

LONDON BOROUGH OF HILLINGDON

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1.0 INTRODUCTION

Proposed Development

1.1 Ardent Consulting Engineers Ltd (ACE) have been commissioned by the London Borough of Hillingdon (LBH) to carry out an Air Quality Assessment (AQA) in support of a planning application for a proposed residential development located in Hayes, within the London Borough of Hillingdon (LBH).

1.2 The proposal comprises the following:

"Development in outline (with all matters reserved) for residential floorspace (Class C3) to comprise: demolition of all existing buildings and structures; erection of new buildings; new pedestrian and vehicular accesses; associated amenity space, open space, landscaping; car and cycle parking spaces; plant, refuse storage, servicing area and other works incidental to the proposed development; and

Detailed planning consent for Block A comprising 30 residential units (Class C3); new pedestrian access; associated amenity space and landscaping; cycle parking, refuse storage, and other associated infrastructure".

1.3 Delivery of the aspects of the development subject to detailed planning consent (i.e. Phase 1) is anticipated to take place between autumn 2022 and summer 2024, with the full development (i.e. detailed + outline) anticipated to be delivered by 2027.

Scope

1.4 This report describes existing air quality within the study area and considers both the suitability of the Site for the proposed development and the potential impact of the development on local air quality during both the construction and operational phases.

1.5 The main air pollutants of concern related to the demolition and construction phase are dust and particulate matter (PM₁₀) from on-site demolition and construction activities and as a result of material tracked out by demolition and construction vehicles, as well as emissions of nitrogen dioxide (NO₂), PM₁₀ and PM_{2.5} from

demolition and construction vehicles. The main air pollutants of concern related to operational traffic generated by the proposed development are emissions of NO₂, PM₁₀ and PM_{2.5} which may potentially impact on existing properties, and emissions of nitrogen oxides (NO_x), NO₂ and ammonia (NH₃) which may potentially impact on ecological sites. The air pollutants of concern in terms of the suitability of the Site for its proposed use during the operational phase are NO₂, PM₁₀ and PM_{2.5}.

- 1.6 The energy strategy associated with the proposed development will comprise air-source heat pumps (ASHPs) and / or water-source heat pumps (WSHPs) and photovoltaic (PV) panels, which will not have any associated on-site emissions. As such, the potential impact of the proposed energy strategy on air quality can be screened out as being 'not significant'.
- 1.7 An assessment has been carried out to determine whether the development is 'air quality neutral' in terms of transport and building emissions.

2.0 LEGISLATION, POLICY AND GUIDANCE

National Air Quality Legislation and Strategy; Human Health

The Air Quality Strategy

- 2.1 The Air Quality Strategy (Defra, 2007) established the policy framework for ambient air quality management in the UK, with the objective of ensuring a quality of ambient air for all that would not pose a significant risk to health or quality of life. This document set out the National Air Quality Objectives (NAQOs) and the policy for achieving them. It followed part IV of the Environment Act (UK Government, 1995) which introduced a system of Local Air Quality Management (LAQM) requiring local authorities to regularly review and assess air quality within their boundary and appraise plans in light of these assessments.
- 2.2 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) which should include measures expected to ensure that the NAQOs are met within the AQMA.

National Air Quality Objectives

- 2.3 NAQOs were defined by The Air Quality Strategy (Defra, 2007) and enshrined in regulations by the Air Quality Standards Regulation (Statutory Instrument, 2010, No 1001) and Air Quality Standards (Amendment) Regulations (Statutory Instrument, 2016 No. 1184) which implemented the European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC).
- 2.4 Relevant objectives are set out in **Table 2-1**.

Table 2-1: NO₂, PM₁₀ and PM_{2.5} Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO ₂)	1-hour mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual mean	40 µg/m ³
Particulate Matter (PM ₁₀)	24-hour mean	50 µg/m ³ not to be exceeded more than 35 ¹ times a year
	Annual mean	40 µg/m ³ ²
Particulate Matter (PM _{2.5})	Annual mean	25 µg/m ³ ³
	Annual mean	20 µg/m ³ ⁴
	Exposure reduction target	15% reduction between 2010 and 2020 at Urban Background sites

2.5 Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the 1-hour mean NO₂ objective is unlikely to be exceeded where road transport is the main source of pollution (Defra, 2016). This concentration has therefore been used in this AQA to screen whether an exceedance of the 1-hour mean NO₂ objective is likely. Similarly, an annual mean PM₁₀ concentration of 32 µg/m³ is used to screen whether an exceedance of the 24-hour mean PM₁₀ objective is likely.

2.6 London Local Air Quality Management Technical Guidance 2019 (LLAQM.TG(19)) (Mayor of London, 2019) provides guidance to local authorities as to where NAQOs apply. These are summarised in **Table 2-2**.

¹ 7 times a year for Scotland

² 18 µg/m³ for Scotland

³ 12 µg/m³ for Scotland

⁴ Indicative stage 2 limit value post 2020, derived based on the exposure reduction target of a 15% reduction between 2010 and 2020. This value has been used as the relevant air quality objective throughout this AQA in order to ensure a conservative approach.

Table 2-2: Relevant Exposure

Averaging Period	Relevant Locations	NAQOs should apply	NAQOs don't usually apply
Annual mean	Where individuals are exposed for a cumulative period of 6 months in a year	Facades of residential properties, gardens of residences, schools, hospitals, care homes etc.	Façades of offices, hotels, kerbside sites or any other location where public exposure is expected to be short term
24-hour mean	Where individuals are expected to be exposed for 24-hours or longer	As above, with the addition of hotels	Façades of offices, kerbside sites or any other location where public exposure is expected to be short term
1-hour mean	Where individuals are expected to spend one hour or longer	As above, with the addition of kerbside sites, those parts of car parks, bus stations and railway stations etc. which are not fully enclosed and outdoor locations where members of the public might reasonably be expected to spend one hour or more	Kerbside sites where the public would not be expected to have regular access

National Air Quality Plan for Nitrogen Dioxide (NO₂) in the UK

- 2.7 The National Air Quality Plan (Defra and DfT, 2017) was written as a joint venture between the Department for Environment, Food and Rural Affairs (Defra) and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO₂ in the UK. It includes a number of measures such as those aimed at investing in Ultra Low Emission Vehicles (ULEVs) charging infrastructure, public transport and grants to help local authorities in improving air quality.
- 2.8 The plan requires all local authorities in England with areas expected not to meet the Limit Values by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in "*the shortest time possible*". These plans are

to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the local authority may need to consider implementation of a Clean Air Zone which places restrictions on vehicle access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

The Road to Zero Strategy

- 2.9 The 'Road to Zero' strategy (HM Government, 2018) set out the governments aims regarding zero emissions vehicles. These include the aim that all new cars and vans have zero tailpipe emissions by 2040 and for almost every car to be zero emission by 2050. Measures are aimed at encouraging uptake of the cleanest vehicles and supporting electric charging infrastructure.

Clean Air Strategy

- 2.10 The Clean Air Strategy (Defra, 2019) sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with PM_{2.5} concentrations exceeding 10 µg/m³ by 50% by 2025.

National Air Quality Legislation; Ecology

- 2.11 Poor air quality can have a negative impact on ecological habitats as well as human health. The Conservation of Habitats and Species Regulations (Statutory Instrument, 2017) was put in place in order to protect ecological sites following the publication of European Directive 92/43/EEC (European Economic Community (EEC), 1992) regarding the designation of Special Areas of Conservation (SAC) and 2009/147/EC (European Community, 2009) regarding the designation of Special Protection Areas (SPAs). These regulations require that the competent authority (the planning authority in this case) consider whether a development will have a likely significant effect on an SAC or SPA (known as 'European Sites'). Should this be considered to be likely then an 'appropriate assessment' is required

to identify whether the new development will indeed have a significant adverse effect on the ecological site(s).

- 2.12 The Environment Act (UK Government, 1995) and the Natural Environment and Rural Communities Act (HM Government, 2006) set out a general requirement for conservation of biodiversity.

Critical Levels

- 2.13 Critical levels have been set for a number of gaseous pollutants. These are the concentrations of pollutants below which there is no known harmful effects on vegetation or ecosystems. These levels have been set by UK government and are considered to be relevant objectives for all internationally designated sites, as well as for Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNR), local nature reserves (LNR), local wildlife sites (LWS) and ancient woodland (AW). The relevant critical levels are set out in **Table 2-3**.

Table 2-3: Ecological Critical Levels

Pollutant	Time Period	Objective
Nitrogen Oxides (expressed as NO ₂)	Annual Mean	30 µg/m ³
Ammonia (NH ₃)	Annual Mean	3 µg/m ³ (unless lichens or bryophytes are present, then 1 µg/m ³)

Critical Loads

- 2.14 Critical loads represent the amount of pollutant deposited to a given ecosystem over a year, below which it is understood that there is no harmful effect to the ecosystem. Critical loads vary spatially throughout the UK.

Planning Policy

National Planning Policy

- 2.15 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) sets out the Government's planning policies for England and how they expect these to be implemented. Consideration of air quality within planning is considered an important element of this framework which recommends that transport and the potential impact on the environment should be considered at an early stage in order to allow for mitigation or even avoidance of impacts through location and layout of developments.
- 2.16 It is recommended that both the impacts of a potential development on the environment and the risk to new development from existing pollution be taken into account when planning policy is drafted. Furthermore these should contribute to compliance with relevant limit values or objectives and should be consistent with any local AQAP.
- 2.17 The NPPF also recommends that *"existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*
- 2.18 The NPPF also states that:
- "Planning policies and decisions should contribute to and enhance the natural and local environment by:*
- Protecting and enhancing...sites of biodiversity or geological values...*
 - minimising impacts on...biodiversity..."*
- 2.19 The Planning Practice Guidance (PPG) provides guidance on how planning can enact the policies set out in the NPPF. It is set out as separate papers for different sectors and, therefore, the 'Air Quality' PPG (Ministry of Housing, Communities

and Local Government, 2019) is aimed at addressing policy relating specifically to air quality. This document gives guidelines for when air quality is likely to be relevant to a planning decision:

"Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."

- 2.20 The 'Air Quality' PPG also states that more detailed information such as whether the development could have a significant impact on air quality, baseline air quality and whether occupiers of the development could experience poor air quality may be required in order to make an informed decision. Further, it notes that any assessment should be proportionate, taking into account the scale of the proposed development, as well as any potential impacts.
- 2.21 Some suggestions on mitigation measures are set out within the PPG, such as separation distances, filtration/ventilation, green infrastructure, promotion of low emission forms of transport, control of dust and emissions from construction and, finally, contributing funding to measures such as those identified in AQAPs to offset impacts from the development.

Regional Policy and Guidance

The London Plan

- 2.22 In London, a London Plan has been developed (Mayor of London, 2021). This includes a number of references to air quality, however, these are all incorporated into policy SL1: Air Quality, which states:
- A. *Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.*

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

1. Development proposals should not:

- a) lead to further deterioration of existing poor air quality*
- b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*
- c) create unacceptable risk of high levels of exposure to poor air quality.*

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

- a) development proposals must be at least Air Quality Neutral*
- b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures*
- c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1*
- d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.*

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

- 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.

D. In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

E. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

The London Environment Strategy

2.23 The London Environmental Strategy (Mayor of London, 2018) considers policies aimed at improving the environment in London, across a number of different areas such as air quality, noise and climate change. There are a number of objectives but notable in relation to air quality is the objective: *"for London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities."*

2.24 Chapter 4 of the Environmental Strategy relates specifically to air quality and identifies a number of key issues to be addressed:

- Achieving legal compliance as quickly as possible;
- Diesel vehicles, especially cars and vans;
- Tackling all sources of pollution;
- Government action;
- Maximising co-benefits between air quality and climate change policies; and

- Further reductions are needed in PM₁₀ and PM_{2.5}, particularly from transboundary pollution, tyre and brake wear and wood burning.

Local Policy

2.25 Part 1 of the Hillingdon Local Plan was adopted in 2012 (LBH, 2012) and is the key strategic planning document for LBH, setting out a long-term spatial vision and objectives for the Borough. The Local Plan identifies as a main planning challenge for Hillingdon *"The need to mitigate air quality impacts especially around the strategic road network and Heathrow Airport, in order to work towards achievement of both national and European Union standards at relevant locations and improve the local air quality for communities"*. Part 1 of the Local Plan also includes the following three relevant Strategic Policies:

- Policy EM1 'Climate Change Adaption and Mitigation' states that *"The Council will ensure that climate change mitigation is addressed at every stage of the development process by:...*
 - *...Promoting the use of decentralised energy within large scale development whilst improving local air quality levels;*
 - *Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions..."*;
- Policy EM8 'Land, Water, Air and Noise' states that *"...All development should not cause deterioration in the local air quality levels and should ensure the protection of both existing and new sensitive receptors.*

All major development within the Air Quality Management Area (AQMA) should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide

a management plan for ensuring air quality impacts can be kept to a minimum.

The Council seeks to reduce the levels of pollutants referred to in the Government's National Air Quality Strategy and will have regard to the Mayor's Air Quality Strategy. London Boroughs should also take account of the findings of the Air Quality Review and Assessments and Actions plans, in particular where Air Quality Management Areas have been designated.

