

Air Quality Assessment

Barnes Hospital

For Star Land Realty UK Ltd

Quality Management

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Executive Summary

The Barnes Hospital development is located within the administrative area of the London Borough of Richmond upon Thames (LBRuT). The entire borough is designated as an Air Quality Management Area (AQMA) due to elevated concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀) attributable to road traffic emissions.

This Air Quality Assessment, undertaken to accompany the planning application, considers the air quality impacts from the construction phase and once the Proposed Development is fully operational.

The assessment has been undertaken based upon appropriate information on the Proposed Development provided by Star Land Realty Ltd and its project team. In undertaking this assessment, RPS experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour. These professional responsibilities are in accordance with the code of professional conduct set by the Institution of Environmental Sciences for members of the Institute of Air Quality Management (IAQM).

For the construction phase, the most important consideration is dust. Without appropriate mitigation, dust could cause temporary soiling of surfaces, particularly windows, cars and laundry. The mitigation measures provided within this report should ensure that the risk of adverse dust effects is reduced to a minimum.

For the operational phase, arrivals at and departures from the Proposed Development may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are the most important consideration during this phase of the development. In this case, the development generates a small number of additional vehicle movements and the air quality effects are not considered significant.

Detailed atmospheric dispersion modelling has been undertaken to establish the suitability of the site for its proposed use. Pollutant concentrations are predicted to be well within the relevant health-based air quality objectives at the façades of proposed receptors. Therefore, air quality is acceptable at the development site, making it suitable for its proposed use. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be 'not significant' overall.

The Barnes Hospital development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBRuT's Air Quality Action Plan. There are no constraints to the development in the context of air quality.

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1 Introduction

- 1.1 This report details the air quality assessment undertaken for the proposed demolition of existing structures and redevelopment of site including construction of three new buildings comprising residential units of mixed tenure (Use Class C3), conversion of two existing buildings for residential use (Use Class C3), car and cycle parking, landscaping and associated works at Barnes Hospital ('the Proposed Development').
- 1.2 The site benefits from an extant outline planning permission (ref. 18/3642/OUT) for residential use. Medical and educational uses were also permitted as part of the outline permission on the other parts of the Barnes Hospital campus that fall outside of this planning application boundary and will be brought forward separately to the east of the site.
- 1.3 This outline planning permission ('OPP') (ref. 18/3642/OUT) was granted on 14 September 2020 for:
- "Outline planning permission for the demolition and comprehensive redevelopment (phased development) of land at Barnes Hospital to provide a mixed use development comprising a health centre (Use Class D1), a Special Educational Needs (SEN) School (Use Class D1), up to 80 new build residential units (Use class C3), the conversion of two of the retained BTMs for use for up to 3no. residential units (Use Class C3), the conversion of one BTM for medical use (Use Class D1), car parking, landscaping and associated works. All matters reserved save for the full details submitted in relation to access points at the site boundaries."*
- 1.4 The OPP granted approval for a three-part phased development of the site: (1) the residential part, (2) the SEN School and (3) the health centre. The OPP approves the development of up to 80 residential units with associated car and cycle parking within three blocks of two and three storeys.
- 1.5 The Proposed Development includes 109 residential units (106 in the new buildings, 3 within the retained BTMs) and 50 car parking spaces.
- 1.6 This report complements RPS' air quality neutral impact calculation 'Air Quality Neutral Calculation' report. That air quality neutral calculation report quantifies the emissions of atmospheric pollutants from the development at source (i.e. from vehicles and building plant) and compares the emissions with official benchmark levels that define neutrality. In contrast, this report considers the impacts of the development on ambient air quality at the point of exposure (i.e. at sensitive receptor locations) by comparing predicted levels with Air Quality Strategy objectives. The local authority, the London Borough of Richmond upon Thames (LBRuT) has designated the entire borough as an Air Quality Management Area (AQMA) due to elevated

concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀) attributable to road traffic emissions.

1.7 This air quality assessment covers the:

- Construction phase - an evaluation of the temporary effects from fugitive construction dust and construction-vehicle exhaust emissions; and the
- Operational phase – an evaluation of
 - the impacts of the development traffic on the local area
 - the impacts on future occupants of the development from their exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.

1.8 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual construction-phase effects and the residual operational-phase effects.

2 Policy and Legislative Context

Ambient Air Quality Legislation and National Policy

Air Quality Standards Regulations

2.1 The Air Quality Standards Regulations 2010 [1] sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

2.2 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [2]. The Strategy sets UK air quality standards* and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

2.3 The 1995 Environment Act also established the UK system of Local Air Quality Management (LAQM), that requires local authorities to go through a process of review and assessment of air quality in their areas, identifying places where objectives are not likely to be met, then declaring Air Quality Management Areas (AQMAS) and putting in place Air Quality Action Plans to improve air quality. These plans also contribute, at local level, to the achievement of the limit values in the Air Quality Standards Regulations.

* Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

2.4 The limit values and objectives relevant to this assessment are summarised in Table 2.1. Although the limit values and the AQS objectives are numerically equal, there are some differences in where they apply and who is responsible for their achievement.

Table 2.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO ₂)	1 hour	200 µg.m ⁻³	18 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM ₁₀)	24 Hour	50 µg.m ⁻³	35 times per calendar year
	Annual	40 µg.m ⁻³	-
Particulate Matter (PM _{2.5})	Annual	25 µg.m ⁻³	-

2.5 On 14 January 2019, Defra published the 'Clean Air Strategy 2019'. The report sets out actions that the Government intends to take to reduce emissions from transport, in the home, from farming and from industry.

National Planning Policy

National Planning Policy Framework

2.6 The National Planning Policy Framework (NPPF) [3] is a material consideration for local planning authorities and decision-takers in determining applications. At the heart of the NPPF, is a presumption in favour of sustainable development, subject to caveats where a plan or project affects a habitats site. For determining planning applications, this means approving development proposals if they accord with an up-to-date local development plan, unless material considerations indicate otherwise. If the development plan does not contain relevant policies, or the policies are out of date, then planning permission should be granted unless the application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development, or any adverse impacts would significantly outweigh the benefits.

2.7 The NPPF sets out three overarching objectives to achieve sustainable development. The relevant objective in the context of this air quality assessment is:

“an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy” (Paragraph 8c)

2.8 Under the heading ‘Promoting sustainable transport’, the NPPF states:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.” (Paragraph 105)

2.9 Under the heading ‘Conserving and enhancing the natural environment’, the NPPF states:

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

...

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; ...” (Paragraph 174)

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.” (Paragraph 186)

National Planning Practice Guidance

2.10 The National Planning Practice Guidance (NPPG) was issued on-line on 6 March 2014 and is updated periodically by government as a live document. The last major update of the Air Quality Section was on 1 November 2019. The Air Quality section of the NPPG describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

2.11 The NPPG advises that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. 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. The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

“Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;

Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;

Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;

Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;

Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value.”

- 2.12 The NPPG provides advice on how air quality impacts can be mitigated and notes *“Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.”*

Regional Policy Guidance – The London Plan

- 2.13 The Mayor of London is responsible for all strategic planning in London. Amongst the Mayor’s duties is the requirement to develop a Spatial Development Strategy for London, known as the London Plan. The London Plan [4] was published in March 2021. The Plan acts as an integrating framework for a set of strategies, including improvements to air quality.

- 2.14 The key policy relating to air quality is Policy SI 1: Improving Air Quality:

“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:

- 1) how proposals have considered ways to maximise benefits to local air quality, and*
- 2) 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.”

2.15 It continues by stating that: *“Where this policy refers to ‘existing poor air quality’ this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits.”*

2.16 The Mayor’s London Environment Strategy [5] sets out the following policies seeking to improve London’s air quality to the point where air pollution no longer poses a significant risk to human health:

“Policy 4.1.1 Make sure that London and its communities, particularly the most disadvantaged and those in priority locations, are empowered to reduce their exposure to poor air quality.

Policy 4.1.2 Improve the understanding of air quality health impacts to better target policies and action

Policy 4.2.1 Reduce emissions from London’s road transport network by phasing out fossil fuelled vehicles, prioritising action on diesel, and enabling Londoners to switch to more sustainable forms of transport

Policy 4.2.2 Reduce emissions from non-road transport sources, including by phasing out fossil fuels

Policy 4.2.3 Reduce emissions from non-transport sources, including by phasing out fossil fuels

Policy 4.2.4 The Mayor will work with the government, the London boroughs and other partners to accelerate the achievement of legal limits in Greater London and improve air quality

Policy 4.2.5 The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice, lead action and support evidence based steps to improve air quality

Policy 4.3.1 The Mayor will establish new targets for PM2.5 and other pollutants where needed. The Mayor will seek to meet these targets as soon as possible, working with government and other partners

Policy 4.3.2 The Mayor will encourage the take up of ultra low and zero emission technologies to make sure London’s entire transport system is zero emission by 2050 to further reduce levels of pollution and achieve WHO air quality guidelines

Policy 4.3.3 Phase out the use of fossil fuels to heat, cool and maintain London’s buildings, homes and urban spaces, and reduce the impact of building emissions on air quality

Policy 4.3.4 Work to reduce exposure to indoor air pollutants in the home, schools, workplace and other enclosed spaces”

2.17 In April 2014, the Greater London Authority (GLA) published Supplementary Planning Guidance (SPG) Sustainable Design and Construction [6]. The SPG reinforces the existing need for a ‘conventional’ Air Quality Assessment where pollutant concentrations, at the point of human exposure, are compared with the relevant national objectives; however, the SPG also details how major developments must demonstrate they are achieving ‘Air Quality Neutral’. The Air Quality Neutral calculations have been undertaken for the Proposed Development and are provided in a separate report.

