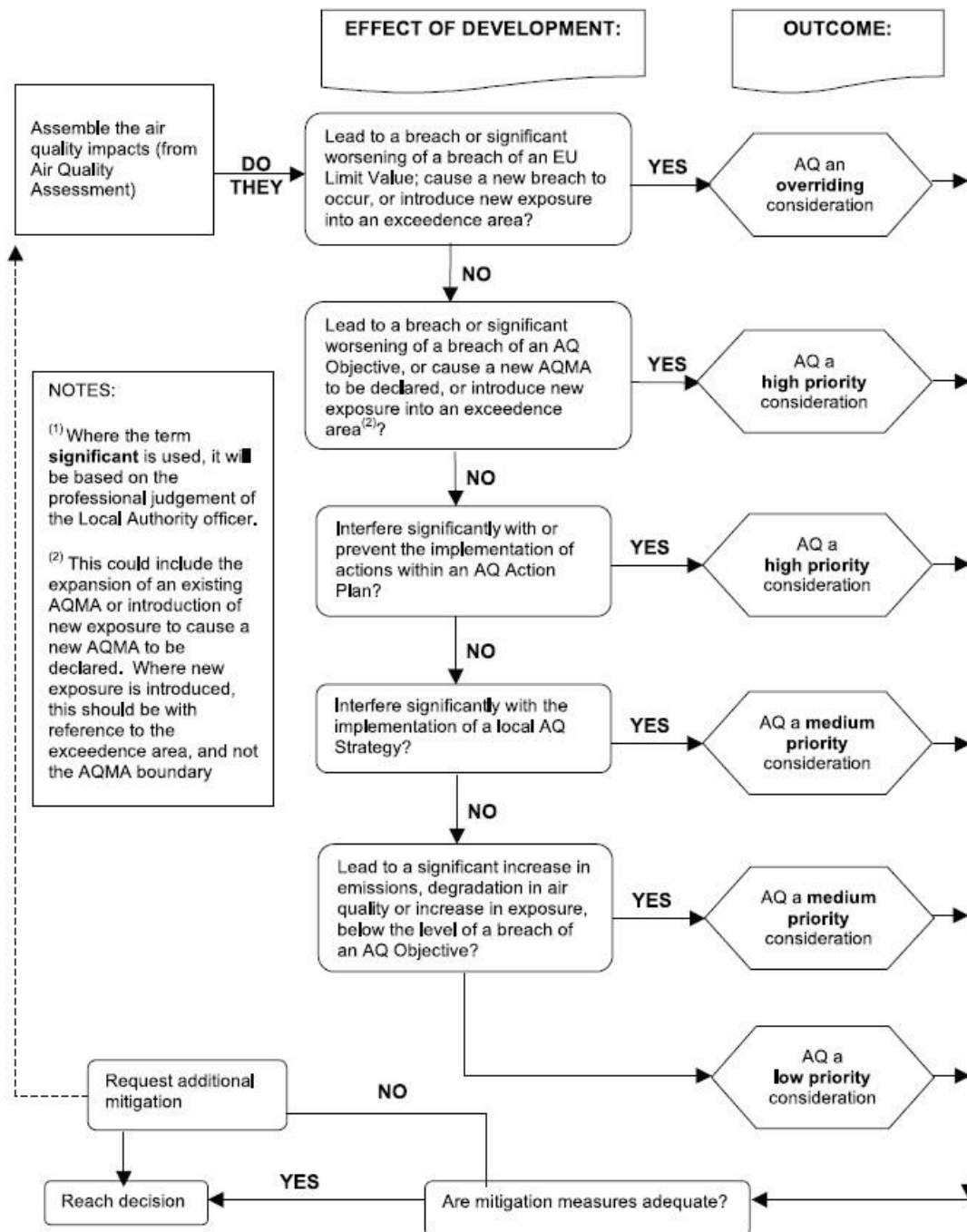
The significance of emissions will be determined by comparing the predicted results to the Air Pollution Exposure Criteria (APEC) detailed in the Air Quality and Planning Guidance written by the London Air Pollution Planning and the Local Environment (APPLE) working group¹⁶. The Air Pollution Exposure Criteria is considered appropriate to describe the significance of the impacts predicted, together with an indication as to the level of mitigation required in order for the development to be approved. The APEC table is provided below.