The Council has a network of Air Quality Monitoring stations but recognises that this can be widened to improve understanding of air quality impacts. The Council may therefore require new major development in an AQMA to fund additional air quality monitoring stations to assist in managing air quality improvements.”; and

- *Policy B1 'Built Environment' states that "The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents. All new developments should:...Maximise the opportunities for all new homes to contribute to...reducing emission of local air quality pollutants...”.*

2.26 Part 2 of the Local Plan (LBH, 2020) with the purpose of providing detailed policies that will form the basis of the Council's decisions on individual planning applications. The Local Plan includes the following six relevant policies:

- Policy DMEI1 'Living Walls and Roofs and On-site Vegetation' states that “All development proposals are required to comply with the following:...
- *...Major development in Air Quality Management Areas must provide onsite provision of living roofs and / or walls. A suitable offsite contribution may be required where onsite provision is not appropriate.”;*

- Policy DMEI 3 'Decentralised Energy' states that *"...The Council will support the development of DENs [Decentralised Energy Networks] and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality";*
- Policy DMEI 7 'Biodiversity Protection and Enhancement' states that *"If development is proposed on or near to a site considered to have features of ecological or geological value, applicants must submit appropriate surveys and assessments to demonstrate that the proposed development will not have unacceptable effects..."*.
- Policy DMEI 14 'Air Quality' states that *"A) Development proposals should demonstrate appropriate reductions in emissions to sustain compliance with and contribute towards meeting EU limit values and national air quality objectives for pollutants.*
 - *i) be at least "air quality neutral";*
 - *ii) include sufficient mitigation to ensure there is no unacceptable risk from air pollution to sensitive receptors, both existing and new; and*
 - *iii) actively contribute towards the improvement of air quality, especially within the Air Quality Management Area";*
- Policy DMT 1 'Managing Transport Impacts' states that *"Development proposals will be required to meet the transport needs of the development and address its transport impacts in a sustainable manner. In order for developments to be acceptable they are required to ... have no significant adverse transport or associated air quality...impacts on the local and wider environment, particularly on the strategic road network."; and*
- Policy DMT 2 'Highway Impacts' states that *"Development proposals must ensure that ... they do not contribute to the deterioration of air quality...or local amenity...of all road users and residents".*

LBH AQAP

- 2.27 Under LLAQM (Mayor of London, 2019), LBH are required to regularly review and assess air quality within the Borough and determine whether or not the air quality objectives are likely to be achieved.
- 2.28 In September 2003, LBH declared an AQMA (the Hillingdon AQMA) as a result of exceedances of the annual mean NO₂ objective. The Hillingdon AQMA encompasses the area from the southern boundary of the Borough to the border defined by the A40 corridor.
- 2.29 Following the declaration of the LBN AQMA, an AQAP was developed in order to tackle poor air quality in the Borough. LBN's most recent AQAP covers the period from 2019 to 2024 (LBH, 2019) and outlines actions that will be taken to improve air quality within the Borough. Actions developed fall under the following seven broad themes: Monitoring and other core statutory duties, Emissions from developments and buildings, Public health and awareness raising, Delivery servicing and freight, Borough fleet actions, Localised solutions and Cleaner transport.

Assessment Guidance

- 2.30 This assessment has been based on a number of guidance documents, the most significant of which are set out below:

London Local Air Quality Management Technical Guidance (LAQM.TG(19)) (Mayor of London, 2019)

- 2.31 This document was published for use by London local authorities in review and assessment work but includes a number of technical guidelines on carrying out modelling assessment and management of monitoring data which set out best practice and are therefore relevant to all air quality assessments.

Land-Use Planning and Development Control: Planning For Air Quality (IAQM & EPUK, 2017)

- 2.32 The Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) have published joint guidance on the assessment of air quality

impacts for planning purposes. This includes information on when an air quality assessment is required, what should be included in an assessment and the assessment of significance.

***The Control of Dust and Emissions During Construction and Demolition
SPG*** (GLA, 2014a)

- 2.33 This guidance includes a methodology for identifying the risk of potential dust sources associated with demolition, construction, earthworks and trackout in London. This is then used to identify the level of mitigation necessary in order for the impacts to be not significant.

Guidance on the Assessment of Dust from Demolition and Construction
(IAQM, 2014)

- 2.34 This guidance includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout. This is then used to identify the level of mitigation necessary in order for the impacts to be not significant. The London SPG 'The Control of Dust and Emissions During Construction and Demolition' is based on this guidance, however, the original document is more detailed and therefore it is used to provide additional information where necessary.

A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM, 2020)

The IAQM guidance on 'Assessment of Air Quality Impacts on Designated Nature Conservation Sites' sets out the appropriate approach for this element of assessment. Due to the complexity of ecological impacts, an air quality professional alone can only identify whether emissions are unlikely to have a significant impact when compared against the relevant screening criteria. Where the relevant screening criteria are exceeded, the combined input of both an air quality professional and an ecologist is generally required; the former to identify any changes to concentrations of deposition and the latter to consider the overall effect taking into consideration the location and sensitivity of any given habitat.

Sustainable Design and Construction SPG (GLA, 2014)

- 2.35 The 'Sustainable Design and Construction' Supplementary Planning Guidance (SPG) (GLA, 2014) was developed as part of the Implementation Framework for the London Plan 2016 (Mayor of London, 2016). The SPG has recently been revoked, however, the current London Plan (Mayor of London, 2021) still includes the requirement that development proposal must be 'at least Air Quality Neutral' (see Paragraph 2.22) and no further guidance concerning the assessment of 'air quality neutrality' has since been published. As such, the 'air quality neutral' assessment presented within this AQA is based on the information provided within the 'Sustainable Design and Construction' SPG and the Air Quality Neutral Planning Support Update: GLA 80371 (Air Quality Consultants, 2014).
- 2.36 Details of the 'air quality neutral' benchmarks (as set out by the Air Quality Neutral Planning Support Update: GLA 80371) are provided in **Appendix B**. Where a development is not considered to be 'Air Quality Neutral', it is recommended that on-site mitigation measures such as green infrastructure, changes to combustion plant specification, abatement technology or exposure reduction are considered in preference to offsite mitigation measures.

3.0 METHODOLOGY

- 3.1 The methodology set out in the following sections has been identified as being the most appropriate approach to assess potential impacts associated with the proposed development and whether these impacts are acceptable, along with the identification of any required mitigation.

Baseline Air Quality

- 3.2 'Current'⁵ and future⁶ baseline air quality has been obtained by collating the results of monitoring carried out by LBH, referring to identified AQMAs and Air Quality Focus Areas (AQFAs), considering any exceedances of the EU Limit Values predicted by Defra's Pollution Climate Mapping (PCM) mode (Defra, 2020a) or measured by any nearby Automatic Urban and Rural Network (AURN) monitoring site(s) and considering predicted background concentrations defined based on the national pollution maps published by Defra (Defra, 2020b). In addition, baseline concentrations of pollutants in 2019 and 2023 have been modelled at a number of locations following the methodology set out under 'Detailed Assessment', below.

Demolition and Construction Dust Impacts

- 3.3 There is a potential for dust from onsite activities and off-site trackout during the demolition and construction to have an impact on sensitive human and ecological receptors within the study area.
- 3.4 The suspension of dust and particulate matter is related to weather conditions and wind direction, ground and particle characteristics and on-site activities. There is a potential for impacts to occur when dust generating activities coincide with dry, windy conditions and where sensitive receptors are located downwind of the dust source.
- 3.5 Separation distance is an important factor as large particles (>30 µm) which are responsible for most dust annoyance largely deposit within 100 m of sources.

⁵ The 'current' baseline year for the purposes of this assessment has been taken to be 2019 as this is the most recent year for which representative local monitoring data are available.

⁶ The future baseline year has been taken to be 2024 as this is the earliest year that any part of the proposed development is anticipated to be occupied.

Intermediate particles (10-30 µm) can travel 200-500 m but are less likely to trigger annoyance. Significant annoyance is therefore generally limited to a few hundred metres of the source. Small particles (<10 µm) are deposited slowly and may travel up to 1 km. Whilst these particles are responsible for most impacts on human health, impacts are not likely to be experienced at significant distance due to dispersion effects.

- 3.6 The assessment of construction dust impacts has been carried out following the SPG on 'The Control of Dust and Emissions During Construction and Demolition' (GLA, 2014a), which is based on the IAQM 'Guidance on the Assessment of Dust from Construction and Demolition' (IAQM, 2014). Within this guidance, an 'impact' is described as a change in pollutant concentration or dust deposition and an 'effect' is described as the consequence of an impact.
- 3.7 The assessment considers three potential dust impacts:
- Loss of amenity due to dust soiling;
 - Human health effects due to an increase in concentrations of PM₁₀; and
 - Harm caused to ecological receptors due to dust deposition.
- 3.8 Full details of the approach taken to assessing dust are provided in **Appendix C**, the stages of the assessment are:
- Identify whether there are sensitive receptors within the relevant distances (study area) for site activities during the construction phase;
 - Assess the risk of dust impacts for each site activity type (demolition, earthworks, construction and trackout) – this includes identifying the emissions magnitude for each activity type, the sensitivity of the area and then combining these factors to identify risk;
 - Identify mitigation measures, based on assessed risk, sufficient to ensure off-site impacts are not significant; and
 - Assess impacts with mitigation in place. These should normally be not significant.

- 3.9 The IAQM guidance makes it clear that no assessment of the significance of impacts without mitigation should be carried out as mitigation measures will be required due to planning conditions as well as best practice for construction companies. The IAQM guidance also states that the residual impact, taking into account the proposed mitigation will usually be 'not significant'.

Demolition and Construction Road Traffic Impacts

- 3.10 Potential impacts as a result of demolition and construction traffic generated by the proposed development have been assessed qualitatively taking into consideration the anticipated duration of the demolition and construction period and any anticipated mitigation measures that are likely to be applied.
- 3.11 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

Operational Impacts; Human Health

Operational Development-Generated Traffic Impacts; Screening Assessment

- 3.12 The IAQM/EPUK guidance 'Land Use Planning and Development Control: Planning for Air Quality' (IAQM & EPUK, 2017) includes a list of indicative criteria for where a detailed air quality assessment is likely to be needed. The criteria relating to screening air quality impacts in relation to additional traffic are:
- An increase in Light Duty Vehicle (LDV) traffic of >500 annual average daily traffic (AADT) (or >100 AADT within or adjacent to an AQMA); and/or
 - An increase in Heavy Duty Vehicle (HDV) traffic of >100 AADT (or >25 AADT within or adjacent to an AQMA).
- 3.13 The above criteria apply to any individual link and therefore, a development generating >500 AADT (or >100 AADT within an AQMA) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.

- 3.14 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

Site Suitability; Screening Assessment

- 3.15 The potential for exceedances of the relevant objectives at sensitive locations within the proposed development has been screened qualitatively, taking into consideration the location of the Site in relation to nearby emission sources (e.g. local roads), the layout of the proposed development and baseline air quality conditions within the Site and the surrounding area.
- 3.16 Where it is not possible to screen out the potential for significant effects, then further detailed assessment is generally required.

Detailed Assessment

- 3.17 Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted at a range of locations for human health exposure. These locations include existing sensitive properties in the local area and proposed sensitive properties introduced by the development. Concentrations and changes in concentrations have then been compared against appropriate assessment criteria in order to determine significance.
- 3.18 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the air quality objective(s). For the pollutants of interest in this assessment (NO₂, PM₁₀ and PM_{2.5}), sensitive locations include the façades of dwellings and schools which are sensitive to the annual mean NO₂, PM₁₀ and PM_{2.5} objectives, the 24-hour PM₁₀ objective and the 1-hour NO₂ objective. When identifying receptors, particular attention has been paid to locations close to junctions where the impact of slow, congested traffic may increase impacts and road links where the greatest volumes of development-generated traffic will travel.
- 3.19 Based on the criteria above, six existing residential properties, one existing infant school and seven proposed residential dwellings have been identified as receptors. Existing receptors R01 to R07 and proposed receptors P01 to P04 have been chosen to represent worst-case locations where pollutant concentrations are likely

to be highest and impacts are likely to be greatest. Proposed receptors P05 to P07 have been chosen to represent conditions where concentrations are likely to be comparably lower. Details of these receptors are presented in **Table 3-1** and the receptor locations are shown in **Figure 3-1** and **Figure 3-2**.

3.20 In addition concentrations of NO₂ and PM₁₀ have been modelled at the HIL5 automatic monitoring site and concentrations of NO₂ have been modelled at the HILL28 diffusion tube monitoring site for use in model verification. Further details of model verification are provided in **Appendix D**.

Table 3-1: Human Receptor Locations

Receptor	Description	X coordinate	Y coordinate	Height (m) ^a	No. properties represented
Existing Receptors					
R01	Residential property facing Avondale Drive	510781	180208	1.5	3
R02	Residential property facing Avondale Drive	510658	180261	1.5	~12
R03	Infant school facing Avondale Drive	510553	180325	0.5 ^b	1
R04	Residential property facing Avondale Drive	510466	180339	1.5	4
R05	Residential property facing Avondale Drive	510350	180387	1.5	~6

Receptor	Description	X coordinate	Y coordinate	Height (m) ^a	No. properties represented
R06	Residential property facing Avondale Drive	510315	180444	1.5	2
R07	Residential property on the junction between Avondale Drive and Coldharbour Lane	510296	180465	1.5	~2
Proposed Receptors					
P01	Residential property facing Avondale Drive	510790	180237	1.5 & 4.5	4
P02	Residential property facing Avondale Drive	510736	180255	1.5 & 4.5	4
P03	Residential property facing Avondale Drive	510670	180279	1.5 & 4.5	4
P04	Residential property facing Avondale Drive	510604	180303	1.5 & 4.5	4
P05	Residence set back from Avondale Drive to the rear of the building	510753	180303	1.5 & 4.5	4

Receptor	Description	X coordinate	Y coordinate	Height (m) ^a	No. properties represented
P06	Residence set back from Avondale Drive to the rear of the building	510681	180308	1.5 & 4.5	4
P07	Residence set back from Avondale Drive to the rear of the building	510616	180330	1.5 & 4.5	4

^a Receptors have been modelled at heights of 1.5 m and 4.5 m to represent ground and 1st floor levels respectively, unless stated otherwise.