2.18 In March 2021, the Mayor of London released the London Plan Guidance: Air Quality Positive document. This is a pre-consultation draft which will be formally consulted on in autumn 2021.

Local Planning Policy

2.19 The LBRuT Local Plan was adopted in July 2018. This document sets out policies and guidance for development of the borough over the next 15 years.

2.20 The following policies are relevant to this assessment:

“Policy LP 8

Amenity and Living Conditions

All development will be required to protect the amenity and living conditions for occupants of new, existing, adjoining and neighbouring properties. The Council will:

...

ensure there is no harm to the reasonable enjoyment of the use of buildings, gardens and other spaces due to increases in traffic, servicing, parking, noise, light, disturbance, air pollution, odours or vibration or local micro-climate effects.

...”

“Policy LP 10

Local Environmental Impacts, Pollution and Land Contamination

The Council will seek to ensure that local environmental impacts of all development proposals do not lead to detrimental effects on the health, safety and the amenity of existing and new users or occupiers of the development site, or the surrounding land. These potential impacts can include, but are not limited to, air pollution, noise and vibration, light pollution, odours and fumes, solar glare and solar dazzle as well as land contamination.

Developers should follow any guidance provided by the Council on local environmental impacts and pollution as well as on noise generating and noise sensitive development. Where necessary, the Council will set planning conditions to reduce local environmental impacts on adjacent land uses to acceptable levels.

Air Quality

The Council promotes good air quality design and new technologies. Developers should secure at least 'Emissions Neutral' development. To consider the impact of introducing new developments in areas already subject to poor air quality, the following will be required:

an air quality impact assessment, including where necessary, modelled data;

mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;

measures to protect the occupiers of new developments from existing sources;

strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors.

2.21 In June 2020, The LBRuT published its Air Quality Supplementary Planning Document which provides advice on:

- the implementation of Policy LP 10;
- designing new developments to minimise the effects on the local community as well as avoiding introducing new exposure in areas of poor air quality;
- the assessment of air quality impacts of development: and
- appropriate mitigation measures.

3 Assessment Methodology

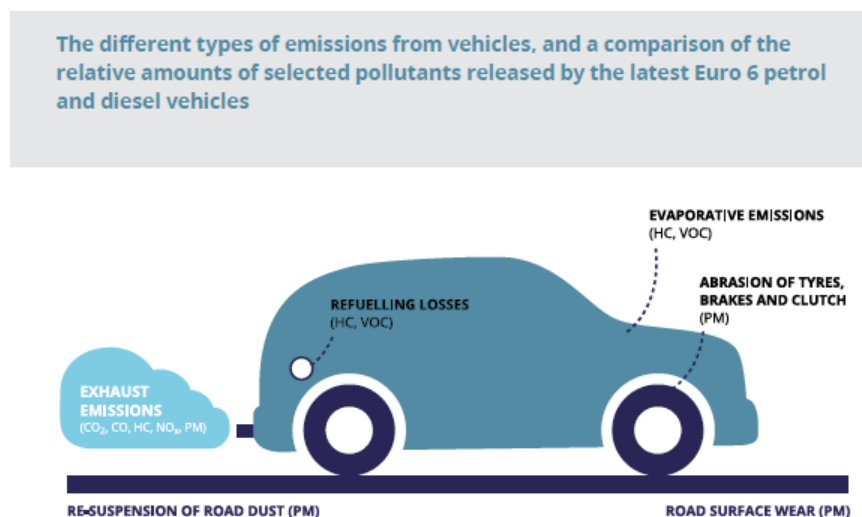
- 3.1 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that “*Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific. The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned.*” It lists a number of areas that might be usefully agreed at the outset.
- 3.2 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [7], the Mayor of London’s Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [8], the IAQM Guidance on the assessment of dust from demolition and construction [9] and, where relevant, the Mayor of London’s Local Air Quality Management Technical Guidance: LLAQM.TG16 [10]. It includes the key elements listed below:
- assessment of the existing air quality in the study area (existing baseline) and prediction of the future air quality without the development in place (future baseline), using official government estimates from Defra, publicly available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
 - a qualitative assessment of likely construction-phase impacts with mitigation and controls in place; and
 - a quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation), encompassing
 - the impacts of the development traffic on the local area
 - the impacts on future occupants of the development from their exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.
- 3.3 In line with the guidance set out in the NPPG, the Environmental Health Department at the LBRuT was contacted in 2017 to agree the scope and methodology for the original assessment.

3.4 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The RPS air quality team members involved at various stages of this assessment have professional affiliations that include Fellow and Member of the Institute of Air Quality Management, Chartered Chemist, Chartered Scientist, Chartered Environmentalist and Member of the Royal Society of Chemistry and have the required academic qualifications for these professional bodies. In addition, the Director responsible for authorising all deliverables has over 17 years' experience.

Summary of Key Pollutants Considered

3.5 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM₁₀). Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO₂. The NO oxidises in the atmosphere to form NO₂. The assessment of operational impacts therefore focuses on changes in NO₂ and PM₁₀ concentrations. The impact from fine particulate matter, known as PM_{2.5} (a subset of PM₁₀) concentrations has also been considered.

Figure 3.1 Types of Vehicle Emissions



Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

3.6 For the construction phase of the Proposed Development the key pollutant is dust, covering both the PM₁₀ fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

- 3.7 Regarding exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality [9] except for large, long-term construction sites: the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [7] indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. The results of the Highways and Access assessment indicates that the aforementioned EPUK & IAQM thresholds are not expected to be exceeded for any individual road during the construction phase of this project; therefore, construction-vehicle exhaust emissions have not been assessed specifically.

Construction Phase - Methodology

- 3.8 Dust is the generic term used to describe particulate matter in the size range 1-75 μm in diameter [11]. Particles greater than 75 μm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.
- 3.9 The effects of dust are linked to particle size and two main categories are usually considered:
- PM₁₀ particles, those up to 10 μm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
 - Dust, generally considered to be particles larger than 10 μm which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.
- 3.10 The IAQM Guidance on the assessment of dust from demolition and construction sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM₁₀ effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. (In this particular application, there are no ecological receptors within the distances and ecological effects have been scoped out). These distances are set to be deliberately conservative.

- 3.11 Concentration-based limit values and objectives have been set for the PM₁₀ suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.
- 3.12 The Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [8] (hereafter referred to as the Construction and Demolition SPG) provides information relating to the approach to the assessment, recommended mitigation measures and appropriate monitoring strategies. In particular, the Construction and Demolition SPG states that the assessment methodology provided in the current version of the Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction should be used.
- 3.13 The IAQM dust guidance aims to estimate the impacts of both PM₁₀ and dust through a risk-based assessment procedure. The IAQM dust guidance document states: *"The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified."*
- 3.14 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: *"This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified."*
- 3.15 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach:
- The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e. the route through the air) from source to receptor.
 - The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

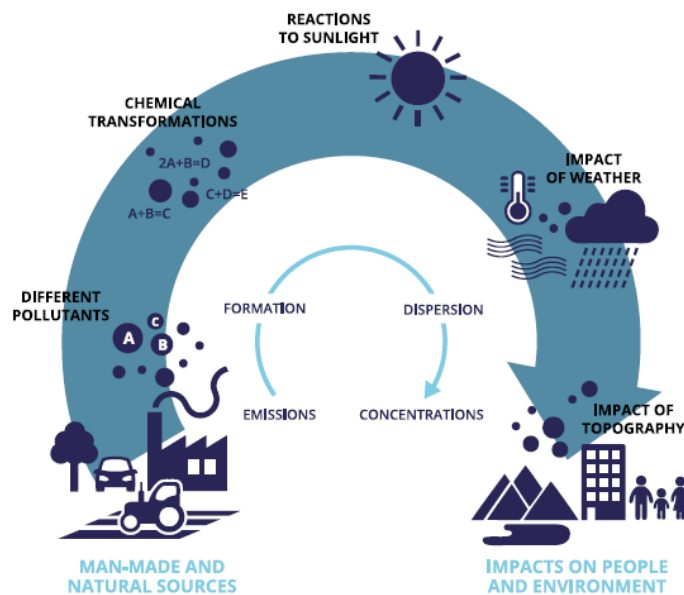
- 3.16 The detail of the dust assessment methodology is provided in Appendix A.
- 3.17 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the Mayor of London’s SPG. The Mayor of London’s SPG states that with the recommended dust mitigation measures in place the residual impact will be “minimised”.
- 3.18 This assessment does not consider the air quality impacts of dust from any contaminated land or buildings. If contaminated land is identified on the Application Site, the impacts will be assessed in other technical discipline reports.

Operational Phase - Methodology

Atmospheric Dispersion Modelling of Pollutant Concentrations

3.19 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

Figure 3.2 Air Pollution: From Emissions to Exposure



Source: European Environment Agency (2016) Explaining Road Transport Emissions: A Non-technical Guide

- 3.20 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4.
- 3.21 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the UK by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Model Input Data

Traffic Flow Data

- 3.22 Traffic data used in the assessment have been provided by the project's transport consultants, Motion. Traffic data for three scenarios were provided:
- Without Proposed Development and Without the Outline Planning Permission (OPP) in the first year that the development is expected to be fully operational, 2024:
 - Without Proposed Development and With the OPP in the first year that the development is expected to be fully operational, 2024 (i.e. the currently permitted development); and
 - With Proposed Development and With the OPP in the first year that the development is expected to be fully operational, 2024.
- 3.23 The traffic flow data provided for this assessment are summarised in Table 3.1. The modelled road links are illustrated in Figure 1.

