Air Quality Assessment

Sandycombe Road (Scheme P03)

Sandycombe Road, North Sheen, Richmond

For Goldcrest Land Plc.






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Quality Management

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Executive Summary

The Sandycombe Road development is located within the administrative area of the London Borough of Richmond upon Thames (LBR). The entire borough is designated as an Air Quality Management Area (AQMA) due to elevated concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}) attributable to road traffic emissions.

This Air Quality Assessment considers the air quality impacts of proposed development scheme P03 in terms of the construction phase and the operational phase. Scheme P03 comprises a maximum five storey development with 20 flats.

The assessment has been undertaken based upon appropriate information on proposed development scheme P03 provided by Goldcrest Land Plc. 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 proposed development scheme P03 may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are an important consideration during this phase of the development. Another important consideration is the emissions from the proposed gas-fired Combined Heat and Power (CHP) plant.

Detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2019. Pollutant concentrations are predicted to be well within the relevant health-based air quality objectives at the façades of both existing and proposed receptors. Therefore, air quality is acceptable at the development site, making it suitable for its proposed uses. The operational impact of proposed development scheme P03 on existing receptors is predicted to be “negligible” taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be ‘not significant’ overall.

The Sandycombe Road P03 development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBR’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 Sandycombe Road P03 development scheme in the London Borough of Richmond upon Thames (LBR). The development comprises offices on the ground floor and twenty flats over a further four storeys. The report complements RPS' earlier air quality neutral impact calculation report *'Air Quality Neutral Calculation:* Sandycombe Road (Scheme P03)*'* 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 and EU Limit Values. The local authority, LBR council, has designated the entire borough as an Air Quality Management Area (AQMA) due to elevated concentrations of nitrogen dioxide (NO_2) and particulate matter (PM_{10}) attributable to road traffic emissions. The application site is therefore located within an AQMA.

1.2 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 and building emissions on the local area including any effects on the AQMA
  - 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.

1.3 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

The Ambient Air Quality Directive and Air Quality Standards Regulations

2.1 The 2008 Ambient Air Quality Directive (2008/50/EC) [1] aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; it sets legally binding concentration-based limit values, as well as target values. There are also information and alert thresholds for reporting purposes. These are to be achieved for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene. This Directive replaced most of the previous EU air quality legislation and in England was transposed into domestic law by the Air Quality Standards England Regulations 2010 [2], which in addition incorporates the 4th Air Quality Daughter Directive (2004/107/EC) that sets targets for ambient air concentrations of certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). Member states must comply with the limit values (which are legally binding on the Secretary of State) and 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 [3]. 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 EU Directives.

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

♦ 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.

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 EU limit values.

2.4 For the purposes of this assessment, the limit values set out in the Air Quality Standards Regulations 2010 and the objective levels specified under the current UK AQS have been used.

2.5 The limit values and objectives relevant to this assessment are summarised in Table 2.1.

Table 2.1 Summary of Relevant Air Quality Limit Values and Objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than	Target Date
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	Target of 15% reduction in concentrations at urban background locations	-	Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background locations (c)		Between 2010 and 2020 (b)
	Annual	25 µg.m^{-3}	-	01.01.2020 (a)
		25 µg.m^{-3}		01.01.2015 (b)

(a) Target date set in UK Air Quality Strategy 2007
(b) Target date set in Air Quality Standards Regulations 2010
(c) Aim to not exceed 18 µg.m^{-3} by 2020

National Planning Policy

National Planning Policy Framework

2.6 The National Planning Policy Framework (NPPF) [4] 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. 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.

2.7 The NPPF sets out 12 core land-use planning principles. The relevant core-principle in the context of this air quality assessment is that planning should "*contribute to conserving and enhancing the natural environment and reducing pollution*". (Paragraph 17)

2.8 Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states:

"The planning system should contribute to and enhance the natural and local environment by:

- *…*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability… (Paragraph 109)*

National Planning Practice Guidance

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

2.10 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 generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

2.11 The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *"Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed 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; adds to turnover in a large car park; or result in 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; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*

- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

2.12 The NPPG provides advice on how air quality impacts can be mitigated and notes "Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. 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 [5]. The current version of the London Plan was published in March 2015 and incorporates Further Alterations to the London Plan published in July 2011. 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 7.14: Improving Air Quality:

"Strategic

A. The Mayor recognises the importance of tackling air pollution and improving air quality to London's development and the health and well-being of its people. He will work with strategic partners to ensure that the spatial, climate change, transport and design policies of this plan support implementation of his Air Quality and Transport strategies to achieve reductions in pollutant emissions and minimise public exposure to pollution.