^b Receptor representing an infant school, therefore, modelled at 0.5 m to represent the breathing height of infants.

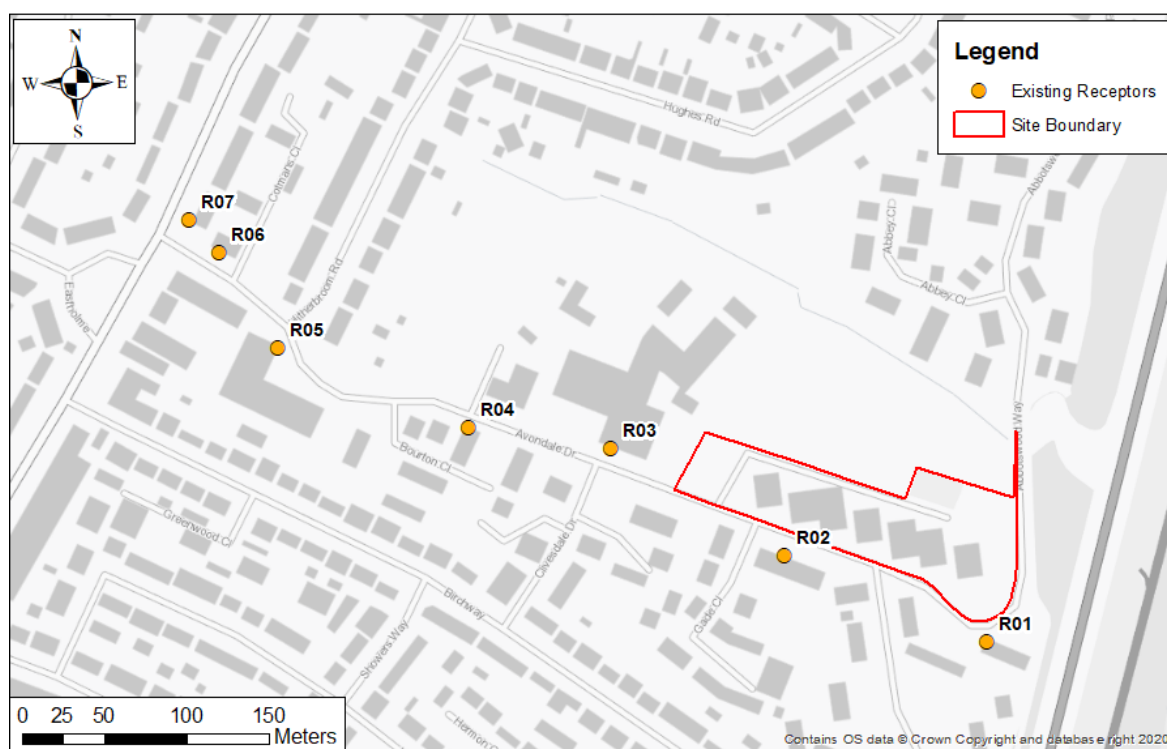


Figure 3-1: Existing Receptor Locations



Figure 3-2: Proposed Receptor Locations

Figure contains data from Pollard Thomas Edwards (drawing No. AVD-PTE-VD-XX-DR-A-10002, Rev. P01)

- 3.21 Concentrations of NO_2 , PM_{10} and $\text{PM}_{2.5}$ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5). This model requires a number of inputs including traffic flow (in AADT format), composition (i.e. proportion of HDVs) and average speed as well as road characteristics such as width, gradient and street canyon dimensions, as applicable.
- 3.22 Traffic data have been provided by the project's Transport Consultant (Markides Associates) and obtained from the London Atmospheric Emission Inventory (LAEI) database (GLA, 2020). A summary of the traffic data used in this assessment is provided in **Appendix E**.
- 3.23 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v10.1 (Defra, 2020c). This utilises emissions factors taken from the European Monitoring and Evaluation Programme (EMEP) / European Environment Agency (EEA) Air Pollution Emission Inventory Guidebook 2019 (EMEP / EEA, 2019) which is consistent with the COPERT 5.3 emission calculation tool (EMISIA, 2019), fleet composition data collected as part of the National Atmospheric Emissions Inventory (NAEI) and by Transport for London (TfL), along

with data relating to the fleet and vehicle turnover in the UK. Traffic data were entered into the EFT to provide emissions rates for each of the road links modelled for the 'current'⁵ and future years⁶, along with road type, vehicle fleet composition and speed. Whilst NO_x emission rates are related to exhaust only, emissions rates for PM₁₀ and PM_{2.5} also include increments for road, tyre and break wear.

- 3.24 The model also requires meteorological data and inputs. The model has been run utilising 2019 data from the Heathrow Airport meteorological station which is considered suitable for the study area. **Appendix D** provides additional information on the meteorological inputs.

Assumptions and Limitations

- 3.25 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent on the traffic data that have been input which will have inherent uncertainties associated with them. There is then the uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 3.26 The model relies on meteorological data for 2019 which may not represent conditions in the future, particularly when taking into consideration additional uncertainties introduced as a result of climate change.
- 3.27 Per-vehicle exhaust emissions are predicted to reduce year-on-year due to technological advances and changes to the vehicle mix such as uptake of Euro VI/6 vehicles as well as Low and Ultra Low emission technology. Whilst there has been uncertainty regarding the accuracy of these predictions in the past, recent evidence (Air Quality Consultants Ltd., 2020) suggests that the current emissions factor predictions are likely to reflect real world conditions without the need for a sensitivity test. Additionally, the model has undergone a verification process in order to adjust the model to real-world conditions (i.e. local monitoring). It is therefore considered appropriate to use emissions factors as provided by the EFT for this assessment without adjustment beyond appropriate verification.
- 3.28 As emissions are expected to reduce over time, it is considered to be a conservative approach to assess the impacts of the development in the earliest appropriate year; 2024 is the earliest year that any part of the development is

anticipated to be operational and has, therefore, been chosen as the future assessment year. In order to ensure that potential future impacts are considered fully, traffic data relating to 2027 (i.e. when the development will be fully operational) have been used in conjunction with emissions relating to 2024 to represent the future assessment year; this approach is worst-case and, therefore, the assessment is considered to be conservative in this respect.

- 3.29 It should be noted that the traffic data used within this assessment and the emissions factors within the latest EFT are based on assumptions which were current before the occurrence of the Covid-19 pandemic. As such, these data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

Air Quality Impacts Significance Criteria

- 3.30 As there is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development, the approach developed by the IAQM and EPUK (IAQM & EPUK, 2017) has been followed in this assessment. This approach considers the predicted change in air quality, as a result of the development, on existing receptors, taking into account the absolute concentrations in comparison to the objectives (set out in **Table 2-1**). This guidance sets out three stages of assessment:

- 1) Determine the magnitude of change at each receptor as a percentage of the objective / Limit Value;
- 2) Describe the impact at each receptor, taking into account the sensitivity of the receptor to changes in concentration (based on the average concentration in the assessment year); and
- 3) Assess the overall significance.

- 3.31 The first two steps are set out **Table 3-2**.

Table 3-2: Impact Descriptors for Individual Receptors ^a

Concentration ^b	% Change ^c			
	1 ^d	2-5	6-10	>10
≤75% % ^e	Negligible	Negligible	Slight	Moderate
>75% - ≤95% ^f	Negligible	Slight	Moderate	Moderate
>95%-≤102% ^g	Slight	Moderate	Moderate	Substantial
>102%-<110% ^h	Moderate	Moderate	Substantial	Substantial
≥110% ⁱ	Moderate	Substantial	Substantial	Substantial

^a Where concentrations increase, the impact is described as adverse and where it decreases, it is described as beneficial.

^b Long term average concentration at receptor in assessment year

^c In relation to Objective / Limit Value

^d % change rounded to nearest whole number. Where the change is 0 (i.e. <0.5) the impact will be Negligible.

^e NO₂ or PM₁₀ annual mean ≤30µg/m³; PM_{2.5} annual mean ≤18.75µg/m³; PM₁₀ daily mean ≤24µg/m³ annual mean

^f NO₂ or PM₁₀ annual mean >30-≤38µg/m³; PM_{2.5} annual mean >18.75-≤23.75µg/m³; PM₁₀ daily mean >24-≤30.4µg/m³ annual mean

^g NO₂ or PM₁₀ annual mean >38-≤40.8µg/m³; PM_{2.5} annual mean >23.75-≤25.5µg/m³; PM₁₀ daily mean >30.4-≤32.64µg/m³ annual mean

^h NO₂ or PM₁₀ annual mean >40.8-≤44µg/m³; PM_{2.5} annual mean >25.5-≤27.5µg/m³; PM₁₀ daily mean >32.64-≤35.2µg/m³ annual mean

ⁱ NO₂ or PM₁₀ annual mean >44µg/m³; PM_{2.5} annual mean >27.5µg/m³; PM₁₀ daily mean >35.2µg/m³ annual mean

3.32 The assessment of overall significance (step 3) is made based on professional judgement, taking into account factors such as:

- The number of properties affected by different levels of impacts;
- The magnitude of any changes and descriptors (as identified in stage 1 and 2);
- Whether a new exceedance of an objective or limit value is predicted to arise or an existing exceedance removed or an existing exceedance substantially increased or reduced;
- The level of uncertainty, including the extent to which worst case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.33 When considered at individual receptors, moderate or substantial impacts at individual receptors may be considered significant, and negligible or slight impacts not significant. Consideration of the overall effect on air quality needs to

incorporate consideration of impacts as a whole including the extent to which receptors represent sensitive locations and whether this wider impact is significant or not.

- 3.34 In the absence of official guidance on the assessment of the potential for existing emissions sources to impact the proposed development, this assessment has been limited to a comparison of predicted concentrations within the development, against the objectives (as set out in **Table 2-1** and **Table 2-2**).

Operational Impacts; Ecology

- 3.35 Based on the IAQM guidance (IAQM, 2020) there is a potential for 'significant' effects on ecology as a result of transport emissions in cases where sensitive designated ecological sites are located within 200 m of a road with a potentially significant increase in traffic. As identified by the IAQM guidance, an increase in traffic is considered to be potentially significant where a development alone, or in combination with other nearby committed developments, will increase traffic flows by >1,000 total AADT and / or >200 HDV AADT. In cases where committed development traffic is not available and / or the screening criteria referenced by the IAQM guidance is exceeded, then an alternative screening criteria of 50 total AADT and / or 10 HDV AADT for development-generated traffic only is commonly used.
- 3.36 Where the risk of significant effects on an ecological site(s) cannot be screened out, detailed modelling and / or additional assessment in conjunction with an ecologist is generally required.

Air Quality Neutral

- 3.37 The approach set out within the Air Quality Neutral Planning Support Update (Air Quality Consultants, 2014) has been followed in order to assess whether the development is air quality neutral.

4.0 BASELINE CONDITIONS

Site Context and Study Area

- 4.1 The Site is set within urban surroundings, predominantly consisting of residential properties. The Site is bound to the east by Abbotswood Way and to the south by Avondale Drive with residential properties located on the opposite side of this road. The Avondale Children's Playground is situated within the Site's area the northeast and Hitherbroom Park is located just beyond the northeast portion of the Site. Minet Infant and Junior Schools are located immediately to the west of the Site with a school field directly north of the Site. The A312 is located approximately 35 m to the east of the proposed development. The Site is located approximately 3.8 km to the north of London Heathrow Airport. The Site currently comprises a residential estate.
- 4.2 Part of the Yeading Brook, Minet Country Park and Hitherbroom Park Site of Interest for Nature Conservation (SINC) is located adjacent to the Site's north-eastern boundary and part is located approximately 60 m to the east of the Site.
- 4.3 The study area in relation to air quality has been defined as:
- For the demolition and construction dust risk assessment, the study area is the area up to 350 m from the development Site boundary and up to 50 m of the route(s) used by demolition and construction vehicles on the public highway (up to 500 m from the Site entrance(s)). This is based on the IAQM guidance (IAQM, 2014) which is more precautionary in this instance than the London guidance (GLA, 2014a).
 - For the assessment of the effect of construction and operational development-generated traffic on human health, the study area incorporates all main roads (and adjacent sensitive human receptors) along which vehicles generated by the proposed development may travel;
 - For the ecological assessment of development generated traffic during the construction and operational phases, the study area incorporates all main roads within 200 m of a designated ecological site (and the nearby

designated ecological site(s)) along which vehicles generated by the proposed development may travel; and

- For the assessment of Site suitability, the study area has been identified as the area within the boundary of the Site and sources which will influence this area.