Table 3.1 Traffic Data Used Within the Assessment

Road Link ID	Road Link Name	Speed (km.hr ⁻¹)	Daily Two Way Vehicle Flow					
			Without Development (without OPP)		Without Development (with OPP)		With Development (OPP plus Current Application)	
			Total Vehicles	HDV %	Total Vehicles	HDV %	Total Vehicles	HDV %
1	South Worple Way	32	801	4	694	4	730	4
2	White Hart Lane	32	4701	9	4621	9	4648	9
3	South Circular Road	48	26571	4	26531	4	26549	4
4*	Priests Bridge	48	13286	4	13266	4	13275	4

Notes: (km.hr⁻¹) = kilometres per hour

HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses

LDV = Light Duty Vehicle

* Traffic flows for this link have been estimated as half of those on Link 3, as it is a one-way road.

- 3.24 As shown in Table 3.1 above, the OPP development is expected to lead to a reduction in traffic on the local road network. Furthermore, when the additional residential units are included (the OPP plus Current Application), traffic flows remain below the flows without any development.
- 3.25 On that basis, the With Development (OPP plus Current Application) has been modelled to determine the suitability of the site for its proposed uses. The impacts of the development on the surrounding area are discussed later in section 6.
- 3.26 The average speed on each road has been reduced by 10 km.hr⁻¹ to take into account the possibility of slow-moving traffic near junctions and at roundabouts in accordance with LLAQM.TG16.

Vehicle Emission Factors

- 3.27 The modelling has been undertaken using Defra’s 2020 emission factor toolkit (version 10.1) which draws on emissions generated by the European Environment Agency (EEA) COPERT 5.3 emission calculation tool.

Meteorological Data

- 3.28 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is Heathrow approximately 14 km west of the Application Site. Meteorological data from that station for 2020 have been used within the dispersion model. The wind rose is presented in Figure 2.

Receptors

3.29 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LLAQM.TG16 [10] provides examples of exposure locations and these are summarised in Table 3.2.

Table 3.2 Examples of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expected to be short-term.
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3.30 Representative sensitive receptors for this assessment have been selected at locations within the proposed development where pollutant concentrations are anticipated to be greatest, as listed in Table 3.3.

Table 3.3 Modelled Sensitive Receptors

ID	Description	x	y
P1	Proposed Development 1	521123	175727
P2	Proposed Development 2	521164	175731
P3	Proposed Development 3	521205	175734

- 3.31 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

Long-Term Pollutant Predictions

- 3.32 Annual-mean NO_x and PM₁₀ concentrations have been predicted at representative sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_x emissions is converted to NO₂ to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO₂ concentrations have been derived from the modelled road-related annual-mean NO_x concentration using Defra's calculator [12].

Short-Term Pollutant Predictions

- 3.33 In order to predict the likelihood of exceedances of the hourly-mean AQS objectives for NO₂ and the daily-mean AQS objective for PM₁₀, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

Hourly-Mean AQS Objective for NO₂

- 3.34 Research undertaken in support of LLAQM.TG16 has indicated that the hourly-mean limit value and objective for NO₂ is unlikely to be exceeded at a roadside location where the annual-mean NO₂ concentration is less than 60 µg.m⁻³. The threshold of 60 µg.m⁻³ NO₂ has been used as the guideline for considering a likely exceedance of the hourly-mean nitrogen dioxide objective.

Daily-Mean AQS Objective for PM₁₀

- 3.35 The number of exceedances of the daily-mean AQS objective for PM₁₀ of 50 µg.m⁻³ may be estimated using the relationship set out in LLAQM.TG16:

$$\text{Number of Exceedances of Daily Mean of } 50 \mu\text{g.m}^{-3} = -18.5 + 0.00145 * (\text{Predicted Annual-mean } PM_{10})^3 + 206 / (\text{Predicted Annual-mean } PM_{10} \text{ Concentration})$$

- 3.36 This relationship indicates that the daily-mean AQS objective for PM₁₀ is likely to be met if the predicted annual-mean PM₁₀ concentration is 31.8 µg.m⁻³ or less.
- 3.37 The daily mean objective is therefore not considered further within this assessment if the annual-mean PM₁₀ concentration is predicted to be less than 31.5 µg.m⁻³.

Fugitive PM₁₀ Emissions

3.38 Transport PM₁₀ emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM₁₀ exhaust emissions; therefore, the relative importance of fugitive PM₁₀ emissions is increasing. Current official vehicle emission factors for particulate matter include brake dust and tyre wear which studies suggest may account for approximately one-third of the total particulate emissions from road transport; but not re-suspended road dust (which remains unquantified.)

Significance Criteria for New Population Exposure (Site Suitability)

3.39 The London Councils' Air Quality and Planning Guidance [13] provides Air Pollution Exposure Criteria (APEC) for assessing the significance on exposure to air pollution and the levels of mitigation required when considering site suitability. Table 3.4 provides a summary of the criteria.

Table 3.4 Summary of Air Pollution Exposure Criteria (APEC)

Criteria	Applicable Range NO ₂ Annual-Mean	Applicable Range PM ₁₀	Recommendation
APEC-A	> 5% below national objective	Annual-Mean >5% below national objective 24-Hour >1-day less than national objective	No air quality grounds for refusal; however mitigation of any emissions should be considered.
APEC-B	Between 5% below or above national objective	Annual-Mean Between 5% above or below national objective 24-Hour Between 1-day above or below national objective	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered, e.g. maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered and internal pollutant emissions minimised.
APEC-C	>5% above national objective	Annual-Mean >5% above national objective 24-Hour >1-day more than national objective	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

3.40 Concentrations have been predicted at proposed receptors to determine the APEC category that would apply.

- 3.41 The EPUK & IAQM guidance considers an exceedance of an air quality objective at a building façade to be significant adverse effect unless provision is made to reduce the resident's or occupant's exposure by some means.

Uncertainty

- 3.42 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).
- 3.43 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.
- 3.44 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the uncertainty range informed by an analysis of relevant, available data.
- 3.45 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.
- 3.46 LLAQM.TG16 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

- 3.47 For the verification and adjustment of NO_x/NO₂ concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.
- 3.48 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Notwithstanding this, a small number of monitoring locations have been identified within the study area and a model verification study has been undertaken for the proposed development and is included at Appendix B.
- 3.49 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 3.5.

Table 3.5 Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of current baseline air quality conditions	The background concentration used within the assessment is the most conservative value from a comparison of measured and Defra mapped concentration estimate.	The background concentration is the major proportion of the total predicted concentration.
	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The conservative assumptions adopted ensure that the background concentration used within the model contributes to the result being towards the top of the uncertainty range, rather than a central estimate.
Fraction from Modelled Sources	Traffic flow estimates	Traffic flows provided have all been based on traffic counts, rather than flows derived from a traffic model. High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration.
	Traffic speed estimates	The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	The modelled fraction is likely to contribute to the result being between a central estimate and the top of the uncertainty range.

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment.	
	Receptors	Receptor locations have been identified where concentrations are expected to be highest.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly. The fractional bias indicates that the model performing well.	

3.50 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

4 Baseline Air Quality Conditions

Overview

- 4.1 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance and EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. LLAQM.TG16 recommends that Defra mapped concentration estimates are used to inform background concentrations in air quality modelling and states that: *“Where appropriate these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality”*.
- 4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:
- Defra maps [14], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
 - published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies.
- 4.3 A detailed description of how the baseline air quality has been derived for this Proposed Development site is summarised in the following paragraphs.

Review and Assessment Process

- 4.4 The LBRuT, has designated the entire borough as an AQMA due to elevated concentrations of NO₂ and PM₁₀ attributable to road traffic emissions.
- 4.5 The LBRuT Air Quality Action Plan 2019 - 2024 sets out actions the Council intends to take to tackle air pollution in the Borough over the five-year period between 2019 and 2024. It lists a number of measures to improve air quality under four areas:
- Monitoring Air Quality
 - Changing our Environment
 - Changing Behaviour
 - Tackling Pollution

4.6 Within these four areas, there are two measures relevant to development:

- *“New building and development. We have embedded air quality in our Local Plan and will produce a Supplementary Planning Document that will help to deliver our aspirations for cleaner air in the borough. This document will cover all areas of planning and ensure developers focus on air quality throughout the build and for the life of the development”.*
- *“The impact of demolition and construction can be a significant contributor to poor air quality. We will ensure that sites are regulated in accordance with the Mayor of London’s Non Road Mobile Machinery where this is applicable. This project is currently being delivered throughout London by our joint regulatory service”.*

4.7 In June 2020, The LBRuT published its Air Quality Supplementary Planning Document which provides advice on:

- the implementation of Policy LP 10;
- designing new developments to minimise the effects on the local community as well as avoiding introducing new exposure in areas of poor air quality;
- the assessment of air quality impacts of development: and
- appropriate mitigation measures.

Local Urban Background Monitoring

4.8 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an appropriate source of data for the purposes of describing baseline air quality for this Proposed Development site.

4.9 There is one local monitoring station where urban background concentrations are measured using continuous automatic instruments. The London Borough of Wandsworth (LBW) monitors NO₂ and PM₁₀ at the WA9 urban background location. The most recently measured annual-mean concentrations are presented in Table 4.1.

Table 4.1 Automatically Monitored Urban Background Annual-Mean Concentrations

Monitor Name	Approximate Distance from the Application Site (km)	Pollutant	Concentration (µg.m ⁻³)					
			2015	2016	2017	2018	2019	2020
Putney (WA9)	2.9	NO ₂	40	45	31	35	35	26
		PM ₁₀	18	18	17	17	18	16

4.10 In addition, the LBW, the LBRuT and the London Borough of Hammersmith and Fulham manually monitors NO₂ concentrations at a number of urban background locations using passive diffusion tubes and the most recently measured annual-mean concentrations are presented in Table 4.2.