Planning decisions

B Development proposals should:

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

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

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

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

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

2.15 The Mayor's Air Quality Strategy (MAQS) [6], referred to in Policy 7.14, sets out policies and proposals seeking to improve London's air quality to the point where air pollution no longer poses a significant risk to human health.

2.16 In April 2014, the Greater London Authority (GLA) published Supplementary Planning Guidance (SPG) Sustainable Design and Construction [7]. 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 the Mayor of London's *'Air Quality Neutral'* Policy 7.14. The Air Quality Neutral calculations have been undertaken for proposed development scheme P03 and are provided in a separate report.

Local Planning Policy

2.17 The London Borough of Richmond Core Strategy was adopted in April 2009, setting out policies for the next fifteen years.

2.18 Policy CP1 Sustainable Development in the Core Strategy is relevant to this assessment and states:

"1.A The policy seeks to maximise the effective use of resources including land, water and energy, and assist in reducing any long term adverse environmental impacts of development. Development will be required to conform to the Sustainable Construction checklist, including the requirement to meet the Code for Sustainable Homes level 3 (for new homes), Ecohomes "excellent" (for conversions) or BREEAM "excellent" (for other types of development). This requirement will be adjusted in future years through subsequent DPDs, to take into account the

then prevailing standards in the Code for Sustainable Homes and any other National Guidance, and ensure that these standards are met or exceeded.

The following principles will be promoted:-

…1.E Environmental gain to compensate for any environmental cost of development will be sought."

2.19 LBR's Core Strategy is currently under review, with adoption of the Local Plan targeted for spring 2018.

2.20 Policy LP10 Air Quality in the pre-publication Local Plan would be relevant to this assessment and states:

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

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

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

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

4. 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 Policy LP 44 Facilitating Sustainable Travel Choices would also be relevant. It states:

"The Council will work in partnership to promote safe, sustainable and accessible transport solutions, which minimise the impacts of development including in relation to congestion and air pollution, and maximise opportunities including for health benefits and providing access to services, facilities and employment. The Council will:

A. Location of development

Encourage high trip generating development to be located in areas with good public transport with sufficient capacity, or which are capable of supporting improvements to provide good public transport accessibility and capacity.

B. Walking and cycling

Ensure that, where appropriate, new development is designed to maximise permeability within and to the immediate vicinity of the development site through the provision of safe and convenient walking and cycling routes, and to provide opportunities for walking and cycling, including through the provision of links and enhancements to existing networks.

C. Public transport

Ensure that major new developments maximise opportunities to provide safe and convenient access to public transport services. Proposals will be expected to support improvements to existing services and infrastructure where no capacity currently exists or is planned to be provided.

Protect existing public transport interchange facilities unless suitable alternative facilities can be provided which ensure the maintenance of the existing public transport operations. Applications will need to include details setting out how such re-provision will be secured and provided in a timely manner.

D. The road network

Ensure that new development does not have a severe impact on the operation, safety or accessibility to the local or strategic highway networks. Any impacts on the local or strategic highway networks, arising from the development itself or the cumulative effects of development, including in relation to on-street parking, should be mitigated through the provision of, or contributions towards, necessary and relevant transport improvements.

In assessing planning applications the cumulative impacts of development on the transport network will be taken into account. Planning applications will need to be supported by the provision of a Transport Assessment if it is a major development and a Transport Statement if it is a minor development."

3 Assessment Methodology

Approach

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 should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific. The scope and content of supporting information is therefore 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 [8], the Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [9], the IAQM Guidance on the assessment of dust from demolition and construction [10] and, where relevant, the Mayor of London's Local Air Quality Management Technical Guidance: LLAQM.TG16 [11]. 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, publically 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 and building emissions on the local area including any effects on the AQMA
    - 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 LBR was consulted to agree the scope and methodology for this assessment. Further details are provided in Annex C.