Limit Values

- 4.4 The site is within the 'Greater London Urban Area' which has been reported as exceeding the NO₂ Limit Value. As such, the area requires the implementation of a Clean Air Zone. Two charging Clean Air Zones have been implemented in Greater London; the Low Emission Zone (LEZ) and the Ultra-Low Emission Zone (ULEZ).
- 4.5 The Site is located within the LEZ which currently charges Heavy Goods Vehicles (HGVs), Light Goods Vehicles (LGVs), buses / minibuses and coaches that do not meet Euro VI (NO_x and particulate matter (PM)) standards. The Site is not located within the ULEZ.
- 4.6 The Site is located approximately 3 km to the northeast of the London Hillingdon Urban Background AURN monitoring site. This site measured an annual mean NO₂ concentration of 45 µg/m³ in 2019 (LBH, 2020), thus exceeding the EU Limit Value. The Site is also located approximately 2.4 km to the north of the London Harlington AURN monitoring site which measured no exceedances of the NO₂, PM₁₀ or PM_{2.5} EU Limit Values in 2019.
- 4.7 Defra's PCM model predicts exceedances of the NO₂ annual mean EU Limit Value on the A312 in close proximity to the site in 2019, with concentrations predicted to fall below the objective by 2024. No exceedances of the PM₁₀ and PM_{2.5} EU Limit Values were predicted in close proximity to the site in 2018, 2020 and 2025⁷.

⁷ 2019 and 2024 data are not available for particulate matter, and so data for 2018, 2020 and 2025 have been considered instead.

LLAQM

- 4.8 LBH has assessed air quality within its area as part of its responsibilities under LLAQM. The Hillingdon AQMA was declared in September 2003 as a result of exceedances of the annual mean NO₂ objective. The development Site is located within this AQMA.

AQFAs

- 4.9 The Greater London Authority (GLA) has declared 187 AQFAs within Greater London. AQFAs are locations that exceed the annual mean NO₂ EU Limit Value as well as being locations with high levels of human exposure. The Site is not located within an AQFA.
- 4.10 LBH has also defined a number of air quality Focus Area within its area (LBH, 2019). The Site is not located within any of the Focus Area declared by LBH.

Monitoring

- 4.11 LBH carried out NO₂ monitoring at 10 automatic and 55 diffusion tube monitoring sites in 2019. The closest and most representative locations are identified in **Figure 4-1** and measured concentrations from 2015 to 2019 are shown in **Table 4-1** and **Table 4-2**.
- 4.12 Exceedances of the annual mean NO₂ objective were measured at the HILL07 monitoring site in 2017, at the HILL18 monitoring site between 2015 and 2017, and at the HIL5 monitoring site between 2015 and 2019 and at the HILL26 monitoring site between 2015 and 2018. No exceedances of the annual mean objective were measured at monitoring sites HILL08, HILL17, HILL27, HILL28 and HILL31 during this time period.
- 4.13 Automatic site HIL5 did not measure any exceedances of the 1-hour mean objective between 2015 and 2019. Furthermore, measured concentrations at all monitoring sites did not exceed 60 µg/m³ between 2015 and 2019, suggesting that exceedances of the 1-hour mean objective were not likely during this period.
- 4.14 During the time period 2015 to 2019, a weak overall trend of decreasing measured concentrations is apparent at automatic monitoring site HIL5 and diffusion tube

[illegible]

Figure 4-1: Local Monitoring Locations

Table 4-1: Measured Annual Mean NO₂ Concentrations (µg/m³)

Site ID	Site Name	Site Type	2015	2016	2017	2018	2019
Automatic Sites							
HIL5	Hillingdon Hayes	Roadside	46	46	47	43	41
Diffusion Tube Sites							
HILL07	Harold Avenue	Roadside	36	35	43	38	37
HILL08	15 Phelps Way Hayes	Roadside	31	32	33	34	34
HILL17	49 Riverdale Gardens, Hayes	Background	27	26	33	31	32
HILL18	Blyth Road, Hayes	Roadside	42	41	49	39	37
HILL26	R/O 130 Cleave Avenue, Hayes	Roadside	44	42	52	42	40
HILL27	Botwell House RC Primary School	Roadside	31	31	34	33	33
HILL28	Blyth Road 2 nd Tube, Hayes	Roadside	32	32	36	32	32
HILL31	Roundabout House, 34 Pinner Road	Roadside	-*	-*	-*	-*	33
Objective			40				

Exceedances of the annual mean objective are shown in **BOLD**.

Data taken from LBH's 2020 Air Quality Annual Status Report (ASR) (LBH, 2020)

*No data available

Table 4-2: Measured Exceedances of the Hourly Mean NO₂ Objective

Site ID	Site Name	Site Type	Number of Hours >200 µg/m ³				
			2015	2016	2017	2018	2019
HIL5	Hillingdon Hayes	Roadside	2	1	12	0	0
Objective			18				

Data taken from LBH's 2020 Air Quality ASR (LBH, 2020)

- 4.15 LBH measured PM₁₀ concentrations at the HIL5 automatic monitoring site. Results of these measurements for the period 2015 to 2019 are presented in **Table 4-3**. Annual mean concentrations of PM₁₀ at the HIL5 automatic monitoring site were below both the annual mean and the 24-hour mean objectives between 2015 and 2019.
- 4.16 There are no representative local monitoring sites which measures PM_{2.5} located in close proximity to the development Site.

Table 4-3: Measured PM₁₀ and PM_{2.5} Concentrations

Site ID	Site Name	Site Type	2015	2016	2017	2018	2019
Annual Mean PM ₁₀ (µg/m ³)							
HIL5	Hillingdon Hayes	Roadside	28	28	27	30	28
Objective			40				
PM ₁₀ Number of Days >50 µg/m ³							
HIL5	Hillingdon Hayes	Roadside	14	32	26	22	25
Objective			35				

Data taken from LBH's 2020 Air Quality ASR (LBH, 2020)

Predicted Background Concentrations

- 4.17 Predicted annual mean background concentrations of NO₂, PM₁₀ and PM_{2.5} have been obtained from national maps provided by Defra (Defra, 2020b).
- 4.18 The mapped NO₂ backgrounds were compared against concentrations recorded at local background monitoring sites. Details of the calibration are shown in **Appendix D**. The adjusted NO₂ backgrounds are shown in **Table 4-4**.
- 4.19 It was not possible to calculate a specific PM₁₀ or PM_{2.5} adjustment factor since there are no nearby suitable background PM monitoring sites. The unadjusted PM₁₀ and PM_{2.5} backgrounds are shown in **Table 4-4**.
- 4.20 The predicted background concentrations are all below the relevant objectives at the development Site.

Table 4-4: Predicted Annual Mean Background Concentrations (µg/m³)

Year	Location	NO ₂	PM ₁₀	PM _{2.5}
2019	Existing & proposed receptors	29	17	12
2024	Existing & proposed receptors	24	16	11
Objectives		40	40	20

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

Predicted Baseline Concentrations

- 4.21 The ADMS-Roads model has been used to predict baseline annual mean NO₂, PM₁₀ and PM_{2.5} concentrations at each of the existing receptor locations identified in

Table 3-1 for both the current⁵ and future⁶ baseline scenarios. The results of these predictions are shown in **Table 4-5**.

Table 4-5: Predicted Annual Mean Baseline Concentrations ($\mu\text{g}/\text{m}^3$)

Receptor	NO ₂		PM ₁₀		PM _{2.5}	
	2019	2024	2019	2024	2019	2024
R01	31	26	18	16	12	11
R02	30	25	17	16	11	11
R03	30	25	17	16	11	11
R04	30	25	17	16	12	11
R05	30	25	17	16	11	11
R06	30	25	17	16	11	11
R07	34	27	18	17	12	11
Objectives	40				20	

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

- 4.22 The predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations are below the annual mean objectives at all receptors in both 2019 and 2024. Furthermore, predicted annual mean concentrations of NO₂ and PM₁₀ are below 60 $\mu\text{g}/\text{m}^3$ and 32 $\mu\text{g}/\text{m}^3$ respectively at all receptors in both 2019 and 2024, indicating that exceedances of the short-term NO₂ and PM₁₀ objectives during this time period are not likely.

5.0 PREDICTED IMPACTS

Construction Dust Impacts

Screening Assessment

- 5.1 The primary potential effects during the construction phase relate to annoyance and loss of amenity caused by dust soiling, health impacts relating to PM₁₀ and ecological impacts due to dust deposition. Based on the screening criteria set out by the IAQM, it is considered necessary to carry out a construction dust risk assessment as there are sensitive human receptors within 350 m of the development site boundary and within 50 m of roads along which dust may be tracked.
- 5.2 There is a non-statutory ecological sites (a SINC) located within 50 m of the site boundary and roads along which dust may be tracked and, therefore, the assessment of dust deposition on ecological sites has been considered as part of the construction dust risk assessment.

Further Assessment

Dust Emission Magnitude

- 5.3 The dust emission magnitude relating to Demolition, Earthworks, Construction, and Trackout have been determined based on the GLA guidance (as set out in **Appendix C**).
- 5.4 Proposed demolition activities include the demolition of the existing council estate buildings, with a total estimated building volume of between 20,000 and 50,000 m³. Materials to be demolished will include brick and concrete which have a high to moderate potential for dust release. Demolition activities are anticipated to occur more than 20 m from the ground. As such, the dust emissions magnitude associated to demolition activities is considered to be 'large'.
- 5.5 Proposed earthworks activities include the excavation for foundations of the new development. Works could extend up to 10,700 m² (the approximate area of the Site). The soil composition across the Site is deep, with a silt to silty loam texture,

and a residual clay and loamy loess subsoil, with grains argillaceous⁸ in size. As such, this soil composition is considered to have the potential to be moderately dusty. The emission magnitude for earthworks activities is considered to be 'large'.

- 5.6 The development will involve the construction of four new residential blocks of between five and 10 storeys, with a total estimated total building volume of over 100,000 m³. The emission magnitude for construction activities is therefore considered to be 'large'.
- 5.7 The number of vehicles exiting the site which may track material onto roads is unknown but, given the size and nature of the site, this is expected to be more than 50 HDVs a day. Based on this, the dust emission magnitude is considered to be 'large'.

Area Sensitivity

- 5.8 The sensitivity of the area to dust soiling and human health impacts has been assessed based on the criteria shown in **Appendix C**.
- 5.9 Residential properties and schools are considered to be of 'high' sensitivity to dust soiling, whilst commercial properties are considered to be 'medium' sensitivity receptors. There are between 10 and 100 residential dwellings and two schools⁹ (as part of the same Minet Infant and Junior School) located within 20 m of the Site boundary. The sensitivity of the area surrounding the Site to dust soiling is considered to be 'high'.
- 5.10 The guidance states that trackout can occur on roads up to 500 m from large sites. As demolition and construction vehicle routing are not currently known, the worst-case assumption has been made that all main roads may be used by HDVs exiting the Site and that dust and mud may be tracked up to 500 m along these roads

⁸ Typical grain size < 0.06 mm.

⁹ When considering the number of receptors present within affected areas of Minet Infant School and Minet Junior School, the approach of considering each individual within the school as a single receptor has been taken, as this is worst-case and will provide a more conservative assessment.

from the site entrance. There are estimated to be over 100 residential properties, between 1 and 10 commercial properties and two schools⁹ (as part of the same Minet Infant and Junior School) located within 20 m of roads which may be subject to trackout. The sensitivity to dust soiling relating to trackout is, therefore, considered to be 'high'.

- 5.11 Residential properties and schools are considered to be of 'high' sensitivity in terms of human health effects. For the purposes of the construction dust risk assessment, taking into consideration predicted baseline concentrations at receptors R01 and R02 in 2019 (see **Table 4-5**) it is considered that worst-case annual mean concentrations of PM₁₀ at locations that may be affected by construction dust and trackout will be <24 µg/m³. Taking into account the assumed baseline PM₁₀ concentrations and the number of sensitive properties in close proximity to of the Site boundary (see Paragraph 5.9) and roads where trackout may occur (see Paragraph 5.10), the sensitivity of the surrounding area to human health effects is considered to be 'low' for on-site activities and 'medium' for trackout activities.
- 5.12 Local designated ecological sites with features that may be affected by dust deposition are generally considered to be low sensitivity receptors. The Yeading Brook, Minet Country Park and Hitherbroom Park SINC is located within 20 m of both the development Site boundary and roads along which material may be tracked by demolition and construction traffic. The sensitivity of the area to ecological impacts is, therefore, considered to be 'low'.

Risk of Impacts

- 5.13 The risk of construction dust impacts, without mitigation, has been assessed based on the tables provided in **Appendix C** and the identified risks are shown below in **Table 5-1**.

Table 5-1: Risk of Construction Dust Impacts Without Mitigation

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

- 5.14 Overall, taking into consideration the risks set out in **Table 5-1**, appropriate mitigation measures corresponding to a 'high risk' site are required during the demolition and construction phase of the development. The recommended list of mitigation measures is set out in **Section 6.0**.
- 5.15 The IAQM recommends that no judgement of the significance of construction dust effects should be made without taking mitigation into account. This is due to the fact that mitigation measures are assumed to be secured by planning conditions and legal requirements as well and construction codes of conduct. Following implementation of the recommended mitigation (as set out in **Section 6.0**), residual impacts will be 'not significant'.