Table 4.2 Passively Monitored Urban Background Annual-Mean NO₂ Concentrations

Monitor Name	Borough	Approximate Distance from the Application Site (km)	Concentration (µg.m ⁻³)					
			2015	2016	2017	2018	2019	2020
Holly Lodge, Richmond Park (28)	Richmond	2.4	17	21	17	18	17	12
Wetlands, Barnes (37)		2.1	21	25	20	21	20	14
Daylesford Avenue, Putney (W6)	Wandsworth	1.1	24	28	23	23	23	16
Werter Road, Putney (W10)		3	35	35	-	-	-	-
Radipole Road	Hammersmith & Fulham	3.7	32	35	33	21	30	-
Cardross Street		3.8	31	34	37	27	28	-

All concentrations have been adjusted for bias

4.11 Measured concentrations in 2020 are clearly lower than concentrations in earlier years and are likely to be indicative of fewer vehicles on the roads during lockdowns associated with the COVID 19 pandemic. Concentrations in 2020 have therefore not been considered further as suitable for inform the background concentrations in the model.

Defra Mapped Concentration Estimates

4.12 Defra’s total annual-mean NO₂ concentration estimates have been collected for the 1 km grid squares of the monitoring sites and the Proposed Development and are summarised in Table 4.3.

Table 4.3 Defra Mapped Annual-Mean Background NO₂ Concentration Estimates

Monitor Name	Borough	Approximate Distance from the Application Site (km)	Concentration (µg.m ⁻³)	
			Range of Monitored*	Estimated Defra Mapped
Holly Lodge, Richmond Park (28)	Richmond	2.4	17 - 21	17.7
Wetlands, Barnes (37)		2.1	20 - 25	23.5
Putney (WA9)	Wandsworth	2.9	31 - 45	25.4
Daylesford Avenue, Putney (W6)		1.1	23 - 28	22.7

Monitor Name	Borough	Approximate Distance from the Application Site (km)	Concentration ($\mu\text{g}\cdot\text{m}^{-3}$) Range of Monitored*	Estimated Defra Mapped
Werter Road, Putney (W10)		3	35 - 35	25.4
Radipole Road	Hammersmith & Fulham	3.7	21 - 35	26.5
Cardross Street		3.8	27 - 37	27.8
Application Site				22.8

*The range does not include results from 2020 which were lower due to the Covid-19 pandemic.

4.13 Similarly, the Defra total annual-mean PM_{10} concentration estimates have been collected for the grid square of the monitoring sites and the Proposed Development and are summarised in Table 4.4.

Table 4.4 Defra Mapped Annual-Mean Background PM_{10} Concentration Estimates

Monitor Name	Borough	Approximate Distance from the Application Site (km)	Concentration ($\mu\text{g}\cdot\text{m}^{-3}$) Range of Monitored*	Estimated Defra Mapped
Putney (WA9)	Wandsworth	2.9	17 - 18	18.4
Application Site				17.5

*The range does not include results from 2020 which were lower due to the Covid-19 pandemic.

Appropriate Background Concentrations for the Development Site

- 4.14 For NO_2 , the Defra mapped background concentration estimates are generally smaller than or within the range of the results from monitoring and the use of these data would not be conservative. The Daylesford Avenue, Putney monitor is the closest monitoring location to the Application Site. Automatically monitored annual-mean NO_2 concentrations at the Daylesford Avenue monitor range from 23 to 28 $\mu\text{g}\cdot\text{m}^{-3}$. To ensure the assessment is conservative, the background annual-mean NO_2 concentration has been derived from the 28 $\mu\text{g}\cdot\text{m}^{-3}$, monitored in 2016.
- 4.15 For PM_{10} , the Defra mapped background concentration estimate is higher than the range of results from monitoring. The background annual-mean PM_{10} concentration at the Application Site has been derived from the estimated Defra mapped concentration.
- 4.16 In the absence of $\text{PM}_{2.5}$ monitoring at this site, the background annual-mean concentration at the Application Site has been derived from the Defra mapped background concentration estimate.

- 4.17 Historically the view has been that background traffic-related NO₂ concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. After a prolonged period through the last decade where background annual-mean NO₂ concentrations did not generally decrease in line with expectations, the most recent monitoring studies indicate ambient traffic-related NO₂ concentrations are now falling. To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.
- 4.18 Table 4.5 summarises the annual-mean background concentrations for NO₂, PM₁₀ and PM_{2.5} used in this assessment.

Table 4.5 Summary of Background Annual-Mean (Long-term) Concentrations used in the Assessment

Pollutant	Data Source	Concentration (µg.m ⁻³)
NO ₂	Daylesford Avenue (2016)	28
PM ₁₀	Defra (2018)	17.5
PM _{2.5}		11.7

5 Assessment of Construction-Phase Air Quality Impacts

Construction Dust

- 5.1 Whilst no detailed construction phase information is currently available, the type of activities that could cause fugitive dust emissions are: demolition; earthworks; handling and disposal of spoil; wind-blown particulate material from stockpiles; handling of loose construction materials; and movement of vehicles, both on and off site.
- 5.2 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression methods.
- 5.3 The main effect of any dust emissions, if not mitigated, could be annoyance due to soiling of surfaces, particularly windows, cars and laundry. However, it is normally possible, by implementation of proper control, to ensure that dust deposition does not give rise to significant adverse effects, although short-term events may occur (for example, due to technical failure or exceptional weather conditions). The following assessment, using the IAQM methodology, predicts the risk of dust impacts and the level of mitigation to minimise air quality impacts.

Risk of Dust Impacts

Source

- 5.4 The volume of the buildings on site that would be demolished is below 20,000 m³ and the dust emission magnitude for the demolition phase is classified, using the IAQM dust guidance, as small.
- 5.5 The site area is between 2,500 and 10,000 m² and the dust emission magnitude for the earthworks phase is classified as medium.
- 5.6 The total volume of the buildings to be constructed would be between 25,000 and 100,000 m³ and the dust emission magnitude for the construction phase is classified as medium.
- 5.7 Assuming that the maximum number of outwards movements in any one day is less than 10 HDVs, the dust emission magnitude for trackout would be classified as small.

Table 5.1 Dust Emission Magnitude for Demolition, Earthworks, Construction and Trackout

Demolition	Earthworks	Construction	Trackout
Small	Medium	Medium	Small

Pathway and Receptor - Sensitivity of the Area

5.8 All demolition, earthworks and construction activities are assumed to occur within the site boundary. As such, receptors at distances within 20 m, 50 m, 100 m, 200 m and 350 m of the site boundary have been identified and are illustrated in Figure 3. The sensitivity of the area has been classified and the results are provided in Table 5.2 below.

Table 5.2 Sensitivity of the Surrounding Area for Demolition, Earthworks and Construction

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	10 – 100 high sensitivity receptors located within 20 m of the site boundary (Table A.5)
Human Health	Low	Background PM ₁₀ concentrations for the assessment = 17.5 µg.m ⁻³ 10 – 100 high sensitivity receptors located within 20 m of the site boundary and PM ₁₀ concentrations below 24 µg.m ⁻³ (Table A.6)

5.9 The Dust Emission Magnitude for trackout is classified as small and trackout may occur on roads up to 50 m from the site. The major route within 50 m of the site is South Worple Way. The sensitivity of the area has been classified and the results are provided in Table 5.3

Table 5.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	10 – 100 high sensitivity receptors located within 20 m of the roads (Table A.5)
Human Health	Low	Background PM ₁₀ concentrations for the assessment = 17.5 µg.m ⁻³ 10 – 100 high sensitivity receptors located within 20 m of the roads and PM ₁₀ concentrations below 24 µg.m ⁻³ (Table A.6)

Overall Dust Risk

5.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tables A.5 and A.6) to give the Dust Impact Risk. Table 5.4 summarises the Dust Impact Risk for the four activities.

Table 5.4 Dust Impact Risk for Demolition, Earthworks, Construction and Trackout

Source	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	Low
Human Health	Negligible	Low	Low	Negligible
Risk	Low	Medium	Medium	Low

5.11 Taking the site as a whole, the overall risk is deemed to be medium. The mitigation measures appropriate to a level of risk for the site as a whole and for each of the phases are set out in Section 7.

5.12 Provided this package of mitigation measures is implemented, the residual construction dust effects will not be significant. The IAQM dust guidance states that “*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’.*” The IAQM dust guidance recommends that significance is only assigned to the effect after the activities are considered with mitigation in place.

6 Assessment of Operational-Phase Air Quality Impacts

Assessment of Air Quality Impacts on Surrounding Area

- 6.1 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document [7] provides threshold criteria for determining when an air quality assessment. As set out above, the entire borough is designated as an AQMA and the relevant criteria for sites within or adjacent to an AQMA are as follows:
- an increase in annual average daily Light Duty Vehicle (LDV) flows by more than 100; or
 - an increase in annual average daily HDV flows by more than 25.
- 6.2 The project's transport consultants, Motion, have advised that the proposed development will increase the number of daily trips by 36 when compared to the outline planning permission. As set out in paragraph 3.24, when the additional residential units are included (the OPP plus Current Application), traffic flows remain below the flows without any development. As such, the net effect is a decrease in traffic flows overall.
- 6.3 This changes in traffic flows are therefore well below the threshold criteria given above. The EPUK&IAQM continues by stating that *"If none of the criteria are met then there should be no requirement to carry out an air quality assessment for the impact of the proposed development on the local area, and the impacts can be considered to have insignificant effects."*

Assessment of New Population Exposure (Site Suitability)

- 6.4 This section of the report summarises the operational-phase air quality impacts on future occupants of the development from their exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.
- 6.5 Table 6.1 presents the annual-mean NO₂, PM₁₀ and PM_{2.5} concentrations predicted at the façades of proposed receptors. It also sets out the number of predicted exceedances of the daily mean PM₁₀ objective.