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 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 25 years' experience.

Summary of Key Pollutants Considered

3.5 For the operational phase of proposed development scheme P03, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM_{10}). Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. The assessment of operational impacts therefore focuses on changes in NO_2 and PM_{10} concentrations. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of PM_{10}) concentrations has also been considered.

3.6 For the construction phase of proposed development scheme P03 the key pollutant is dust, covering both the PM_{10} 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 [10] except for large, long-term construction sites: the EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [8] 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 Transport Assessment indicate 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.

3.8 Regarding operational building emissions, the applicant has confirmed that the heat and power demands for the proposed development are likely to be met by a gas-fired Combined Heat and Power (CHP) plant with a scrubber system. The applicant acknowledges the potential NO_x emissions associated with CHPs. However, at this stage, a decision on the thermal capacity of the CHP has not been made. Therefore, the applicant requests to be bound by the requirements of the GLA's SPG which state:

"4.3.25 It is acknowledged that developers may not procure plant until planning permission has been obtained. Developers will therefore be required to provide a written statement of their commitment and ability to meet the emission standards within their Air Quality Assessments. When securing these emissions standards, it is best to agree maximum emissions as opposed to

the technology. Technology may improve between the time planning permission is granted and the equipment is procured."

Construction Phase - Methodology

3.9 Dust is the generic term used to describe particulate matter in the size range 1-75 µm in diameter [12]. 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.

3.10 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} 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.

3.11 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 PM_{10} effects on human receptors. These distances are set to be deliberately conservative.

3.12 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.

3.13 Concentration-based limit values and objectives have been set for the PM_{10} 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.

3.14 The Mayor of London's Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance [9] (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.

3.15 The IAQM dust guidance aims to estimate the impacts of both PM_{10} 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."*

3.16 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."*

3.17 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.

3.18 The detail of the dust assessment methodology is provided in Appendix A.

3.19 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 IAQM dust guidance. The guidance states that provided the mitigation measures are successfully implemented, the resultant effects of the dust exposure will normally be *"not significant"*.

3.20 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"*,

3.21 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

3.22 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.

3.23 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.

3.24 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 and from building emissions. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the United Kingdom (UK) by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

3.25 The following scenarios were modelled:

- Without Development – without proposed development scheme P03 in the first year that the development is expected to be fully operational year, 2019; and
- With Development – with proposed development scheme P03 in the first year that the development is expected to be fully operational year, 2019.

Model Input Data

Traffic Flow Data

3.26 The project's transport consultants, Cottee Transport Planning, have provided data for local roads only. For the A316, traffic count data were obtained from the Department for Transport (DfT) website and a growth factor of 1.073 was derived from the DfT's TEMPro (Trip End Model Presentation Program) for the opening year, 2019. Traffic generated by the development (i.e. 22 LDVs) was added to this 'without development' scenario to obtain data for the 'with development' scenario.

3.27 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		With Development	
			LDV	HDV	LDV	HDV
1	Sandycombe Road (Cotttee Transport Planning)	24	6571	592	6593	592
2	A316 – B353 to A205 (DfT)	48	33899	2447	33921	2447

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

3.28 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

3.29 The modelling has been undertaken using Defra's 2016 emission factor toolkit (version 7.0) which draws on emissions generated by the European Environment Agency (EEA) COPERT 4 (v11) emission calculation tool.

Meteorological Data

3.30 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 London Heathrow approximately 11 km west of the Application Site. Meteorological data from that station for 2015 have been used within the dispersion model. The wind rose is presented in Figure 3.

Receptors

3.31 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 [11] provides examples of exposure locations and these are summarised in Table 3.2.

Table 3.2 Example 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

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
		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 expect 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

3.32 Sensitive receptors for this assessment have been selected at properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest as listed in Table 3.3. The modelled existing receptors and proposed receptors are illustrated in Figure 1 and Figure 2 respectively.