Table 9 – Air Pollution Exposure Criteria (APEC)

APEC Category	NO ₂	PM ₁₀	Recommendations
A	>5% below national annual mean objective	>5% below national annual mean objective >1-day less than national 24-hour objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
B	Between 5% below or above national annual mean objective	Between 5% above or below national annual mean objective Between 1-day above or below national 24-hour objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered
C	>5% above national annual mean objective	>5% above national annual mean objective >1-day more than national 24-hour objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated

¹⁶ Air Quality and Planning Guidance, written by the London Air Pollution Planning and the Local Environment (APPLE) working group, January 2007

Figure 5 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5 AIR QUALITY ASSESSMENT

5.1 Impact from Construction Activities

The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the site. Using the criteria provided in Table 7 the dust emission magnitude for each activity is as follows:

- Demolition = Large;
- Earthworks = Medium;
- Construction = Large; and
- Track out = Large.

Based on the IAQM guidance the sensitivity of the surrounding area is summarised in Table 10.

Table 10 – Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	Medium
Human Health	Low	Low	Low	Low

There are no ecological designations sensitive to air quality in the area and as such, this has been scoped out of the assessment.

The dust emission magnitudes and sensitivity of the surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in Table 11.

Table 11 – Summary of Dust Risk

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	Medium	Medium	Medium
Human Health	Low	Low	Low	Low

It should also be noted that the likelihood of an adverse impact occurring is correlated to wind speed and wind direction. As such, unfavourable wind speeds and wind directions must occur at the same time as a dust generating activity in order to generate an adverse impact. The overall impacts also assume that the dust generating activities are occurring over the entirety of the site meaning that as an activity moves further away from a potential receptor the magnitude and significance of the impact will be further reduced.

5.2 Impact of Vehicle Emissions

5.2.1 Model Verification

Using the guidance provided within the Local Air Quality Management Technical Guidance TG(16), the modelled output has been verified against the monitoring data obtained from the site listed in Table 12. The following tables provide a summary of the model verification process for NO_x/NO₂ concentrations.

Table 12 – Comparison of Modelled and Monitored NO₂ Concentrations (µg/m³)

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/monitored] x100
HILL11	28.9	25.3	14.3%
HILL28	32.1	31.7	1.3%
HILL31	31.9	32.5	-1.9%

As described in the Technical Guidance (LAQM.TG16), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within ±25% (ideally ±10%) of the monitored concentrations. In order to improve the confidence in modelled concentrations across the modelled domain the model output has been adjusted. This is described further in the next section.

5.2.2 Model Adjustment

In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NO_x (excluding background). The modelled road contribution NO_x is taken directly from the ADMS-Roads output before it has been converted to NO₂ using the NO_x to NO₂ calculator described in Section 4.6.1. The NO_x to NO₂ calculator can also be used to derive monitored road contributions of NO_x from NO₂ diffusion tube results. A summary of these calculations is provided in Table 13.

Table 13 – Monitored NO_x and NO₂ concentrations

Verification Location	Monitored Total NO ₂	Defra Background NO ₂	Monitored road contribution NO ₂ (total – background)	Monitored road contribution NO _x (total – background)	Modelled road contribution NO _x (excludes background)	Ratio of monitored road contribution NO _x / modelled road contribution NO _x
HILL11	25.3	28.3	-3.0	-6.1	1.3	-4.72
HILL28	31.7	26.8	4.9	10.4	11.3	0.92
HILL31	32.5	23.8	8.7	18.4	17.0	1.08

Once the monitored and modelled road contributions of NO_x (excluding background) have been derived the contributions of NO_x are compared and a ratio derived. In this case it is 1.009 and is used to adjust the modelled road contribution of NO_x. This is shown in Table 14.