Table 6.1 Predicted NO₂, PM₁₀ and PM_{2.5} Concentrations (µg.m⁻³) at Proposed Receptors

Receptor ID	Annual mean NO ₂	APEC Category	Annual mean PM ₁₀	APEC Category	Annual mean PM _{2.5}	Number of Daily Means PM ₁₀ > 50 µg.m ⁻³	APEC Category
1	28.59	APEC-A	17.66	APEC-A	11.85	1	APEC-A

Receptor ID	Annual mean NO ₂	APEC Category	Annual mean PM ₁₀	APEC Category	Annual mean PM _{2.5}	Number of Daily Means PM ₁₀ > 50 µg.m ⁻³	APEC Category
2	28.62		17.67		11.85	1	
3	28.63		17.67		11.85	1	

The Daily-Mean AQS Objective for PM₁₀ is 50µg.m⁻³ not to be exceeded more than 35 times per calendar year

- 6.6 The long-term and short-term objectives apply at the Proposed Development.
- 6.7 The predicted annual-mean NO₂ concentrations range between 28.59 and 28.63 µg.m⁻³, well below the annual-mean AQS objective of 40 µg.m⁻³ at all receptors. Furthermore, as the annual-mean NO₂ concentration is predicted to be less than 60 µg.m⁻³, the hourly-mean AQS objective is expected to be met. As the NO₂ concentrations are predicted to be more than 5% below the AQS objective, it is therefore fall into the London Councils' APEC-A banding for which no mitigation is required.
- 6.8 The predicted annual-mean PM₁₀ concentrations range between 17.66 and 17.67 µg.m⁻³, below the annual-mean AQS objective of 40 µg.m⁻³ at all receptors and below the World Health Organisation (WHO) guideline of 20 µg.m⁻³. Furthermore, as the annual-mean PM₁₀ concentration is predicted to be less than 31.5 µg.m⁻³, the daily-mean AQS objective for this pollutant is expected to be met. As the PM₁₀ concentrations are predicted to be more than 5% below the AQS objective, it is therefore fall into the London Councils' APEC-A banding for which no mitigation is required.
- 6.9 Predicted annual-mean PM_{2.5} concentrations is 11.85 µg.m⁻³. Predicted concentrations at all receptors are below the annual-mean AQS objective of 25 µg.m⁻³. The predicted annual-mean PM_{2.5} concentration exceeds the WHO guideline of 10 µg.m⁻³; the background concentration of 11.7 µg.m⁻³ adopted for the assessment is already above 10 µg.m⁻³. However, concentrations are well below the relevant limit values set in legislation for England.
- 6.10 There are predicted to be a maximum of 1 exceedances of the daily-mean PM₁₀ concentrations of 50 µg.m⁻³. As this is more than one day less than the national objective of 35 exceedances, the APEC-A category applies and no mitigation is required.

Significance of Effects

- 6.11 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.
- 6.12 Taking into account the change in traffic flows associated with the development, the overall impact of the development on the surrounding area as a whole is considered to be not significant.
- 6.13 The AQS objectives for NO₂, PM₁₀ and PM_{2.5} are likely to be met at the facades of the Proposed Development. On that basis, future occupants of the development should be exposed to acceptable air quality and the site is deemed suitable for its proposed future in this respect.
- 6.14 Using professional judgement, the resulting air quality effect is considered to be 'not significant' overall.

Sensitivity and Uncertainty

- 6.15 Section 3 provided an analysis of the sources of uncertainty in the results of the assessment. The conclusion of that analysis was that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.
- 6.16 The impacts at existing receptors are shown to be not significant even for this conservative scenario. Similarly, the predicted pollutant concentrations at proposed receptors are below the relevant AQS objectives. Consequently, further sensitivity analysis has not been undertaken and, in practice, the impacts at sensitive receptors are likely to be lower than those reported in this conservative assessment.

7 Mitigation

Mitigation During Construction

- 7.1 The Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance lists mitigation measures for low, medium and high dust risks.
- 7.2 As summarised in Table 5.4, the predicted Dust Impact Risk is classified as low for Demolition and trackout and medium for Earthworks and Construction. The general site measures described as 'highly recommended' for medium risks are listed below. The 'highly recommended' measures for low risk demolition sites and medium risk construction sites are also listed. There are no 'highly recommended' measures for medium risk earthworks or low risk trackout.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Develop a Dust Management Plan.
- Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
- Display the head or regional office contact information.
- Record and respond to all dust and air quality pollutant emissions complaints.
- Make a 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 dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust (sic) 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 the site, and the action taken to resolve the situation is recorded in the log book.

Preparing and maintaining the site

- Plan site layout: machinery and dust causing activities should be located away from receptors.

- Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
- Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- 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.
- Agree monitoring locations with the Local Authority.
- Where possible, commence baseline monitoring at least three months before phase begins.
- Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone.
- Ensure all non-road mobile machinery (NRMM) comply with the standards set within this guidance.
- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- 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 mitigation (using recycled water where possible).

- Use enclosed chutes, conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Reuse and recycle waste to reduce dust from waste materials.
- Avoid bonfires and burning of waste materials.

Measures specific to demolition

- Ensure effective water suppression is used during demolition operations.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition

Measures specific to construction

- 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.

7.3 The Mayor of London's SPG states that with the recommended dust mitigation measures in place the residual impact will be "*minimised*", and recommends the mitigation is secured by for a condition or Section 106 agreement as appropriate.

Mitigation for the Operational Impact of the Development on the Surrounding Area

7.4 The air quality impact on the surrounding area is considered to be "not significant". On that basis, no mitigation measures are considered necessary.

Mitigation for New Population Exposure (Site Suitability)

7.5 The NO₂, PM₁₀ and PM_{2.5} pollutant concentrations at the facades of the proposed development are predicted to be more than 5% below their respective AQS objectives and therefore fall into the London Councils' APEC-A banding for which no mitigation is required.

8 Conclusions

- 8.1 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the Barnes Hospital development.
- 8.2 Impacts during the construction of the Barnes Hospital development, such as dust generation and plant vehicle emissions, are predicted to be of short duration and only relevant during the construction phase. The results of the risk assessment of construction dust impacts undertaken using the Mayor of London's guidance indicates that before the implementation of mitigation and controls, the risk of dust impacts will be medium. Implementation of the highly-recommended mitigation measures described in the Mayor of London's Supplementary Planning Guidance *"should ensure the air quality impacts of construction and demolition are minimised and any mitigation measures employed are effective"*.
- 8.3 Regarding the operational impact of the Barnes Hospital development on the surrounding area, the development generates a small number of additional vehicle movements and, with reference to the relevant threshold criteria, the air quality effects are not considered significant.
- 8.4 Detailed atmospheric dispersion modelling has been undertaken to establish the suitability of the site for its proposed use. Pollutant concentrations at the façades of proposed residential receptors are predicted to be well within the relevant health-based air quality objectives. On that basis, future users of the development should be exposed to acceptable air quality and the site is deemed suitable for its proposed future use in this respect.
- 8.5 Using professional judgement, the resulting air quality effect of the Barnes Hospital development is considered to be 'not significant' overall.
- 8.6 At the heart of the NPPF is a presumption in favour of sustainable development, subject to caveats where a plan or project affects a habitats site. For determining planning applications, this means approving development proposals if they accord with the local development plan, unless material considerations indicate otherwise. If the development plan is absent, silent or the policies are out of date, then planning permission should be granted unless any adverse impacts would significantly outweigh the benefits, or specific policies in the NPPF indicate development should be restricted.
- 8.7 The NPPG advises that in considering planning permission, the relevant question for air quality is *"will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations or other environmental policies and duties, taking into account the presence of Air Quality Management Areas and Clean Air*