Table 3.3 Modelled Sensitive Receptors

ID	Description	x	y	z
1	Raleigh Road 1	518981	175762	1.5
2	Raleigh Road 2	518985	175785	1.5
3	Gainsborough Road 1	518991	175809	1.5
4	Sandycombe Road 1	519014	175835	1.5
5	Sandycombe Road 2	518996	175864	1.5
6	Sandycombe Road 3	519027	175975	1.5
7	Sandycombe Road 4	519032	176081	1.5
8	Premier Inn	518824	175591	1.5
9	St George's Road 1	518846	175601	1.5
10	St George's Road 2	518959	175643	1.5
11	North Road 2	519063	175788	1.5
12	North Road 2	519084	175870	1.5
13	Darrell Road 1	519186	175718	1.5
14	Chilton Road 1	519099	175918	1.5
15	Chilton Road 2	519178	175899	1.5
16	Darrell School	519237	175808	1.5
17	Raleigh Road 3	518893	175734	1.5
18	Windham Road 1	518914	175811	1.5
19	Gainsborough Road 2	518939	175885	1.5
20	Proposed North West: Ground Floor*	519011	175798	1.5

ID	Description	x	y	z
21	Proposed North West: 1st Floor	519011	175798	4.5
22	Proposed North West: 2nd Floor			7.5
23	Proposed North West: 3rd Floor			10.5
24	Proposed South West: Ground Floor*	519004	175751	1.5
25	Proposed South West: 1st Floor			4.5
26	Proposed South West: 2nd Floor			7.5
27	Proposed South West: 3rd Floor			10.5
28	Proposed North East: Ground Floor*	519033	175794	1.5
29	Proposed North East: 1st Floor			4.5
30	Proposed North East: 2nd Floor			7.5
31	Proposed North East: 3rd Floor			10.5
32	Proposed South East Ground Floor*	519018	175748	1.5
33	Proposed South East: 1st Floor			4.5
34	Proposed South East: 2nd Floor			7.5
35	Proposed South East: 3rd Floor			10.5
36	Proposed South West: 4th Floor	519004	175751	13.5
37	Proposed South East: 4th Floor	519018	175748	13.5

Note: Receptors have been modelled at 1.5 m above each proposed floor level, representative of typical head height.
* At ground floor level, B1 business use is proposed.

3.33 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties, schools and hotels. The hourly-mean AQS objective only applies at the proposed B1 offices to be situated on the ground floor. The approaches used to predict the concentrations for daily and hourly averaging periods are described below.

Long-Term Pollutant Predictions

3.34 Annual-mean NO_x and PM_{10} concentrations have been predicted at selected sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_X emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO_2 concentrations have been derived from the modelled road-related annual-mean NO_x concentration using the Defra's calculator [13].

Short-Term Pollutant Predictions

3.35 In order to predict the likelihood of exceedences of the hourly-mean AQS objectives for NO_2 and the daily-mean AQS objective for PM_{10}, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

Hourly-Mean AQS Objective for NO_2

3.36 Research undertaken in support of LLAQM.TG16 has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60 µg.m^{-3}. In May 2008, a re-analysis of the relationship between annual and hourly-mean NO_2 concentrations was undertaken using data collated between 2003 and 2007 [14]. The conclusions and recommendations of that report are:

"Analysis shows that statistically, on the basis of the dataset available here, the chance of measuring an hourly nitrogen dioxide objective exceedence whilst reporting an annual-mean NO_2 of less than 60 µg.m^{-3} is very low….

It is therefore recommended that local authorities continue to use the threshold of 60 µg.m^{-3} NO_2 as the guideline for considering a likely exceedence of the hourly-mean nitrogen dioxide objective."

Daily-Mean AQS Objective for PM_{10}

3.37 The number of exceedences of the daily-mean AQS objective for PM_{10} of 50 µg.m^{-3} may be estimated using the relationship set out in LLAQM.TG16:

*Number of Exceedences of Daily Mean of 50 µg.m^{-3} = -18.5 + 0.00145 * (Predicted Annual-mean PM_{10})^3 + 206 / (Predicted Annual-mean PM_{10} Concentration)*

3.38 This relationship suggests that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 µg.m^{-3} or less..

3.39 The daily mean objective is not considered further within this assessment if the annual-mean PM_{10} concentration is predicted to be less than 31.5 µg.m^{-3}.

Fugitive PM_{10} Emissions

3.40 Transport PM_{10} 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 PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current 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); however, no allowance is made for re-suspended road dust as this remains unquantified.