Figure 6 – Linear Regression of Modelled and Monitored NO₂

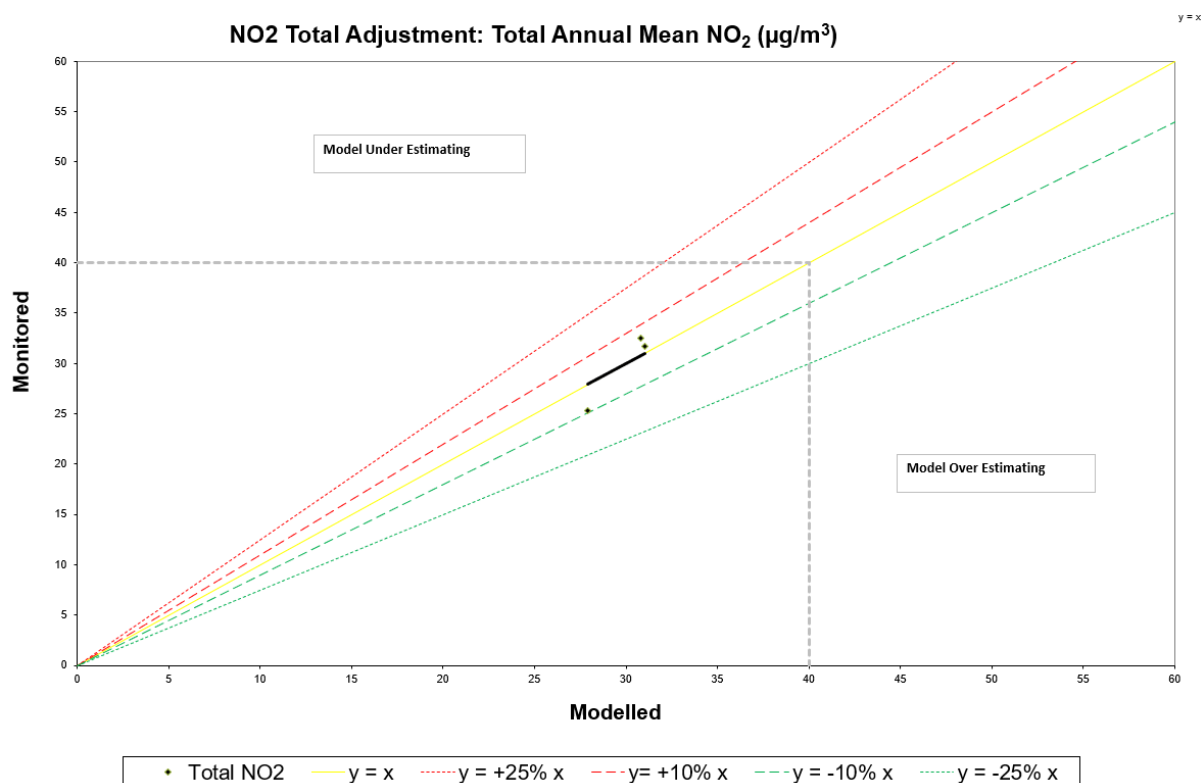


Table 14 – Adjustment of Modelled NO_x Contributions

Verification Location	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NO _x	Modelled total NO ₂ (based on empirical NO _x /NO ₂ relationship)	Monitored total NO ₂	% Difference [(modelled – monitored) / monitored] x 100
HILL11	1.009	1.3	28.9	25.3	14.4%
HILL28	1.009	11.4	32.2	31.7	1.5%
HILL31	1.009	17.2	31.9	32.5	-1.7%

Following adjustment of the modelled NO_x concentrations by a factor of 1.009 the total NO₂ concentration at the model verification location has been calculated using the method described in Section 4.6.1. The revised NO₂ concentration, shown in Table 14, indicates a more acceptable model performance when compared against the monitored NO₂ concentrations. As such, an adjustment factor of 1.009 has been applied to all modelled NO_x concentrations across the model domain before conversion to NO₂.

5.2.3 Nitrogen Dioxide

Predicted annual mean concentrations for NO₂ at the proposed development in 2019 and 2023 are provided in Table 15. As mentioned in Section 4.6.1, NO₂ concentrations have been calculated from the predicted NO_x concentrations using the latest NO_x-NO₂ conversion spreadsheet available from the Air Quality Archive.