Demolition and Construction Road Traffic Impacts

- 5.16 The volume and routing of demolition and construction traffic generated by the proposed development is not available, however, there is likely to be significant fluctuation in the numbers of vehicle movements associated with proposed development throughout the demolition and construction period. When these vehicle movements are averaged over a year then they will be significantly lower than peak movements. Furthermore, the demolition and construction of the proposed development will be completed in phases, thus limiting the total volume of demolition and construction traffic that would be expected if there were no phasing.
- 5.17 Volumes of demolition and construction traffic generated by the proposed development are anticipated to be lower than volumes of development-generated operational traffic, as this is typically the case for developments of this size and type. This being the case, it is reasonable to expect that impacts associated with emissions from demolition and construction vehicles will be less adverse than impacts associated with emissions from operational vehicles (as described in Paragraph 5.27 and 5.28).
- 5.18 It should be taken into consideration that any potential impacts associated with construction traffic will be temporary in nature, with the construction phase anticipated to have a maximum duration of approximately five years. Furthermore, it is anticipated that a Construction Environmental Management Plan (CEMP) and Demolition and Construction Method Statement will be developed and will include

measures to minimise emissions associated with construction vehicles, thus further reducing any potential impacts.

- 5.19 Taking into consideration the above, it is judged that the overall effect of construction vehicles on sensitive existing properties and the Yeading Brook, Minet Country Park and Hitherbroom Park SINC is likely to be 'not significant'.

Operational Road Traffic Impacts; Human Health

Screening Assessment

- 5.20 The proposed development will generate 488 AADT during the operational phase, however, when compared to the Site's existing use, the proposed development will result in a net increase of only 172 AADT. This net increase exceeds the 100 AADT screening criteria (see Paragraph 3.12) along Avondale Drive and, therefore, it is not possible to screen out the potential for significant impacts along this section of road. As such, further detailed assessment has been undertaken to determine impacts along this stretch of road.
- 5.21 The net increase in vehicle flows as a result of the proposed development elsewhere in the local road network is <100 AADT and, therefore, the potential for significant impacts elsewhere can be screened out as being 'not significant' without the need for further assessment.

Detailed Assessment

- 5.22 Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted at existing receptors in 2024, both with and without the proposed development in place. The identified receptors are described in **Table 3-1** and shown in **Figure 4-1**. Predicted concentrations, the percentage change relevant to the applicable objective, and impact at each receptor are shown in **Table 5-2**, **Table 5-3** and **Table 5-4** for NO₂, PM₁₀ and PM_{2.5} respectively.

Table 5-2: Predicted Annual Mean Concentrations of NO₂ (µg/m³), % Change and Impact at each Receptor

Receptor	2024 Without Development	2024 With Development	Change (%)	Impact
R01	26	26	0	Negligible
R02	25	25	0	Negligible
R03	25	25	0	Negligible
R04	25	25	0	Negligible
R05	25	25	0	Negligible
R06	25	25	0	Negligible
R07	27	27	0	Negligible
Objective	40			-

Predicted concentrations and changes are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

Table 5-3: Predicted Annual Mean Concentrations of PM₁₀ (µg/m³), % Change and Impact at each Receptor

Receptor	2024 Without Development	2024 With Development	Change (%)	Impact
R01	16	16	0	Negligible
R02	16	16	0	Negligible
R03	16	16	0	Negligible
R04	16	16	0	Negligible
R05	16	16	0	Negligible
R06	16	16	0	Negligible
R07	17	17	0	Negligible
Objective	40			-

Predicted concentrations and changes are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

Table 5-4: Predicted Annual Mean Concentrations of PM_{2.5} (µg/m³), % Change and Impact at each Receptor

Receptor	2024 Without Development	2024 With Development	Change (%)	Impact
R01	11	11	0	Negligible
R02	11	11	0	Negligible
R03 (at 0.5 m)	11	11	0	Negligible
R04	11	11	0	Negligible
R05	11	11	0	Negligible
R06	11	11	0	Negligible
R07	11	11	0	Negligible
Objective	20			-

Predicted concentrations and changes are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

- 5.23 The predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations in 2024, both without and with the proposed development in place, are well below the relevant objectives at all existing receptors. Furthermore, predicted annual mean NO₂ concentrations are below 60 µg/m³ and annual mean PM₁₀ concentrations are below 32 µg/m³ and, therefore, exceedances of the short-term objectives for NO₂ and PM₁₀ are not considered to be likely to occur.
- 5.24 The predicted changes in annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} (when rounded to the nearest whole number) are 0% at all receptors; using the criteria set out in **Table 3-2**, these impacts are described as being 'negligible' at all receptors.
- 5.25 The impact on existing receptors has been assessed, taking into account:
- the impacts at individual, modelled receptors;
 - the number of properties represented by each modelled receptor;
 - the limitations and assumptions of the assessment;
 - the predicted concentrations and how close these are to relevant objectives; and
 - the potential for any change to impact an existing AQMA or result in the declaration or extension of an AQMA.

- 5.26 Taking these factors into account, the overall impact of the development on local air quality is considered to be 'not significant'.

Site Suitability

Screening Assessment

- 5.27 The proposed development will introduce new areas of sensitive exposure and the Site is located within the Hillingdon AQMA. As such, it is not possible to screen out impacts qualitatively and, therefore, a detailed assessment has been undertaken.

Detailed Assessment

- 5.28 Predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations at modelled receptor locations (as identified in **Table 3-1** and **Figure 3-1**) in 2024 are presented in **Table 5-5**. In cases where more than one height has been modelled, the worst-case (i.e. highest) predicted concentration is presented.

Table 5-5: Predicted Annual Mean Concentrations Within the Development (µg/m³)

Receptor	NO ₂	PM ₁₀	PM _{2.5}
P01	26	16	11
P02	25	16	11
P03	25	16	11
P04	25	16	11
P05	25	16	11
P06	24	16	11
P07	24	16	11
Objectives	40	40	20

- 5.29 Predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} are well below the annual mean objectives at all relevant receptors. Furthermore, predicted annual mean concentrations of NO₂ and PM₁₀ fall below 60 µg/m³ and 32 µg/m³ respectively at all receptors, indicating that exceedances of the short-term NO₂ and PM₁₀ objectives are unlikely to occur.
- 5.30 Based on the predicted concentrations of pollutants in relation to the relevant objectives, it is considered that future residents of the proposed development will

experience acceptable air quality and, therefore, the Site is considered suitable for the proposed end-use.

Operational Road Traffic Impacts; Ecology

- 5.31 As detailed in Paragraph, the proposed development is anticipated to generate a total net increase in operational traffic associated with the Site of 488 AADT. Volumes of committed development-generated traffic are currently unknown.
- 5.32 Proposed development-generated traffic along Avondale Drive and Abbotswood Way, which are located within 200 m of the Yeading Brook, Minet Country Park and Hitherbroom Park SINC, is expected to result in an increase of 172 AADT; i.e. above the relevant criteria for the proposed development in isolation (see Paragraph 3.35). Taking into consideration the minor nature of these roads, it is not considered likely that sufficient committed development-generated traffic to exceed the 1,000 AADT threshold for proposed development + committed development traffic will travel along these roads (see Paragraph 3.35).
- 5.33 Proposed development-generated traffic along Coldharbour Lane, which is located approximately 150 m to the west of the SINC, will result in an increase of 99 AADT to the north and 73 AADT to the south. Coldharbour Road is considered to be more likely than either Avondale Drive or Abbotswood Way to experience increases in committed development-generated traffic (though it is still a minor road), however, it is well set back from the SINC and, furthermore, there are several rows of houses between the road and the SINC which will act as a barrier.
- 5.34 Overall, taking into consideration the volume of development-generated traffic, the minor nature of the nearby road network, the distance of roads from the SINC and the local nature of the SINC (i.e. it is not considered to be of national or international importance), it is considered that the overall effect is likely to be 'not significant'.

Air Quality Neutral Calculations

- 5.35 Air quality neutral calculations have been carried out following the methodology set out in the Air Quality Neutral Planning Support Update (Air Quality Consultants, 2014).

Building Emissions

- 5.36 The proposed energy strategy is anticipated to be comprised of ASHPs and / or WSHPs and PV panels and, as such, will not have any associated on-site emissions. The proposed development will, therefore, be better than 'air quality neutral' in terms of building emissions.

Transport Emissions

- 5.37 The air quality neutral calculations for transport emissions for the proposed development are described in **Table 5-6** to **Table 5-9**.

Table 5-6: Development Trip Generation

Land use/Class	Trips/day	Trips/annum	Distance travelled/trip (km)	Distance Travelled / annum (km)
C3 (Residential)	488	178,120	11.4	2,030,568

Table 5-7: Proposed Development Transport Emission Calculation

Land use/Class	Emissions Factors*		Annual transport Emissions	
	NO _x	PM ₁₀	NO _x	PM ₁₀
C3 (Residential)	0.3530	0.0606	716.8	123.1

* g/vehicle-km.

** kg/annum.

Table 5-8: Transport Benchmark Calculation

Land use/Class	No. Dwellings	Transport Benchmark*		Development Transport Benchmark**	
		NO _x	PM ₁₀	NO _x	PM ₁₀
C3 (Residential)	260	1.55	0.27	403.8	69.4

* kg/dwelling/annum for residential use.

** kg/annum.

**Table 5-9: Comparison of Benchmarked and Development Emissions
(kg/annum)**

Land use/Class	Benchmarked Emissions		Proposed Development Emissions		Comparison to Benchmarked Emissions	
	NO _x	PM ₁₀	NO _x	PM ₁₀	NO _x	PM ₁₀
C3 (Residential)	403.8	69.4	716.8	123.1	+313.0	+53.6

5.38 The development transport NO_x and PM₁₀ emissions are higher than the calculated benchmarks and therefore the development can be considered to be worse than 'air quality neutral' in terms of transport emissions.

5.39 As the proposed development is considered to be worse than air quality neutral in terms of transport emissions, there is a potential for additional mitigation to be required in order to reduce and / or offset the operational transport emissions. However, it should be taken into consideration that the proposed development includes embedded mitigation measures as part of its design which aim to reduce the use of private vehicles (see Paragraph 6.1).

6.0 MITIGATION

Embedded Mitigation

6.1 The proposed development includes the following embedded mitigation measures as part of its design, which will reduce emissions associated with operational development-generated traffic:

- A Travel Plan has been developed which seeks to encourage active travel;
- Introduction of a car-club with the aim of reducing car ownership / use;
- Provision of 20% active and 80% passive electric vehicle charging spaces within the podium car parks; and
- Provision of secured and sheltered cycle parking.

Additional Mitigation

Construction Dust

6.2 The following standard mitigation measures have been identified as being appropriate for a 'high' risk Site. This is based on the recommendations within the SPG on 'The Control of Dust and Emissions during Construction and Demolition' (GLA, 2014a).

6.3 A Dust Management Plan (DMP) should be submitted to LBH prior to works commencing on site.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Develop and implement a Dust Management Plan (DMP);
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;

- Display the head or regional office contact information;
- Record and respond to all dust and air quality pollutant emission complaints;
- Make the complaints log available to the local authority when asked;
- 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 air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions;
- Record any exceptional incidents that cause dust and air quality pollutant emissions, either on- or off- site, and the action taken to resolve the situation in the log book; and
- Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary; and
- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is

provided by IAQM on monitoring during demolition, earthworks and construction.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or 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 100 m 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 transport of dust;
- Agree monitoring locations with the Local Authority;
- Where possible, commence baseline monitoring at least three months before phase begins; and
- 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 on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards;
- Ensure all non-road mobile machinery (NRMM) comply with the standards set out within the SPG;
- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced haul roads 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);
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;

- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- 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

- Avoid bonfires and burning of waste materials; and
- Reuse and recycle waste to reduce dust from 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; and
- 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 as soon as practicable;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil; and
- Only remove the cover 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; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- 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, or mobile water bowsers and regularly cleaned;
- 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 10 m from receptors where possible; and
- Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

Development-Generated Demolition and Construction Traffic Impacts

- 6.4 The overall effect, without mitigation, of demolition and construction traffic generated by the proposed development on nearby sensitive locations in the study area is likely to be 'not significant'. Furthermore, any impacts will be temporary in nature and are expected to be mitigated to some extent by measures outlined within a CEMP and the Demolition and Construction Method Statement. Therefore, it is not considered necessary to recommend any further mitigation measures.

Operational Development-Generated Traffic Impacts

- 6.5 The overall effect, without mitigation, of operational development-generated traffic on nearby sensitive properties will be 'not significant' and the overall effect, without mitigation, of operational development-generated traffic on the Yeading Brook, Minet Country Park and Hitherbroom Park SINC is likely to be 'not significant'. Therefore, it is not considered necessary to recommend mitigation measures.

Site Suitability

- 6.6 Concentrations of pollutants at sensitive locations within the proposed development are predicted to be below the relevant objectives. Therefore, it is considered that future residents of the proposed development will experience acceptable air quality. As such, it is not considered necessary to recommend mitigation measures.

Air Quality Neutral

- 6.7 The proposed development is considered to be worse than air quality neutral in terms of transport emissions and, therefore, there is a potential for additional mitigation to be required in order to reduce and / or offset the operational transport emissions.

- 6.8 However, it should be noted that because the proposed development is anticipated to be substantially better than 'air quality neutral' in terms of building emissions (i.e. on-site building emissions will be zero), this will, to some degree, offset the extent to which the development is worse than 'air quality neutral' in terms of transport emissions.
- 6.9 It should also be taken into consideration that the proposed development also includes embedded mitigation measures as part of its design which aim to reduction the use of private vehicles (see Paragraph 6.1).