Significance Criteria for Development Impacts on the Local Area

3.41 The EPUK/IAQM Land-Use Planning & Development Control: Planning For Air Quality document [8] advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

3.42 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 3.4 provides the EPUK/IAQM approach for describing the human-health air quality impacts at sensitive receptors.

Table 3.4 Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.
3. The table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

3.43 The human-health impact descriptors above apply at individual receptors. The EPUK/IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."*

3.44 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Significance Criteria for New Population Exposure (Site Suitability)

3.45 The London Councils' Air Quality and Planning Guidance (15) 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 3.5 provides a summary of the criteria.

Table 3.5 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.

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

3.47 The EPUK/IAQM guidance considers an exceedance of an air quality objective AQAL to be a significant adverse effect unless provision is made to reduce the resident's or occupant's exposure by some means.

Uncertainty

3.48 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).

3.49 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.

3.50 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 range informed by an analysis of relevant, available data.

3.51 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.

3.52 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.

3.53 For the verification and adjustment of NOx/NO_2 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.

3.54 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 proposed development scheme P03 and is included at Appendix A.

3.55 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 3.6.

Table 3.6 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 estimates.	The background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model is towards the top of the uncertainty range, rather than a central estimate.
	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. Additionally, no reduction has been applied to background concentrations with height. This is also a conservative assumption, since background concentrations are likely to reduce with height.	
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. The modelled fraction is likely to be between a central estimate and the top of the uncertainty range.
	Traffic speed estimates	Measured average traffic speeds have been used within the model for Sandycombe Road. Speed limit data has been used for the A316. The average speed has been	

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		reduced in congested areas to take account of slow-moving and queuing traffic.	
	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 highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly.	

3.56 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 [16], 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 LBR Council has designated the entire borough an AQMA, due to elevated concentrations of NO_2 and PM_{10} attributable to road traffic emissions.

4.5 LBR Council published its Air Quality Action Plan in 2002, which sets out the actions the council intends to implement to improve air quality in the AQMAs. The most recent update and screening assessment to the action plan was published in 2015. The Action Plan set out to adhere to the Low Emission Zone (LEZ) set up throughout London by only allowing access to vehicles with satisfactory emissions standards. The implementation and promotion of cycling, walking and bus schemes have also been used to reduce emissions throughout the borough.

4.6 LLAQM.TG16 includes Air Quality Focus Areas (AQFAs) which are pollution hotspots where there is the potential for high human exposure and where the GLA believes air quality issues are the most acute. The proposed development site and study area lies within 1 km of two AQFAs. The closest AQFA lies southwest of the Application Site covering Richmond Circus and Richmond Bridge with Sheen Road (A305). The second closest AQFA lies to the east/ southeast of the Application Site and covers Richmond Chalker's Corner, Clifford Avenue, the A205, Upper Richmond and Millstone Green.

Local Urban Background Monitoring

4.7 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.

4.8 LBR Council manually monitors NO_2 concentrations at a number of urban background locations using passive diffusion tubes and the most recently measured annual-mean concentrations are presented in Table 4.1.

Table 4.1 Passively Monitored Urban Background Annual-Mean NO_2 Concentrations

Monitor Code	Monitor Name	Approximate Distance from the Application Site (km)	x	y	Concentration (µg.m^{-3})				
					2010	2011	2012	2013	2014
28	Holly Lodge, Richmond Park	1.8	519467	173993	24	20	22	21	18
37[b]	Wetlands Centre, Barnes	4.1	522989	176727	28	26	25	25	22
RUT 03	Alexandra Hall, Cromwell Place, Mortlake	1.3	520348	175849	32	26	-	-	-
RUT 04	Elmfield House, Waldegrave Road, Teddington	5.6	515916	171118	29	29	-	-	-

All concentrations have been adjusted for bias

4.9 There is limited urban background PM_{10} monitoring in the vicinity of the Application Site. The Air Quality Expert Group (AQEG) study of Particulate Matter in the UK [17] provides a comparison of NO_2 and PM_{10} monitoring undertaken in the UK at roadside, urban background and rural locations. A much larger variation in monitored NO_2 concentrations is reported compared to PM_{10} concentrations. The lower variation in monitored PM_{10} concentrations reflects the more even distribution of particulate matter across the UK due to the wide range of sources and the contribution of secondary particulate matter. On this basis, the results of continuous automatic PM_{10} suburban monitoring at the Wetlands Centre in Barnes have been used to inform background concentrations.