Table 15 – Comparison of Predicted Annual Mean NO₂ Concentrations (µg/m³)

Receptor ID	2019	2023	2019	2023
	Ground Floor		First Floor	
D1	32.7	33.0	29.8	30.0
D2	32.6	32.9	29.7	29.9
D3	29.3	29.5	28.2	28.3
D4	28.2	28.3	27.5	27.6
D5	27.6	27.8	27.1	27.2
D6	27.4	27.5	26.9	27.1
D7	27.4	27.5	27.0	27.1
D8	27.8	28.0	27.3	27.4
D9	28.5	28.6	27.7	27.8
D10	29.6	29.8	28.3	28.5

The ADMS predictions for annual mean NO₂ concentrations in 2019 and 2023 indicate that the annual mean objective (40 µg/m³) would not be achieved at the modelled receptor locations.

Nitrogen dioxide also has an hourly objective of 200 µg/m³ not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO₂ concentrations was very weak. Nonetheless, research undertaken in 2003¹⁷ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³. Given that predicted NO₂ concentration in 2019 and 2023 are well below 60 µg/m³ at the modelled receptor the likelihood of the short-term objective for NO₂ being exceeded is considered low.

5.2.4 Particulate Matter

Predicted annual mean concentrations for PM₁₀ in 2019 and 2023 are provided in Table 16.

¹⁷ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Table 16 – Predicted PM₁₀ Concentrations, Annual Mean (µg/m³)

Receptor ID	2019	2023	2019	2023
	Ground Floor		First Floor	
D1	18.1	18.2	17.6	17.6
D2	18.1	18.2	17.6	17.6
D3	17.5	17.6	17.3	17.3
D4	17.3	17.3	17.2	17.2
D5	17.2	17.2	17.1	17.2
D6	17.2	17.2	17.1	17.1
D7	17.2	17.2	17.1	17.1
D8	17.3	17.3	17.2	17.2
D9	17.4	17.4	17.2	17.3
D10	17.6	17.6	17.3	17.4

The ADMS predictions for annual mean PM₁₀ concentrations in 2019 and 2023 indicate that the annual mean objective (40 µg/m³) would be achieved at all the modelled receptor locations. In addition, the maximum number of days when PM₁₀ concentrations are more than 50 µg/m³ is 2, less than the 35 exceedances allowed in the regulations.

6 AIR QUALITY NEUTRAL ASSESSMENT

6.1 Introduction

Policy 7.14 within the London Plan states that every “major” development in Greater London be at least “air quality neutral” and not lead to further deterioration of existing poor air quality. This definition comes from the Town and Country Planning Order¹⁸, to which the London Plan refers.

Within the London Plan, a “major” development is defined by the following criteria:

- 10 or more residential dwellings (or where the number is not given, an area of more than 0.5 ha); or
- For all other uses, where floor space is 1,000 sq m or more (or the site is 1 ha or more).

As such, the proposed development is classified as a “major” development in accordance with 1,000 sq m or more floor space.

The air quality neutral assessment has followed the methodology outlined in the Sustainable Design and Construction Supplementary Planning Guidance (SPG)¹⁹ and the Air Quality Neutral Planning Support Update²⁰. Within these documents, benchmarks have been provided in relation to building and transport emissions, together with a methodology for calculating the building related emissions for a particular development. The building and transport related emissions are then compared to the Building Emissions Benchmarks (BEBs) and Transport Emissions Benchmarks (TEBs) to determine whether the benchmarks are being exceeded. If so, then mitigation measures are required to reduce the site emissions, either by on-site measures or by off-setting.

6.2 Building Emissions

The building emissions have not been calculated as it is unknown at the time of reporting what system will heat the building going forwards.

6.3 Transport Emissions

The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of dwellings or floor area for commercial use. This is summarised in Table 17.

¹⁸ Town and Country Planning (Development Management Procedure)(England) Order, March 2015

¹⁹ Sustainable Design and Construction Supplementary Planning Guidance (SPG), Mayor of London, April 2014

²⁰ Air Quality Neutral Planning Support Update: GLA 80371, April 2014

Table 17 – Transport Emissions Benchmarks (NO_x and PM₁₀)

NO _x			
Land Use	No of Dwellings/ Floor Area	Transport Emission Benchmark (g/dwelling/annum)	Transport Emissions (kg/annum)
C2	15	1553	23
A1	37	249	9
Total Benchmarked Transport NO _x Emission			32
PM ₁₀			
Land Use	No of Dwellings/ Floor Area	Transport Emission Benchmark (g/dwelling/annum)	Transport Emissions (kg/annum)
C2	15	267	4
A1	37	43	2
Total Benchmarked Transport PM ₁₀ Emission			6

The proposed development will generate 3 daily vehicle. As such, the total trip emissions for NO_x and PM₁₀ have been calculated in Table 18.