7.0 CONCLUSIONS

- 7.1 The potential air quality impacts associated with the proposed residential development on Avondale Drive have been assessed.
- 7.2 There is the potential for dust and PM₁₀ impacts during the demolition and construction phase. However, with the proposed mitigation measures in place, the overall residual effect will be 'not significant'.
- 7.3 Taking into consideration anticipated volumes of demolition and construction traffic, the maximum duration of the demolition and construction phase and the anticipated implementation of a CEMP and Demolition and Construction Method Statement, it is judged that the overall effect of emissions from development-generated demolition and construction traffic is likely to be 'not significant'.
- 7.4 The impacts of operational traffic generation associated with the proposed development on existing sensitive properties have been considered, and modelling of pollutant concentrations has been undertaken at existing sensitive locations in the local area. Predicted changes in concentrations as a result of operational development-generated traffic are 'negligible' at all receptors and will not result in any exceedances of the relevant objectives. As such, the overall effect of operational development-generated traffic on existing sensitive properties will be 'not significant'.
- 7.5 The impacts of operational traffic generation associated with the proposed development on the nearby Yeading Brook, Minet Country Park and Hitherbroom Park SINC has also been considered. Taking into consideration the volume of development-generated traffic, the nature and distance of affected roads from the SINC and the SINC's local designation, it is judged that the overall effect of development-generated operational traffic is likely to be 'not significant'.
- 7.6 The impact of local air quality on future residents of the proposed development has been considered, with modelling of pollutant concentrations having been undertaken at worst-case sensitive locations within the Site. Concentrations of pollutants at sensitive locations within the proposed development are predicted to be below the relevant objectives. Therefore, it is considered that future residents

of the proposed development will experience acceptable air quality, and that the Site is suitable for its proposed end-use without mitigation.

- 7.7 The development is considered to be worse than 'air quality neutral' in terms of transport emissions, but better than 'air quality neutral' in terms of building emissions.

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ACE	Ardent Consulting Engineers
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQA	Air Quality Assessment
AQFA	Air Quality Focus Area
AQMA	Air Quality Management Area
ASHP	Air Source Heat Pump
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
AW	Ancient Woodland
BEB	Building Emission Benchmark
BST	British Summer Time
CAZ	Central Activity Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube (DT)	A passive sampler used for collecting NO ₂ in the air
DMP	Dust Management Plan
EEA	European Environment Agency
EFT	Emission Factor Toolkit
EMEP	European Monitoring and Evaluation Programme
EPUK	Environmental Protection UK
EEA	European Environment Agency
EEC	European Economic Community
EMEP	European Monitoring and Evaluation Programme
EPUK	Environmental Protection UK
GIA	Gross Internal Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LBH	London Borough of Hillingdon

Abbreviations	Meaning
LEZ	Low Emission Zone
LDV	Light Duty Vehicle; a vehicle with a gross vehicle weight equal to or less than 3.5 tonnes, includes Light Goods Vehicles, cars and motorbikes
LGV	Light Goods Vehicle
LLAQM	London Local Air Quality Management
LNR	Local Nature Reserve
LWS	Local Wildlife Site
NAEI	National Atmospheric Emissions Inventory
NAQO	National Air Quality Objective as set out in Air Quality Strategy and the Air Quality Regulations
NH ₃	Ammonia
NNR	National Nature Reserve
NO	Nitric Oxide
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides, generally considered to be nitric oxide and NO ₂ . The main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles and natural gas used in gas-fired boilers.
NPPF	National Planning Policy Framework
NRMM	Non-road mobile machinery
PCM	Pollution Climate Mapping
PM ₁₀ or PM _{2.5}	Small airborne particles less than 10/2.5 µg in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
RMSE	Root Mean Square Error
SAC	Special Area of Conservation
SINC	Site of Interest for Nature Conservation
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SSSI	Site of Special Scientific Interest
TEB	Transport Emission Benchmark
TfL	Transport for London
ULEV	Ultra-Low Emission Vehicle
ULEZ	Ultra-Low Emission Zone
WSHP	Water Source Heat Pump

Appendix B Air Quality Neutral Benchmarks for Transport

B1.1 Transport Emission Benchmarks (TEBs) have been defined within the Air Quality Neutral Guidance (**Air Quality Consultants, 2014**) for NO_x and PM₁₀, for Retail (A1 and A2), Commercial (B1) and living accommodation (C3) use classes. These are set out in **Table B.1**, below.

Table B.1: 'Air Quality Neutral' Transport Emissions Benchmarks (TEBs)

Land Use Class	Benchmark		
	CAZ	Inner	Outer
NO_x (g/m²/annum)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NO_x (g/dwelling/annum)			
Residential (C3,C4)	234	558	1,553
PM₁₀ (g/m²/annum)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM₁₀ (g/dwelling/annum)			
Residential (C3,C4)	40.7	100	267

Gross Internal Area (GIA) is used to define the area.

B1.2 The emission for comparison against the TEB is calculated for each land-use category as:

$$\text{trips/annum} * \text{average distance per trip} * \text{emission rate}$$

B1.3 The average distance per trip and emissions rates should be those set out within the guidance and are shown in **Table B.2** and **Table B1.3**.

Table B.2: Average Distance Travelled by Car per Trip

Land Use Class	Distance (km)		
	CAZ	Inner	Outer
Retail (A1)	9.3	5.9	5.4
Office (B1)	3.0	7.7	10.8
Residential (C3,C4)	4.3	3.7	11.4

Table B.3: Emissions Factors

Pollutant	Distance (km)		
	CAZ	Inner	Outer
NO _x	0.4224	0.370	0.353
PM ₁₀	0.0733	0.0665	0.0606

B1.4 Where TEBs have not been calculated, the air quality neutrality of a proposed development can be shown through comparison against trip numbers set out in **Table B.4**.

Table B.4: Benchmark Trips per Annum

Land Use	Number of Trips (trips/m ² /annum)		
	CAZ	Inner	Outer
A3	153	137	170
A4	2.0	8.0	-
A5	-	32.4	590
B2	-	15.6	18.3
B8	-	5.5	6.5
C1	1.9	5.0	6.9
C2	-	3.8	19.5
D1	0.07	65.1	46.1
D2	5.0	22.5	49.0

Appendix C London SPG Dust Assessment Approach

C1 Step 1: Screen the need for an assessment

C1.1 Step 1 is the screen the need for an assessment against the following criteria:

- 'Human receptor' within:
 - 350 m (50 m in London) of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- 'Ecological receptor' within:
 - 50 m of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

C1.2 Where there are no sensitive receptors within these distances, it can be concluded that the impact is negligible and no further assessment relating to construction dust impacts is required.

C2 Step 2: Assess the risk of dust impacts

C2.1 The risk of dust at sufficient quantum to cause annoyance/health/ecological impacts should be based on:

- The scale and nature of the works (potential dust emission magnitude) (**Table C.1** **Table C.**); and
- The sensitivity of the area to dust impacts based on the matrices shown in **Table C.2**, **Table C.3** and **Table C.4**.

C2.2 These factors are then combined to determine the risk of dust impacts without mitigation applied for each of the four activities (Demolition, Earthworks, Construction and Trackout) following the matrices shown in in **Table C.5**, **Table C.6** and **Table C.7**.

Table C.1: Potential Dust Emission Magnitude

Size	Definition
Demolition	
Small	Total building volume <20,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Medium	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities 10-20 m above ground level.
Large	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.
Earthworks	
Small	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 <20,000 tonnes earthworks during wetter months.
Medium	Total site area 2,500 m ² – 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.
Large	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.
Construction	
Small	Total building volume <25,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Medium	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.
Large	Total building volume >100, 000 m ³ , on site concrete batching, sandblasting.
Trackout	
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.

Table C.2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	<10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table C.3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)			
			<20	<50	<100	<350
High	>32 µg/m ³ ^a	>100	High	High	High	Low
		10-100	High	High	Medium	Low
		<10	High	Medium	Low	Low
	28-32 µg/m ³ ^b	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		<10	High	Medium	Low	Low
	24-28 µg/m ³ ^c	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		<10	Medium	Low	Low	Low
	<24 µg/m ³ ^d	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		<10	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low
	-	1-10	Medium	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Table C.4: Sensitivity of the Area to Ecological Impacts

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

Table C.5: Risk of Impacts – Demolition

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

Table C.6: Risk of Impacts – Earthworks and Construction

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

Table C.7: Risk of Impacts – Trackout

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

C3 Step 3: Site-specific Mitigation

- C3.1 Based on the outcome of Step 2, appropriate mitigation measures are recommended. The guidance includes a list of mitigation measures for Low, Medium and High Risk sites but final recommendations should be based on professional judgement and take into account particular site sensitivities and differences in risk for different activities or areas of the site. The mitigation recommended in the guidance are shown in **Table C.8**.

Table C.8: Mitigation Measures

Mitigation Measure	Low Risk	Medium Risk	High Risk
Site Management			
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
Develop and implement a Dust Management Plan (DMP).	D	H	H
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
Display the head or regional office contact information.	H	H	H
Record and respond to all dust and air quality pollutant emission complaints.	H	H	H
Make the complaints log available to the local authority when asked.	H	H	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	H	H
Increase the frequency of site inspections by those accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H
Record any exceptional incidents that cause dust and air quality pollutant emissions, either on- or off- site, and the action taken to resolve the situation in the log book.	H	H	H
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.	N	N	H
Monitoring			
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	D	D	H
Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H
Preparing and maintaining the site			
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	D	H	H
Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution.	N	D	D
Avoid site runoff of water or mud.	H	H	H
Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
Remove materials from site as soon as possible.	D	H	H
Cover, seed or fence stockpiles to prevent wind whipping.	N	H	H
Carry out regular dust soiling checks of buildings within 100 m of site boundary and cleaning to be provided if necessary.	N	D	D
Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust.	N	N	D
Agree monitoring locations with the Local Authority.	N	H	H
Where possible, commence baseline monitoring at least three months before phase begins.	N	H	H
Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.	N	H	H
Operating vehicle/machinery and sustainable travel			
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
Ensure all non-road mobile machinery (NRMM) comply with the standards set out within the SPG	H	H	H
Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H
Impose and signpost a maximum-speed-limit of 15 mph on surfaced haul roads 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	D	H
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	H	H
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	H	H	H
Operations			

Mitigation Measure	Low Risk	Medium Risk	High Risk
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	H	H
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
Use enclosed chutes and conveyors and covered skips.	H	H	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	H	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.	D	H	H
Waste Management			
Avoid bonfires and burning of waste materials.	H	H	H
Reuse and recycle waste to reduce dust from waste materials.	H	H	H
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	D	H
Ensure water suppression is used during demolition operations.	H	H	H
Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
Bag and remove any biological debris or damp down such material before demolition.	H	H	H
Earthworks			
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.	N	D	H
Only remove the cover in small areas during work and not all at once.	N	D	H
Construction			
Avoid scabbling (roughening of concrete surfaces) if possible	D	D	H
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.	D	H	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.	N	D	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D
Trackout			
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	D	H	H
Avoid dry sweeping of large areas.	D	H	H
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	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.	N	H	H
Access gates to be located at least 10 m from receptors where possible.	N	H	H
Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.	N	D	H

(H = Highly Recommended, D = Desirable and N = Not Recommended).

C4 Step 4: Determine Significant Effects

- C4.1 Recommended mitigation measures should be sufficient to ensure that the impact is normally 'not significant'. There may at times be limitations to appropriate mitigation measures (such as a lack of water) and therefore, an assessment should always be made based on the characteristic of each site and the surrounding area.

C5 Step 5: Dust Assessment Report

- C5.1 The dust assessment report should include enough detail to ensure that the basis for the determination of emission magnitude and sensitivity of the area, and therefore the site risk, are clear. The required mitigation so also be set out within the report, along with a description of the mechanism that will

ensure that the appropriate level of mitigation will be implemented (such as through a planning condition).