4.10 The most recent monitored annual-mean PM_{10} concentrations are presented in Table 4.2.

Table 4.2 Monitored Annual-Mean PM_{10} Concentrations

Monitor Code	Monitor Name	x	y	Concentration (µg.m^{-3})				
				2010	2011	2012	2013	2014
R2	Wetlands Centre, Barnes	522991	176495	19	22	18	20	18

Defra Mapped Concentration Estimates

4.11 Defra's total annual-mean NO_2 concentration estimates have been collected for the 1 km grid squares of the monitoring sites and the proposed development site and are summarised in Table 4.3.

Table 4.3 Defra Mapped Annual-Mean Background NO_2 Concentration Estimates

Monitor Code	Monitor Name	Distance to Site (km)	Concentration (µg.m^{-3})	
			Range of Monitored	Estimated Defra Mapped
28	Holly Lodge, Richmond Park	1.8	18 – 24	21.8
37	Wetlands Centre, Barnes	4.1	22 – 28	29.0
RUT 03	Alexandra Hall, Cromwell Place, Mortlake	1.3	26 - 32	29.2
RUT 04	Elmfield House, Waldegrave Road, Teddington	5.6	29.0	26.6
-	Application Site	-	-	29.4

4.12 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 site and are summarised in Table 4.4.

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

Monitor Code	Monitor Name	Distance to Site (km)	Concentration (µg.m^{-3})	
			Range of Monitored	Estimated Defra Mapped
37	Wetlands Centre, Barnes	4.1	18 - 22	18.8
-	Application Site	-	-	19.5

Appropriate Background Concentrations for the Development Site

4.13 For NO_2, the Defra mapped background concentration estimate is typically within or greater than the range of the results from monitoring. The Alexandra Hall (RUT 03) monitor is the closest monitoring location to the Application Site. Passively monitored annual-mean NO_2 concentrations at the RUT 03 monitor range from 26 to 32 µg.m^{-3}. The Defra mapped concentration at the

monitoring site is 29.2 µg.m^{-3} and is well within the monitored range. To ensure the assessment is conservative, the background annual-mean NO_2 concentration has been derived from the Defra mapped background concentration estimate of 29.4 µg.m^{-3} at the Application Site.

4.14 For PM_{10}, the Defra mapped background concentration estimate is also within 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.

4.15 In the absence of $PM_{2.5}$ monitoring at this site, the background annual-mean concentration at the Application Site has been derived from the Defra mapped background concentration estimate.

4.16 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. However, the results of recent monitoring across the UK suggest that background annual-mean NO_2 concentrations have not decreased in line with expectations. Inspection of the results of local monitoring presented here indicates that there is some trend over time for NO_2 in the vicinity of the Application Site.

4.17 To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years. In addition, no reduction with height has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce with height.

4.18 Table 4.5 summarises the annual-mean background concentrations for NO_2, PM_{10} 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	Defra Maps (2013)	29.4
PM_{10}		19.5
$PM_{2.5}$		14.1

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 has been estimated to be between 20,000 and 50,000 m^3. Using the IAQM dust guidance, under these specifications the dust emission magnitude for the demolition phase is classified as medium.

5.5 The site area is estimated to be less than 2,500 m^2. The dust emission magnitude for the earthworks phase is classified as small.

5.6 The total volume of the buildings to be constructed would be less than 25,000 m^3. Under the IAQM dust guidance, the dust emission magnitude for the construction phase is classified as small.

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
Medium	Small	Small	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 4. 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	Medium	Approximately 40 residential properties along Raleigh Road and Gainsborough Road to the west of the site, on Sandycombe Road to the north of the site, and along North Road to the east of the site. 1 – 10 high sensitivity receptors located within 20 m of the site boundary (Table A.4) 10 – 100 high sensitivity receptors located within 50 m of the site boundary
Human Health	Low	Approximately 40 residential properties along Raleigh Road and Gainsborough Road to the west of the site, on Sandycombe Road to the north of the site, and along North Road to the east of the site. Background PM_{10} concentrations for the assessment = 19.5 $\mu g.m^{-3}$ 1 – 10 high sensitivity receptors located within 20 m of the site boundary and PM_{10} concentrations below 24 $\mu g.m^{-3}$ (Table A.5)

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 routes within 50 m of the site are Lower Richmond Road, Sandycombe Road and North Road. The sensitivity of the area has been classified and the results are provided in Table 5.3 below.