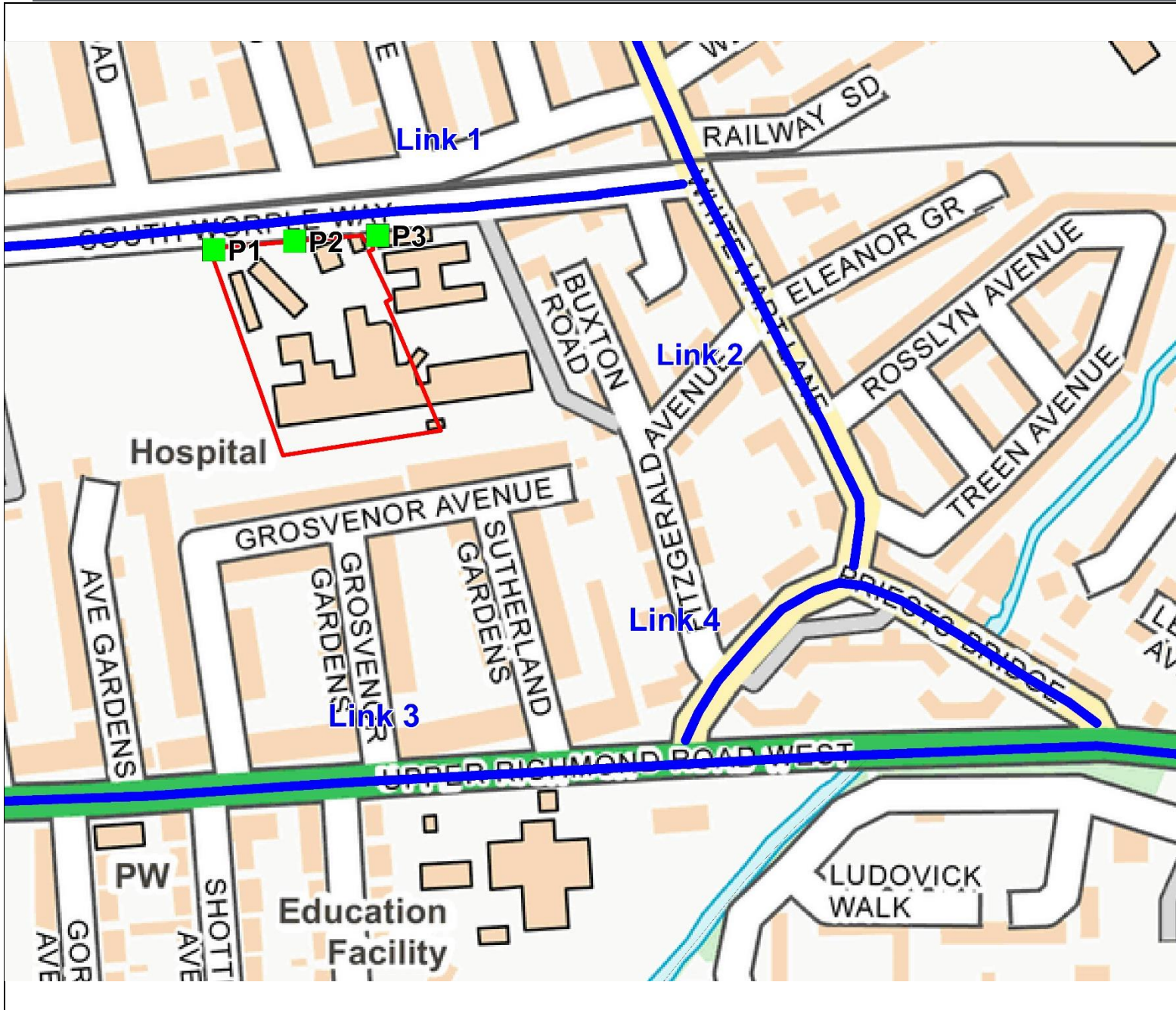
Zones, and the cumulative impacts from individual sites in local areas?" The proposed development will not.

- 8.8 The Barnes Hospital development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBRuT's Air Quality Action Plan. There are no constraints to the development in the context of air quality.

Glossary

AADT	Annual Average Daily Traffic Flow
ADMS	Atmospheric Dispersion Modelling System
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
Deposited Dust	Dust that has settled out onto a surface after having been suspended in air
DMP	Dust Management Plan
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air
Effect	The consequences of an impact, experienced by a receptor
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
Impact	The change in atmospheric pollutant concentration and/or dust deposition. A scheme can have an 'impact' on atmospheric pollutant concentration but no effect, for instance if there are no receptors to experience the impact
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
R&A	Review and Assessment
Receptor	A person, their land or property and ecologically sensitive sites that may be affected by air quality
Risk	The likelihood of an adverse event occurring
Trackout	The transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network

Figures



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Project: Barnes Hospital

Job Ref: JAR02439

File location:

Date: 15/11/21

Rev: 1

Drawn: ACD

Checked: KB

Figure 1: Modelled Road Links and Receptors

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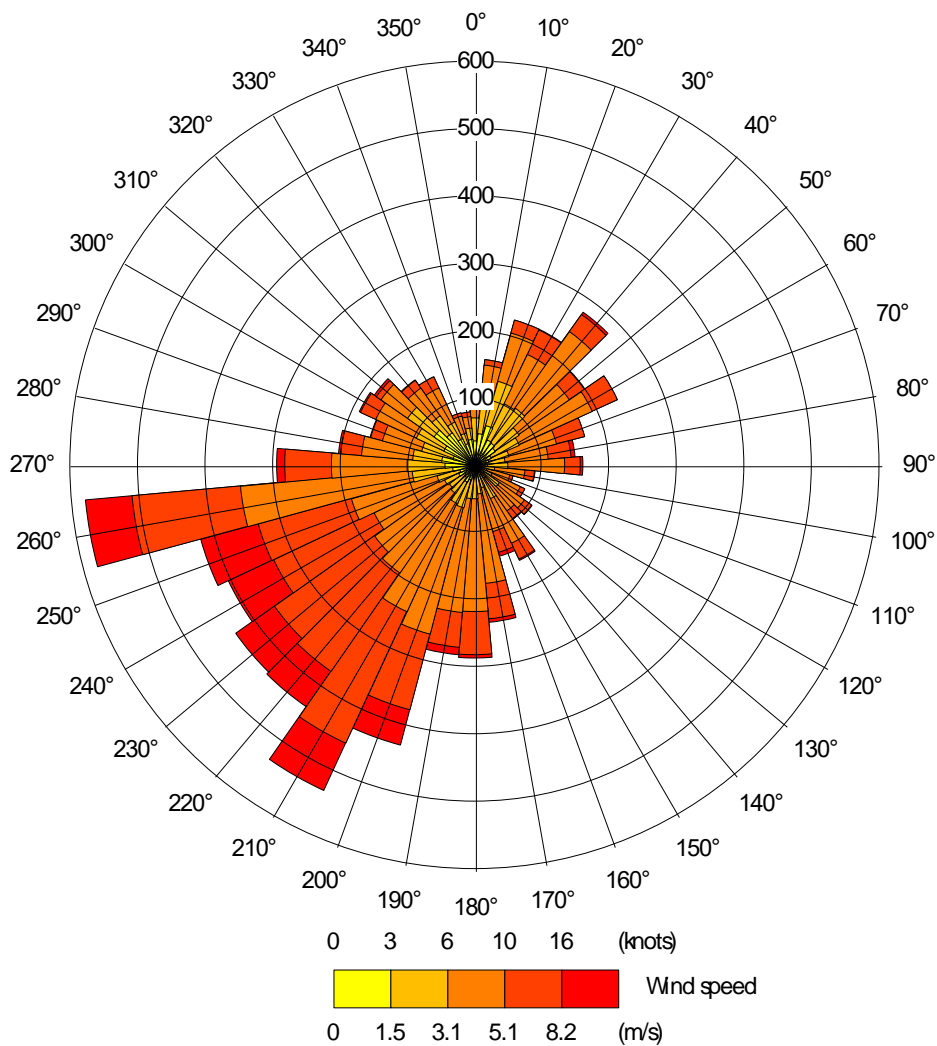

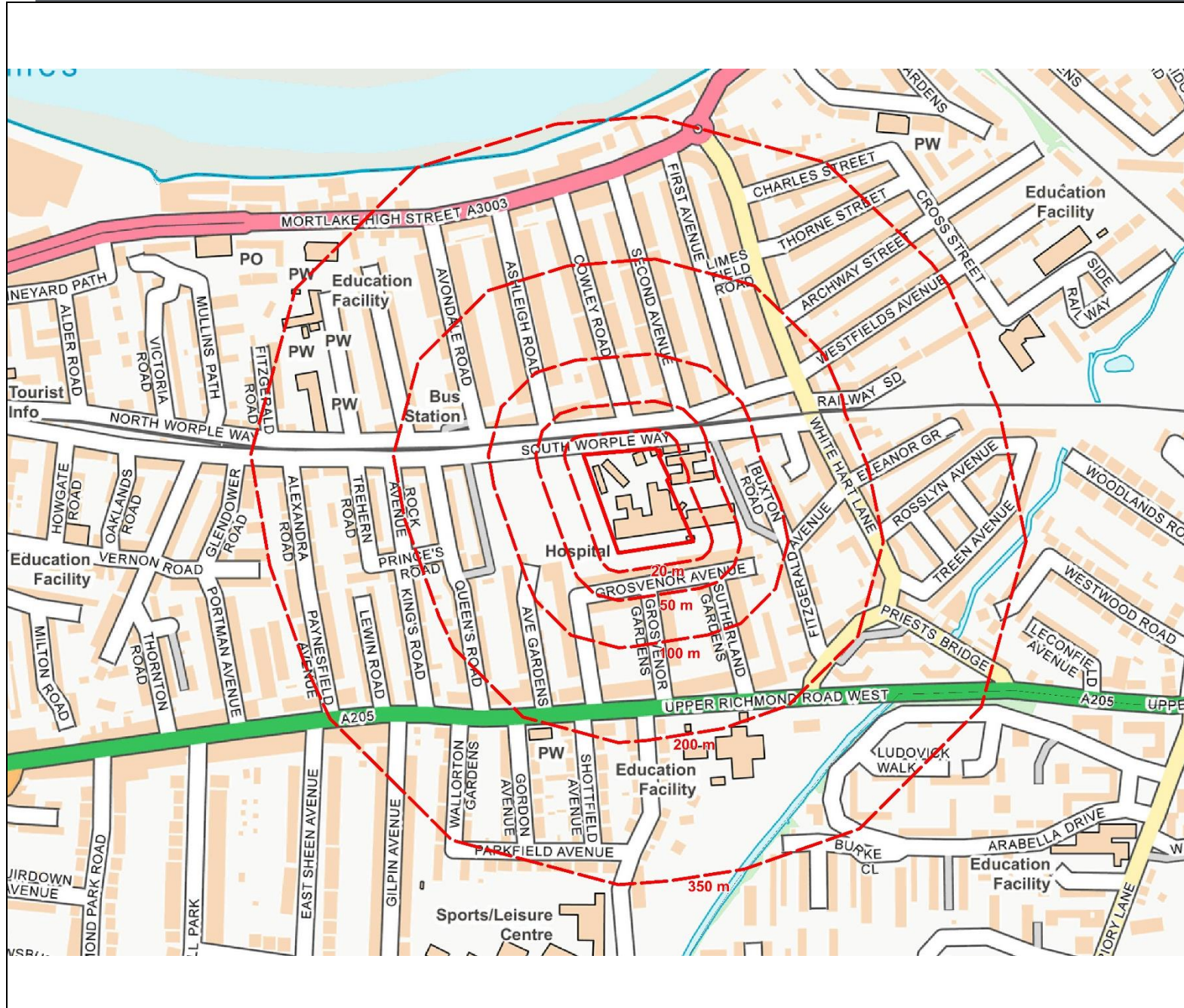


Figure 2: Wind Rose – Heathrow, 2020

Project Number	JAR02439	Project Title	Barnes Hospital		
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Figure 3: Construction Dust Buffers

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Appendices

Appendix A: Detailed Construction Dust Assessment

Methodology

Source

A.1 The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table A.1.