Appendix D Model Inputs and Results Processing

D1 Model Inputs and Results Processing Tools

D.1 Model Inputs and Tools

Model Version	ADMS-Roads v5, April 2020
Street Canyons	The ADMS Advanced Street Canyon Module was used to represent the effect of reduced dispersion and recirculating pollutants in street canyons. The canyons are shown in Appendix E .
British Summer Time (BST)	Adjustment for BST was made within the model, based on the following dates and times: BST begins – 01:00 on 31/03/2019 BST ends – 02:00 on 27/10/2019
Emission Factor Toolkit (EFT)	V10.1, April 2020 (Defra, 2020c)
Time Varying Emissions Factors	Based on Department for Transport (DfT) statistics, Table TRA0307: Motor Vehicle Traffic Distributed by Time of Day and Day of the Week on all roads, Great Britain:2019.
Meteorological Data	2019 hourly meteorological data from the London Heathrow met station has been used in the model. The wind rose is shown in Figure D.1 .
Latitude	51.5°

Surface Roughness	A value of 1 for 'cities, woodlands' was used to represent the study area. A value of 0.3 for 'agricultural areas (max)' was used to represent London Heathrow meteorological station site.
Minimum Monin-Obukhov Length	A value of 30 for 'Cities and large towns' was used to represent the study area. A value of 30 for 'Cities and large towns' was used to represent London Heathrow meteorological station site.
NO _x to NO ₂ conversion	NO₂ from NO_x calculator version 8.1 (Defra, 2020d)
Background Maps	2018 reference year background maps (Defra, 2020b)

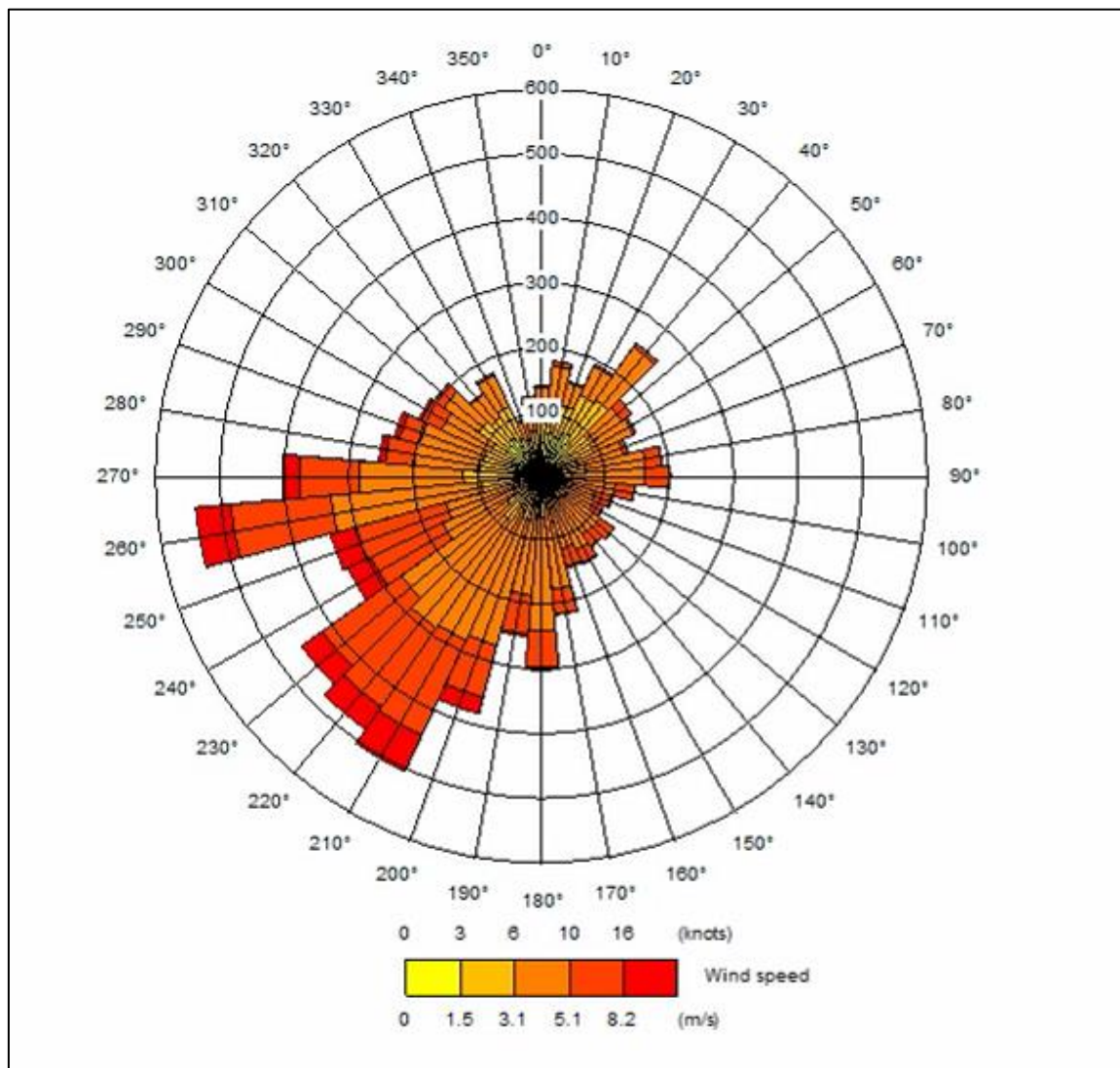


Figure D.1: 2019 London Heathrow Wind Rose

D2 Verification

Nitrogen Dioxide

- D2.1 Most nitrogen dioxide (NO₂) is produced in the atmosphere by a reaction between nitric oxide (NO) and ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the annual mean road-NO_x contribution in 2019 at two monitoring locations (HIL5 and HILL28). Concentrations have been modelled at a height of 1.5 m for HIL5 and 2.5 m for HILL28 (the heights of the monitors).

D2.2 The choice of appropriate monitoring sites for verification has been based on:

- Appropriateness of site (roadside rather than background sites, presence of additional emission sources etc.);
- Distance from study area; and
- Availability of traffic data for modelling.

D2.3 The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO₂ concentrations within the NO_x from NO₂ calculator.

D2.4 A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the modelled road contribution, forced through zero (**Figure D.2**). This factor was then applied to the modelled road-NO_x concentrations. The total NO₂ concentrations were then determined by combining the adjusted modelled road-NO_x with the predicted background NO₂ concentration within the NO_x to NO₂ calculator. A secondary adjustment factor was then calculated as the slope of best fit between the measured NO₂ and primary adjusted, modelled NO₂, forced through zero (**Figure D.3**).

D2.5 The following primary and secondary adjustment factors have been applied to all modelled NO₂ data:

Primary adjustment factor: 0.7828

Secondary adjustment factor: 1.0057

D2.6 The results imply that overall, the model was over-predicting the road-NO_x contribution.

D2.7 The Root Mean Square Error (RMSE) has been calculated as 2.1 µg/m³ (5.3 %) which indicates that the model is performing well (**Defra, 2016**).

D2.8 **Figure D.4** compares the adjusted modelled, total NO₂ at each of the modelling sites with the measured total NO₂ and shows the 1:1 relationship

as well as lines indicating $\pm 10\%$ and $\pm 25\%$ of the 1:1 line. Both HIL5 and HILL28 lie within $\pm 10\%$ of the 1:1 line.

- D2.9 Overall, the verification factor is considered to be appropriate and the model to be performing well in terms of predicting NO_2 . However, as the calculated primary adjustment factor is less than 1 (implying an over-prediction by the model), in order to prove an approach that is more conservative overall, the road- NO_x has not been adjusted.