Table 5.3 Sensitivity of the Surrounding Area for Trackout

Potential Impact	Sensitivity of the Surrounding Area	Reason for Sensitivity Classification
Dust Soiling	High	Between 10 and 100 residential properties aligning Sandycombe Road; the key route used by traffic. 10 – 100 high sensitivity receptors located within 20 m of the roads (Table A.4)
Human Health	Low	Between 10 and 100 residential properties aligning Sandycombe Road; the key route used by traffic. Background PM_{10} concentrations for the assessment = 19.5 $\mu g.m^{-3}$ 10 – 100 high sensitivity receptors located within 20 m of the roads and PM_{10} concentrations below 24 $\mu g.m^{-3}$ (Table A.5)

Overall Dust Risk

5.10 The Dust Emission Magnitude has been considered in the context of the Sensitivity of the Area (Tables A.4 and A.5) 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	Medium
Human Health	Low	Negligible	Negligible	Negligible
Ecology	-	-	-	-
Risk	Medium	Medium	Medium	Medium

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 This section of the report summarises the future operational-phase air quality impacts of the key pollutants associated with the development traffic and building emissions of the proposed scheme.

Nitrogen Dioxide (NO_2)

6.2 Table 6.1 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

Table 6.1 Predicted Annual-Mean NO_2 Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	36.8	36.8	0	Negligible
2	35.9	35.9	0	Negligible
3	36.4	36.4	0	Negligible
4	39.1	39.1	0	Negligible
5	35.7	35.7	0	Negligible
6	38.3	38.3	0	Negligible
7	34.7	34.7	0	Negligible
8	50.9	50.9	0	Negligible
9	49.6	49.6	0	Negligible
10	42.7	42.7	0	Negligible
11	34.4	34.4	0	Negligible
12	32.2	32.2	0	Negligible
13	43.9	43.9	0	Negligible
14	31.6	31.6	0	Negligible
15	31.2	31.2	0	Negligible
16	32.2	32.2	0	Negligible
17	32.5	32.5	0	Negligible
18	31.4	31.4	0	Negligible
19	31.1	31.1	0	Negligible
Maximum	**50.9**	**50.9**	**0**	**-**
Minimum	**31.1**	**31.1**	**0**	**-**

AQS objective = 40 µg.m^{-3}

6.3 Predicted annual-mean NO2 concentrations in the opening year at some of the façades of the existing receptors are above the AQS objective for NO_2, with and without the development.

However, the change is predicted concentration associated with the 22 additional vehicle movements generated by the development is imperceptible. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor ranges from 'negligible'.

6.4 As all predicted annual-mean NO_2 concentrations are below 60 µg.m^{-3}, the hourly-mean objective for NO_2 is likely to be met at al receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

6.5 Overall, the impact on the surrounding area from NO_2 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10})

6.6 Table 6.2 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 6.2 Predicted Annual-Mean PM_{10} Impacts at Existing Receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	20.3	20.3	0	Negligible
2	20.2	20.2	0	Negligible
3	20.2	20.2	0	Negligible
4	20.5	20.5	0	Negligible
5	20.1	20.1	0	Negligible
6	20.4	20.4	0	Negligible
7	20.0	20.0	0	Negligible
8	22.6	22.6	0	Negligible
9	22.4	22.4	0	Negligible
10	21.1	21.1	0	Negligible
11	20.1	20.1	0	Negligible
12	19.8	19.8	0	Negligible
13	21.5	21.5	0	Negligible
14	19.7	19.7	0	Negligible
15	19.7	19.7	0	Negligible
16	19.8	19.8	0	Negligible
17	19.9	19.9	0	Negligible
18	19.7	19.7	0	Negligible
19	19.7	19.7	0	Negligible
Maximum	**22.6**	**22.6**	**0**	**-**
Minimum	**19.7**	**19.7**	**0**	**-**