Table 18 – Total Transport Emissions (NO_x and PM₁₀)

Land Use	Total Trips Per Annum	Total Distance (veh-km/annum)	Total Transport Emissions (g/annum)
NO _x			
C2	730	8322	3
A1	365	1971	1
Total Transport NO _x Emission			4
PM ₁₀			
C2	730	8322	1
A1	365	1971	0
Total Transport PM ₁₀ Emission			1

Based on the comparison between the total transport emissions and Transport Emissions Benchmarks (see Table 19) the proposed development does meet the air quality neutral requirements and therefore no mitigation is required.

Table 19 – Comparison of Total Transport Emissions and Transport Emissions Benchmarks

Pollutant	Total Benchmarked Transport Emissions (kg/annum)	Total Transport Emissions (kg/annum)	Difference (kg/annum)
C2	23	3	-20.4
A1	9	1	-8.4
Total Benchmarked Transport NOx Emission			-28.8
C2	4	1	-3.5
A1	2	0	-1.5
Total Benchmarked Transport PM₁₀ Emission			-5.0

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Impact from Construction Activities

A qualitative assessment of dust levels associated with the proposed development has been carried out. Whilst the likely impact of dust soiling and PM₁₀ are high to low mitigation measures have been listed in Table 20. Implementation of these Best Practice Measures will help reduce the impact of the construction activities.

With these mitigation measures enforced, the likelihood of nuisance dust episodes occurring at those receptors adjacent to the development are considered low to negligible. Notwithstanding this, the developer should take into account the potential impact of air quality and dust on occupational exposure standards (in order to minimise worker exposure) and breaches of air quality objectives that may occur outside the site boundary. Monitoring is not recommended at this stage, however, continuous visual assessment of the site should be undertaken and a complaints log maintained in order to determine the origin of a particular dust nuisance. Keeping an accurate and up to date complaints log will isolate particular site activities to a nuisance dust episode and help prevent it from reoccurring in the future.

Table 20 – Mitigation of Construction Activities

Construction Activity	Mitigation Measures
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site Display the head or regional office contact information.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. Develop a dust management plan Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary Make a complaints log available to the local authority when asked. Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book. 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.
Monitoring	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. 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.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors. Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution. Avoid site runoff of water or mud. Keep site fencing, barriers and scaffolding clean using wet methods Remove materials from site as soon as possible Cover, seed or fence stockpiles to prevent wind whipping Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary Provide showers and ensure a change of shoes and clothes are required before going off site to reduce the transport of dust Agree monitoring sites with the local authority Where possible, commence baseline monitoring at least three months before phase begins Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly
Operating Vehicle/Machinery and Sustainable Travel	Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone Ensure all vehicles switch off engines when stationary – no idling vehicles. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible. 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) Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing). Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials

Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.
Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust)
	Ensure water suppression is used during demolition operations
	Avoid explosive blasting, using appropriate manual or mechanical alternatives
	Bag and remove any biological debris or damp down such material before demolition
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil
	Only remove secure covers in small areas during work and not all at once
Construction	Avoid scabbling (roughening of concrete surfaces) if possible
	Ensure 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
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust
Trackout	Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site
	Avoid dry sweeping of large areas
	Ensure vehicles entering and leaving sites are securely covered to prevent escape of material during transport
	Record all inspections of haul routes and any subsequent action in a site log book
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned
	Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)
	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
	Access gates to be located at least 10m from receptors where possible
	Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site

7.2 Impact of Vehicle Emissions

All predicted NO₂ and PM₁₀ concentrations at the modelled receptor locations fall within APEC Category A, which states that there are “No air quality grounds for refusal; however mitigation of any emissions should be considered”.