Table A.1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
<p>Demolition - building over 50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level.</p> <p>Earthworks – total site area over 10,000 m², potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved > 100,000 tonnes.</p> <p>Construction - total building volume over 100,000 m³, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years.</p> <p>Trackout – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.</p>	Large
<p>Demolition - building between 20,000 to 50,000 m³, potentially dusty construction material and demolition activities 10 - 20 m above ground level.</p> <p>Earthworks – total site area between 2,500 to 10,000 m², moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes.</p> <p>Construction - total building volume between 25,000 and 100,000 m³, use of construction materials with high potential for dust release (e.g. concrete), activities include piling, on-site concrete batching. Period of construction activities between one and two years.</p> <p>Trackout – 10 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.</p>	Medium
<p>Demolition - building less than 20,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months.</p> <p>Earthworks – total site area less than 2,500 m². Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 10,000 tonnes earthworks during winter months.</p> <p>Construction - total building volume below 25,000 m³, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year.</p>	Small

Features of the Source of Dust Emissions	Dust Emission Magnitude
Trackout – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	

Pathway and Receptor - Sensitivity of the Area

- A.2 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.
- A.3 As set out in the IAQM dust guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.
- A.4 Table A.2 and Table A.3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM₁₀ respectively. Table A.4 sets out the basis for determining the sensitivity of ecological receptors to dust.

Table A.2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
Principles:- <ul style="list-style-type: none"> • Users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- <ul style="list-style-type: none"> • Dwellings. • Museums and other culturally important collections. • Medium and long-term car parks and car showrooms. 	High
Principles:- <ul style="list-style-type: none"> • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. 	Medium

Receptor	Sensitivity
<p>Indicative Examples:-</p> <ul style="list-style-type: none"> • Parks. • Places of work. 	
<p>Principles:-</p> <ul style="list-style-type: none"> • the enjoyment of amenity would not reasonably be expected; or • there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. <p>Indicative Examples:-</p> <ul style="list-style-type: none"> • Playing fields, farmland (unless commercially-sensitive horticultural). • Footpaths and roads. • Short-term car parks. 	Low

Table A.3 Sensitivities of People and Property Receptors to PM₁₀

Receptor	Sensitivity
<p>Principles:-</p> <ul style="list-style-type: none"> • Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). <p>Indicative Examples:-</p> <ul style="list-style-type: none"> ▪ Residential properties. ▪ Schools, hospitals and residential care homes. 	High
<p>Principles:-</p> <ul style="list-style-type: none"> • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM₁₀, a relevant location would be one where individuals may be exposed for eight hours or more in a day). <p>Indicative Examples:-</p> <ul style="list-style-type: none"> ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM₁₀ as protection is covered by Health and Safety at Work legislation). 	Medium
<p>Principles:-</p> <ul style="list-style-type: none"> • Locations where human exposure is transient exposure. <p>Indicative Examples:-</p> <ul style="list-style-type: none"> • Public footpaths. • Playing fields, parks. • Shopping streets. 	Low

Table A.4 Sensitivities of Ecological Receptors to Dust

Receptor	Sensitivity
Principles:- <ul style="list-style-type: none"> • Locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. Indicative Examples:- <ul style="list-style-type: none"> • Special Area of Conservation (SAC) designated for acid heathlands adjacent to the demolition of a large site containing concrete (alkali) buildings or for the presence of lichen. 	High
Principles:- <ul style="list-style-type: none"> • Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. Indicative Examples:- <ul style="list-style-type: none"> • Site of Special Scientific Interest (SSSI) with dust sensitive features. 	Medium
Principles:- <ul style="list-style-type: none"> • Locations with a local designation where the features may be affected by dust deposition. Indicative Examples:- <ul style="list-style-type: none"> • A Local Nature Reserve with dust sensitive features 	Low

A.5 The IAQM methodology combines consideration of the pathway and receptor to derive the 'sensitivity of the area'. Table A.5, Table A.6 and Table A.7 show how the sensitivity of the area has been derived for this assessment.

Table A.5 Sensitivity of the Area to Dust Soiling Effects on People and Property

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

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

Receptor Sensitivity	Number of Receptors ^a	Distance from the Source (m) ^b			
		<20	<50	<100	<350
<p>a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.</p> <p>b For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.</p>					

Table A.6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^a	Number of Receptors ^{b, c}	Distance from the Source (m) ^d				
			<20	<50	<100	<200	<350
High	> 32 µg.m ⁻³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 µg.m ⁻³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28 µg.m ⁻³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	< 24 µg.m ⁻³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	> 32 µg.m ⁻³	>10	High	Medium	Low	Low	Low
		1 – 10	Medium	Low	Low	Low	Low
	28 – 32 µg.m ⁻³	> 10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
< 28 µg.m ⁻³	>1	Low	Low	Low	Low	Low	
Low	-	>1	Low	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^a	Number of Receptors ^{b, c}	Distance from the Source (m) ^d				
			<20	<50	<100	<200	<350

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances have been measured from the side of the roads used by construction traffic. Without site-specific mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and trackout impacts have only been considered up to 50 m from the edge of the road.

Table A.7 Sensitivity of the Area to Ecological Impacts

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

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout and for each designated site.

a Only the highest level of area sensitivity has been recorded.

- A.6 The IAQM dust guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:
- any history of dust generating activities in the area;
 - the likelihood of concurrent dust generating activity on nearby sites;
 - any pre-existing screening between the source and the receptors;
 - any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which the works will take place;
 - any conclusions drawn from local topography;
 - duration of the potential impact, as a receptor may become more sensitive over time; and
 - any known specific receptor sensitivities which are considered go beyond the classifications given in the table above.

A.7 The matrices in Table A.8, Table A.9, Table A.10 and Table A.11 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For those cases where the risk category is ‘negligible’, no mitigation measures are required beyond those mandated by legislation.

Table A.8 Risk of Dust 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	Medium Risk	Low Risk	Negligible

Table A.9 Risk of Dust Impacts – Earthworks

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 A.10 Risk of Dust Impacts – 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 A.11 Risk of Dust 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

Appendix B: Model Verification

- B.1 The approach to model verification that LLAQM.TG16 recommends for local authorities when they carry out their LAQM duties is summarised in Section 3. For the verification and adjustment of NO_x/NO₂ concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion-tube monitoring. The LBRuT monitors roadside NO₂ concentrations passively using diffusion tubes at five locations in the vicinity of the Application Site.
- B.2 The concentrations monitored over recent years (ignoring results in 2020 which are lower due to the pandemic) are provided in Table B.1.

Table B.1 Measured Annual-mean NO₂ Concentrations (µg.m⁻³)

Monitoring Site	Measured Annual-mean NO ₂ Concentrations (µg.m ⁻³)				
	2015	2016	2017	2018	2019
23	35	35	35	31	26
25	51	45	46	38	36
26	42	40	40	36	34
36	49	50	60	63	61
70	Not open	Not open	Not open	Not open	42

- B.3 The results in 2019 are generally indicative of the range of results in previous years so have been used for all monitoring sites except monitor 23. The NO₂ concentration measured in 2019 for monitor 23 is 26 µg.m⁻³ which is lower than the baseline concentration of 28 µg.m⁻³ adopted for this assessment. Results from 2018 have been used for monitor 23. Traffic data from the Department for Transport in 2019 have been used.
- B.4 The monitored annual-mean NO_x road contributions have been derived from the monitored annual-mean NO₂ concentrations using the LLAQM.TG16 calculator. The monitored annual-mean NO_x road contributions have then been compared with the modelled annual-mean NO_x road contributions. This comparison is provided in Table B.2 below.