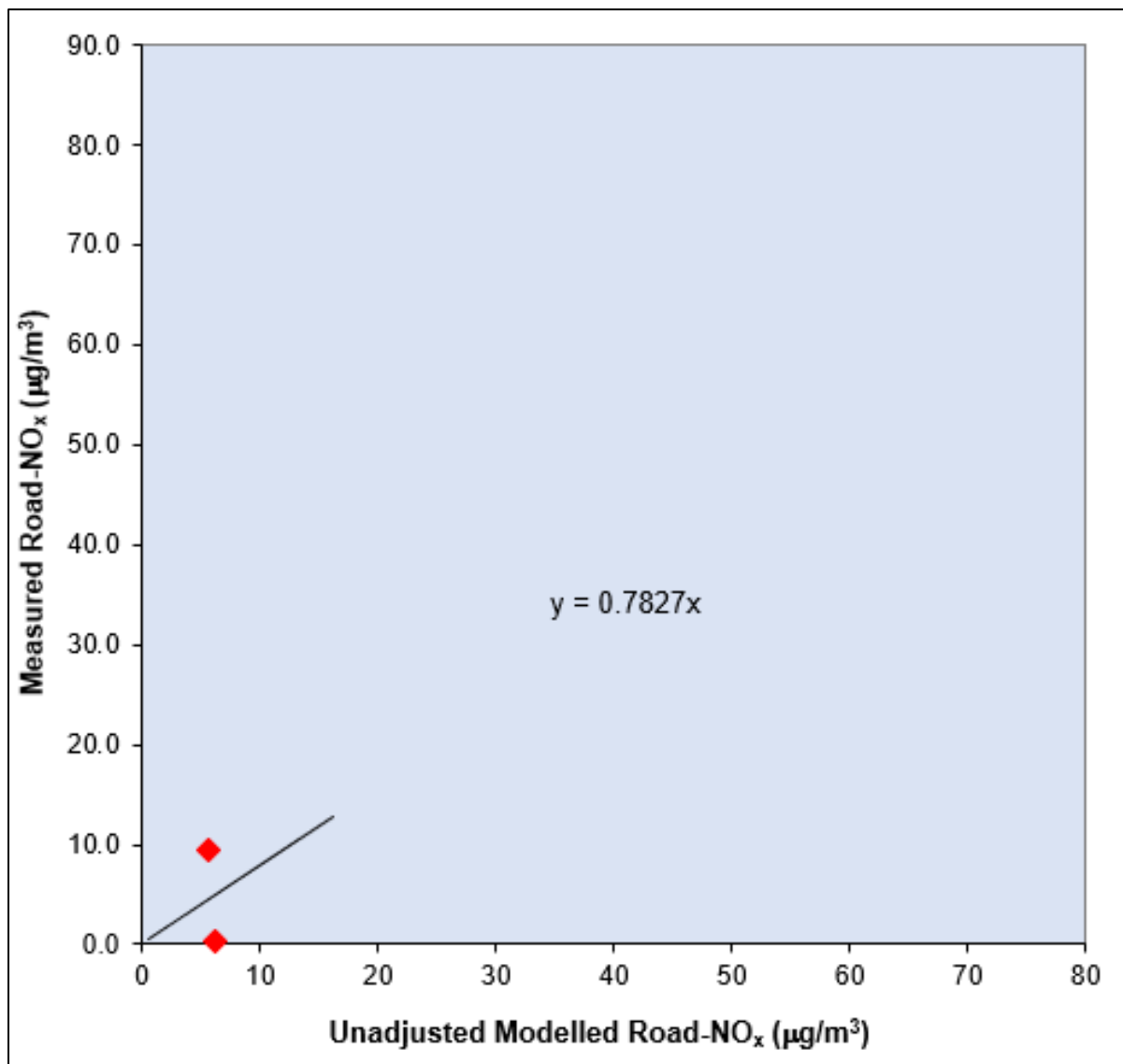


Figure D.2: Measured road- NO_x / Modelled road- NO_x concentrations

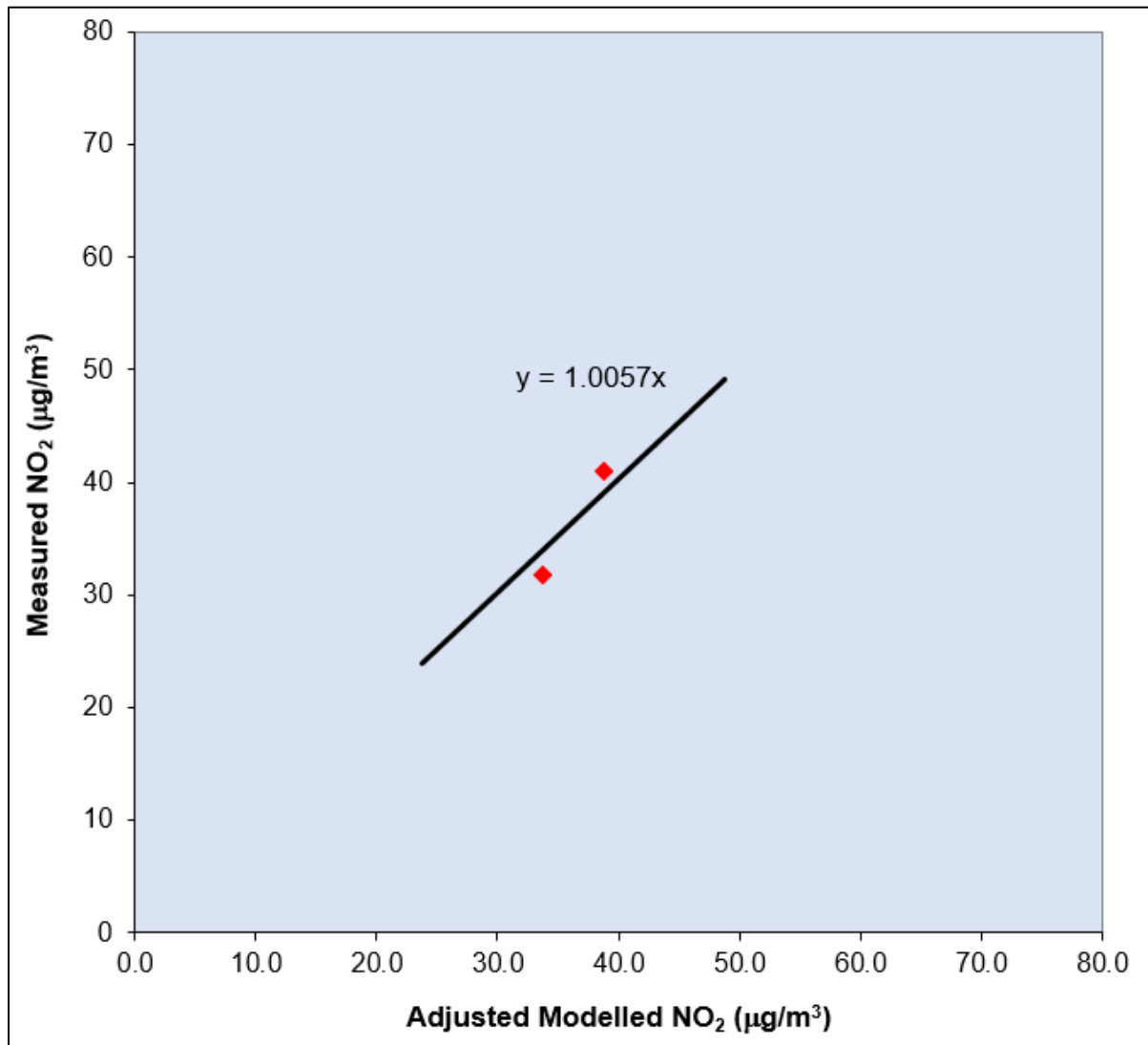


Figure D.3: Measured NO₂ / Primary Adjusted modelled NO₂ concentrations

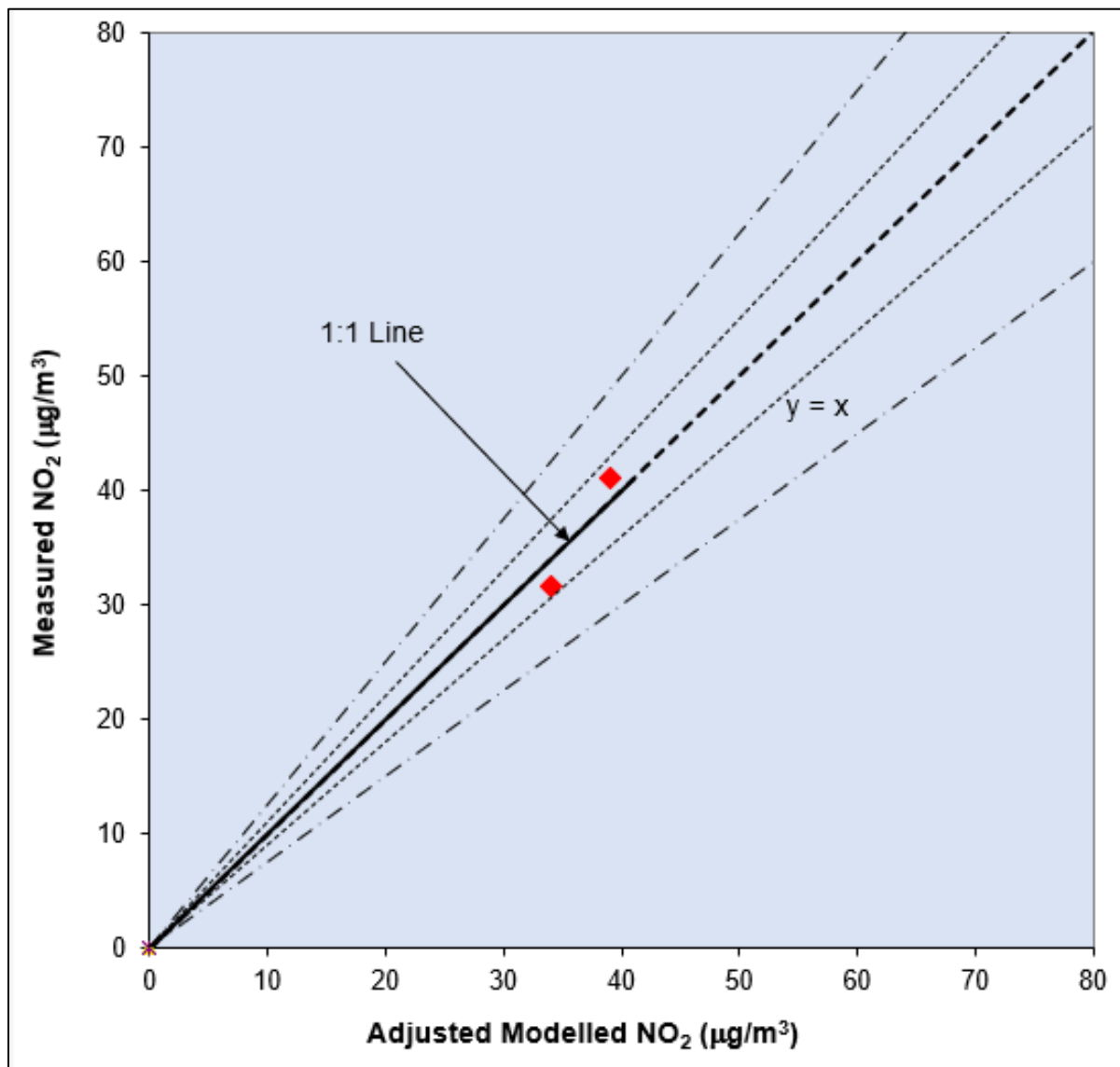


Figure D.4: Measured NO₂ / Fully Adjusted modelled NO₂ concentrations

PM₁₀

- D2.10 The HIL5 automatic monitoring site is the only appropriate location within the study area which monitors PM₁₀. Data from this site has therefore been used to calculate a verification factor for PM₁₀, following a similar methodology as that used for NO₂.
- D2.11 Road-PM₁₀ (calculated from 2019 measured PM₁₀ at the monitoring site, minus adjusted Defra annual mean mapped background PM₁₀ for the appropriate

grid-square) is divided by the modelled road-PM₁₀ to produce a factor which can be applied to PM₁₀ model outputs.

Measured Annual Mean PM₁₀ (28.0 µg/m³) – Background PM₁₀ (18.1 µg/m³)
= 'Measured' road-PM₁₀ (9.9 µg/m³)

'Measured' road-PM₁₀ (9.9 µg/m³) / Modelled road-PM₁₀ (0.5 µg/m³) = PM₁₀
Roads Model Adjustment Factor (21.4909)

- D2.12 The calculated adjustment factor indicates that the model is substantially under-predicting the road-PM₁₀ contribution. Whilst it is common for the model to under-predict to some degree, the implied under prediction in this instance is unusually high.
- D2.13 Site HIL5 is located immediately adjacent to the junction between North Hyde Gardens and North Hyde Road. At the time of undertaking this AQA traffic data is not available for North Hyde Gardens, meaning that it has not been included within the model. As such, the lack of inclusion of North Hyde Gardens, which will be a significant contributor of emissions at the HIL5 monitoring site which would, therefore, result in an under-prediction of emissions at site HIL, contributing to a higher adjustment factor.
- D2.14 It should be noted that road model adjustment factors for PM and NO₂ are typically similar in cases where road emissions are the dominant source. In this case, the calculated road-PM₁₀ adjustment factor is substantially higher than the calculated road-NO_x adjustment factor. The calculated RMSE value for the road-NO_x indicates that the model is performing well in terms of predicting concentrations of NO_x, therefore, it is considered that the calculated road-NO_x adjustment factor is likely to be more reliable than the calculated road PM₁₀ adjustment factor.
- D2.15 Taking into consideration the above, the calculated road-PM₁₀ adjustment factor is not considered to be reliable and, therefore, the approach applied to calculated road-NO_x adjustment (i.e. no adjustment) has been applied to the modelled annual mean road-PM₁₀ concentrations to provide the model results presented within this AQA.

PM_{2.5}

D2.16 There is no PM_{2.5} monitoring in close proximity to the proposed development site. Therefore, the adjustment approach taken for road-NO_x and road-PM₁₀ (i.e. not adjustment) has been applied to the modelled road-PM_{2.5} concentrations also.

D3 Background Calibration

D3.1 To ensure that annual mean background concentrations used in this assessment reflect real-world conditions as accurately as possible, a calibration exercise has been carried out, utilising NO₂ data measured in 2019 at the HILL17 and HILL21 diffusion tube monitors. Measured concentrations have been compared against Defra predictions at the same location to provide a calibration factor as shown in **Table D.2**.

Table D.2: Background Calibration (NO₂)

Parameters	Monitoring Sites	
	HILL17	HILL21
Measured Concentration (µg/m ³)	32	32
Data Capture (%)	75	75
Mapped Concentration (µg/m ³)	28	26
Calibration Factor	1.1 ^a	1.2 ^a
Calibration Factor (average)	1.18 ^a	

Concentrations are rounded as appropriate taking into consideration the level of accuracy of the data sources.

^a Based on unrounded number.

D3.2 The calibration factors suggest that mapped NO₂ backgrounds for the area are under-predicting. Therefore, mapped background NO₂ concentrations have been adjusted by the calculated average calibration factor for the purposes of this AQA.

D3.3 No suitable nearby background PM monitoring is undertaken within LBN. Therefore, no calibration factor has been applied to background PM₁₀ and PM_{2.5} concentrations predicted by Defra.

Appendix E Traffic Data and Road Network

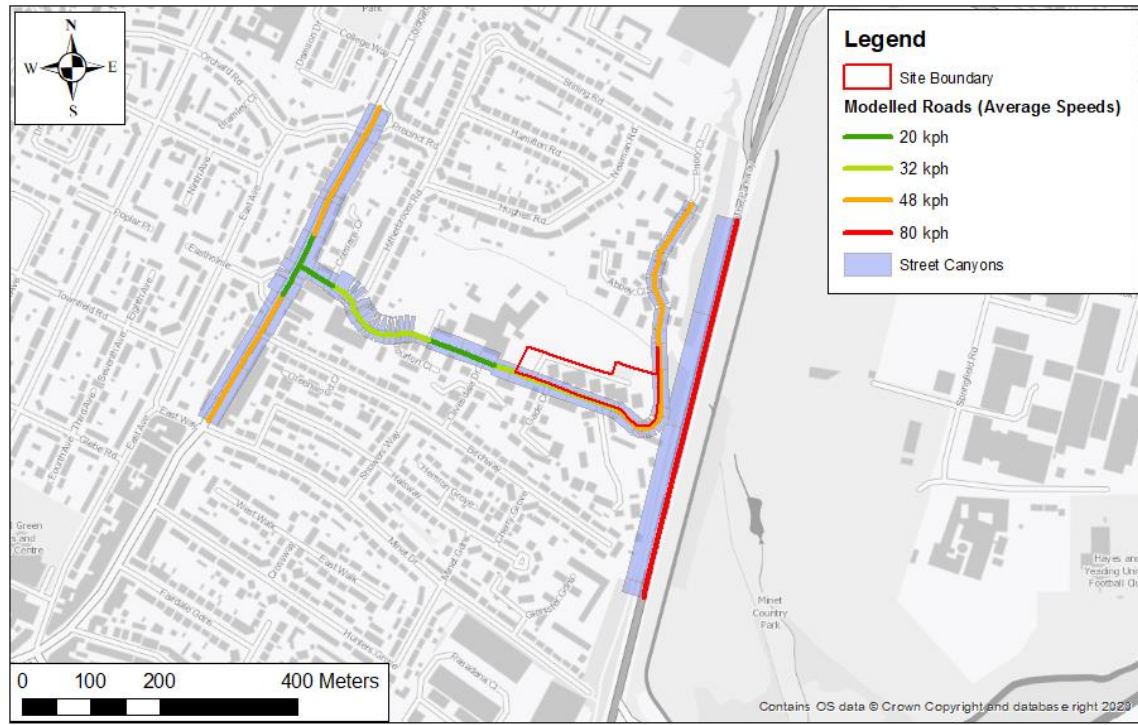


Figure E.1: Modelled Road Network (including Average Speeds [kph] and Modelled Street Canyons)



Figure E.2: Modelled Road Network (2024 Traffic Volumes (AADT))

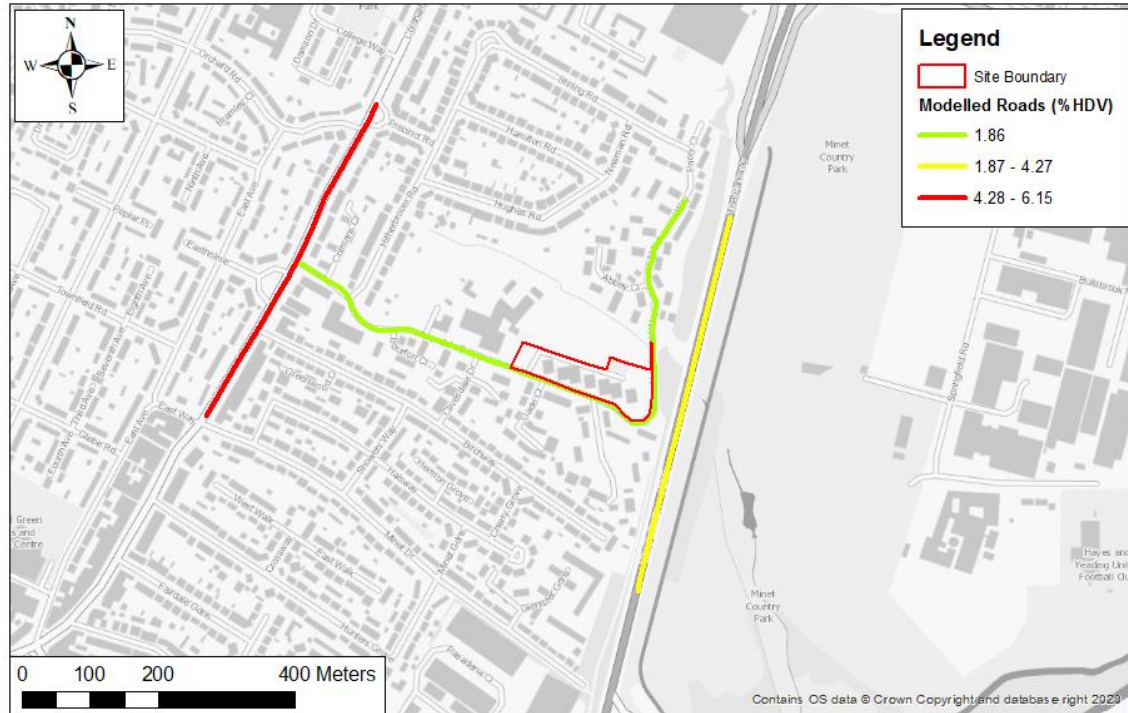


Figure E.3: Modelled Road Network (2024 HDV %)