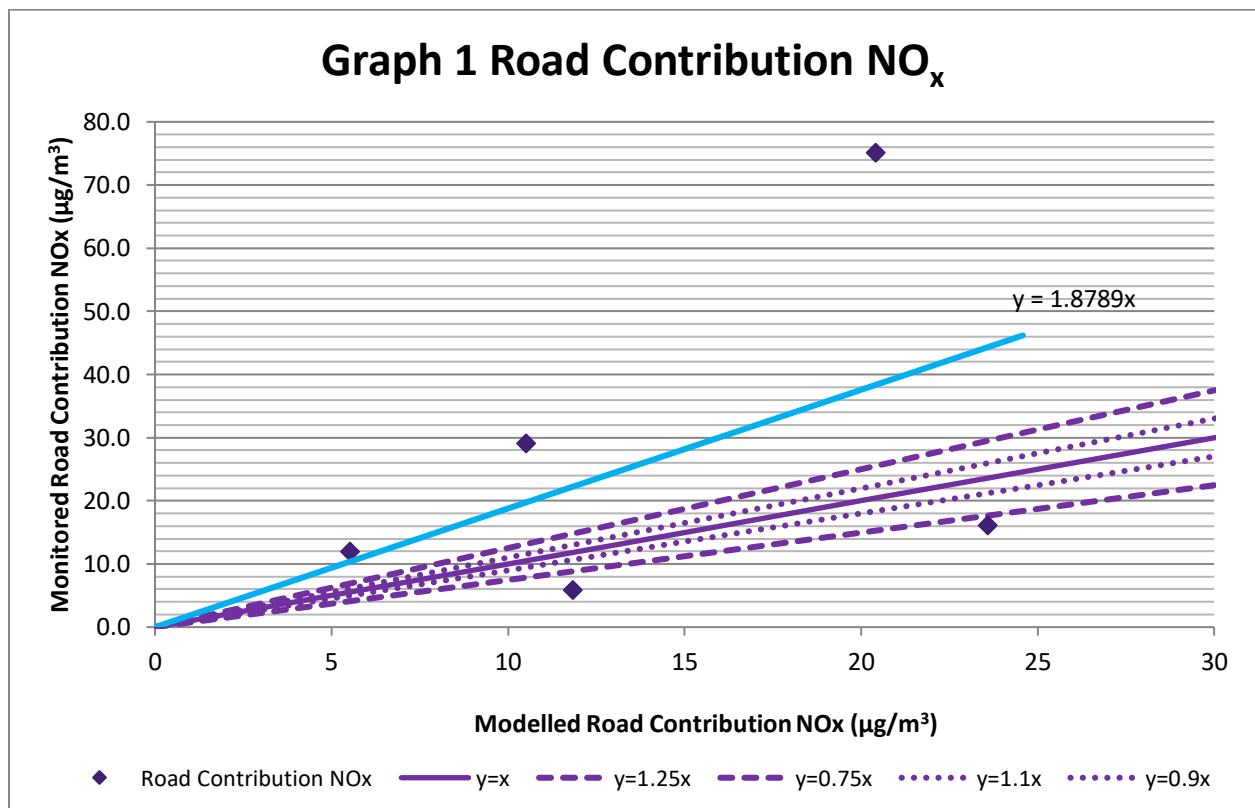
Table B.2 Comparison of Monitored and Modelled Annual-mean Road NO_x Contribution (µg.m⁻³)

Monitoring Site	Annual-mean Road NO _x Contribution (µg.m ⁻³)	
	Monitored	Modelled
23	5.9	11.8
25	16.2	23.6

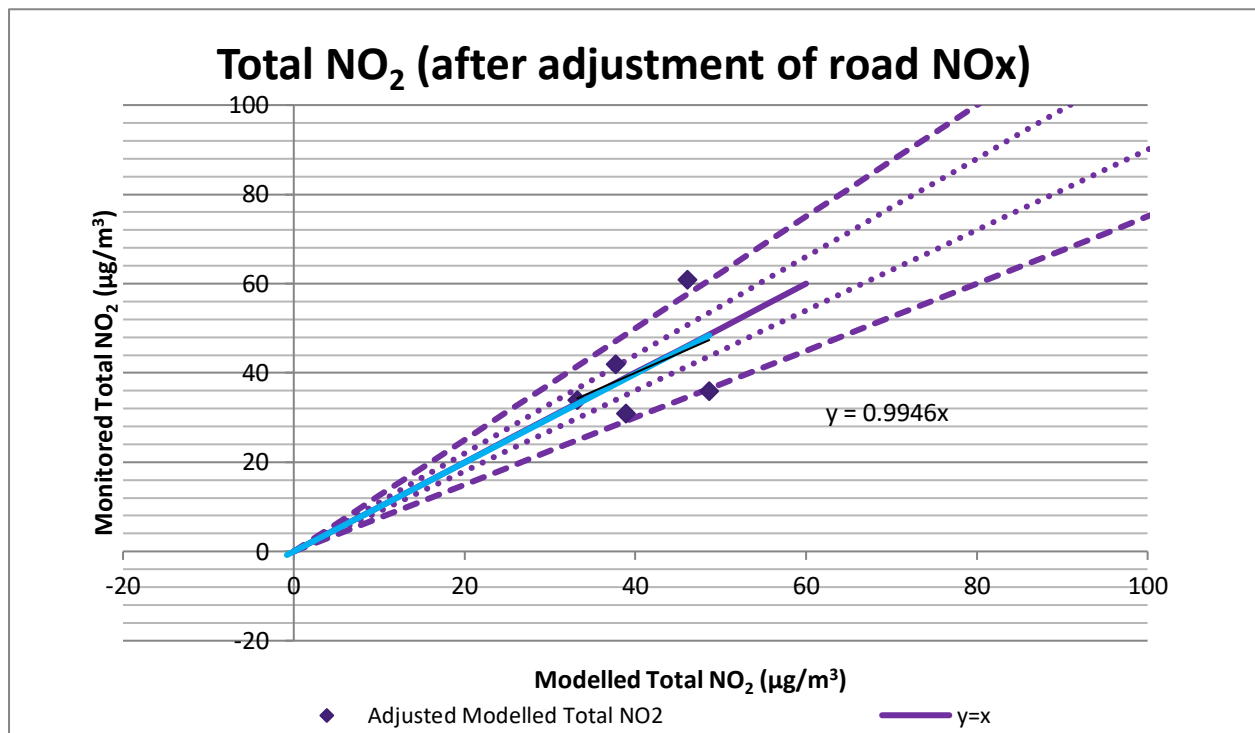
Monitoring Site	Annual-mean Road NO _x Contribution (µg.m ⁻³)	
	Monitored	Modelled
26	12.0	5.5
36	75.1	20.4
70	29.1	10.5

B.5 It should be borne in mind that the monitored concentrations are themselves only estimates to the true concentrations at each point; the EU Directive on air quality [15] designates passive NO₂ samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results, Table A1.2 above indicates that the model is under-predicting at three of the monitors (26, 36 and 70).

B.6 The modelled annual-mean NO_x road contributions have been plotted against the monitored annual-mean NO_x road contributions in Graph 1.



B.7 The modelled NO_x contributions have been multiplied by the gradient of the trend line (1.8789) to determine the corrected NO_x contributions. Modelled annual-mean NO₂ concentrations have been derived from the corrected modelled annual-mean NO_x road contributions. The corrected modelled annual-mean NO₂ concentrations have been plotted against the monitored annual-mean NO₂ concentrations in Graph 2.



- B.8 The corrected modelled annual-mean NO₂ concentrations are all within 25% of the monitored annual-mean NO₂ concentrations except for monitor 70. Monitor 70 is located at the crossroads of the A205 and the B351; however, the Department for Transport do not have data for the B351 so only the A205 was modelled. The modelled concentration is therefore below the monitored concentrations as would be expected.
- B.9 At monitor 26, the nearest monitor to the Application Site, the modelled NO₂ concentration is 33.2 µg.m⁻³ which is within 3% of the monitored concentration of 34 µg.m⁻³ which indicates that there is close agreement between the corrected modelled concentrations and measured concentrations in locations where it matters most. The correction factor improves the modelled concentrations and has been applied to all predictions used within the assessment.
- B.10 The fractional bias can also be used to determine whether the corrected model has a tendency to over or under-predict. The fractional bias is calculated as:
- $$\frac{(\text{Average Monitored NO}_x \text{ Concentration} - \text{Average Predicted NO}_x \text{ Concentration})}{0.5 \times (\text{Average Monitored NO}_x + \text{Average Predicted NO}_x \text{ Concentration})}$$
- B.11 Fractional bias values vary between +2 and -2 and has an ideal value of zero. A negative value suggests a model over-prediction and a positive value suggests a model under-prediction.
- B.12 Table B.3 sets out the average monitored concentration and the average predicted concentration.

Table B.3 Comparison of Monitored and Adjusted Modelled Annual-mean Road NO_x Contribution (µg.m⁻³)

Monitoring Site	Annual-mean Road NO _x Contribution (µg.m ⁻³)	
	Monitored	Corrected Modelled
23	5.9	22.2
25	16.2	44.3
26	12.0	10.4
36	75.1	38.3
70	29.1	19.7
Average	27.6	27.0

B.13 The fractional bias for this study is therefore $(27.6 - 27.0) / (0.5 \times (27.6 + 27.0)) = 0.022$. As the fractional bias is close to zero the adjusted model is performing well.

References

- 1 Defra, 2010, The Air Quality Standards Regulations.
- 2 Defra, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Volume 2.
- 3 Communities and Local Government, July 2021, National Planning Policy Framework
- 4 GLA, March 2021, The London Plan – The Spatial Development Strategy for Greater London.
- 5 GLA, May 2018, London Environment Strategy.
- 6 GLA, April 2014, Supplementary Planning Guidance: Sustainable Design and Construction
- 7 EPUK & IAQM (January 2017) Land-Use Planning & Development Control: Planning For Air Quality
- 8 Mayor of London (July 2014) The Control of Dust and Emissions During Construction and Demolition
- 9 IAQM (2014) Guidance on the assessment of dust from demolition and construction
- 10 Mayor of London (2016) London Local Air Quality Management Technical Guidance, 2016 (LLAQM.TG16)
- 11 British Standard Institute (1983) BS 6069:Part 2:1983, ISO 4225-1980 Characterization of air quality. Glossary
- 12 <http://laqm.defra.gov.uk/review-and-assessment/tools/tools.html>
- 13 London Councils' Air Quality and Planning Guidance, Revised Version January 2007
- 14 Drawn from Defra Maps at <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>
- 15 Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe



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