AQS objective = 40 µg.m^{-3}

6.7 Predicted annual-mean PM_{10} concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.8 As all predicted annual mean PM_{10} concentrations are below 31.5 $\mu g.m^{-3}$, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

6.9 Overall, the impact on the surrounding area from PM_{10} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Fine Particulate Matter ($PM_{2.5}$)

6.10 Table 6.3 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 6.3 Predicted Annual-Mean $PM_{2.5}$ Impacts at Existing Receptors

Receptor ID	Concentration ($\mu g.m^{-3}$)		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	15.5	15.5	0	Negligible
2	15.3	15.3	0	Negligible
3	15.3	15.3	0	Negligible
4	15.8	15.8	0	Negligible
5	15.2	15.2	0	Negligible
6	15.6	15.6	0	Negligible
7	15.0	15.0	0	Negligible
8	19.4	19.4	0	Negligible
9	19.0	19.1	0	Negligible
10	16.9	16.9	0	Negligible
11	15.1	15.1	0	Negligible
12	14.6	14.6	0	Negligible
13	17.5	17.5	0	Negligible
14	14.5	14.5	0	Negligible
15	14.4	14.4	0	Negligible
16	14.7	14.7	0	Negligible
17	14.7	14.7	0	Negligible
18	14.5	14.5	0	Negligible
19	14.4	14.4	0	Negligible
Maximum	**19.4**	**19.4**	**0**	**-**
Minimum	**14.4**	**14.4**	**0**	**-**

AQS objective = 25 $\mu g.m^{-3}$

6.11 Predicted annual-mean $PM_{2.5}$ concentrations in the opening year at the façades of the existing receptors are below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

6.12 Overall, the impact on the surrounding area from $PM_{2.5}$ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

6.13 As the maximum predicted annual-mean $PM_{2.5}$ concentration is below 25 $\mu g.m^{-3}$ in the opening year, and concentrations of $PM_{2.5}$ are expected to decrease in future years, the AQS objective for $PM_{2.5}$ is expected to be met by a wide margin by its target date of 2020.

Assessment of New Population Exposure (Site Suitability)

6.14 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 air pollution, which can be a factor in the suitability of the site for its proposed uses.

6.15 APEC classifications are provided for annual-mean NO_2 and PM_{10} exposure and daily-mean PM_{10} exposure. The annual-mean objectives apply at the first floor and above of the proposed development; the annual-mean -term objectives do not apply at the façades of the B1 (business) uses of the ground floor.

6.16 Table 6.4 presents the annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations predicted at the façades of proposed receptors.

Table 6.4 Predicted Annual-Mean NO_2, PM_{10} and $PM_{2.5}$ Concentrations ($\mu g.m^{-3}$) at Proposed Receptors

Receptor ID	Receptor Name	NO_2	APEC Category	PM_{10}	APEC Category	$PM_{2.5}$
21	Proposed North West: 1st Floor	35.2	APEC-A	20.1	APEC-A	15.1
22	Proposed North West: 2nd Floor	32.9		19.9		14.7
23	Proposed North West: 3rd Floor	31.8		19.8		14.6
25	Proposed South West: 1st Floor	37.6		20.4		15.6
26	Proposed South West: 2nd Floor	34.3		20.1		15.0
27	Proposed South West: 3rd Floor	32.5		19.9		14.7

Receptor ID	Receptor Name	NO_2	APEC Category	PM_{10}	APEC Category	$PM_{2.5}$
29	Proposed North East: 1st Floor	34.4		20.0		15.0
30	Proposed North East: 2nd Floor	33.2		19.9		14.8
31	Proposed North East: 3rd Floor	32.2		19.8		14.6
33	Proposed South East1st Floor	37.5		20.4		15.6
34	Proposed South East: 2nd Floor	34.8		20.1		15.1
35	Proposed South East: 3rd Floor	32.8		19.9		14.8
36	Proposed South West: 4th Floor	31.4		19.7		14.5
37	Proposed South East: 4th Floor	31.5		19.7		14.5

6.17 The long-term and short-term objectives apply at the first floor and above of the proposed development. The short-term objectives apply at the Ground Floor.

6.18 At proposed residential receptors, the predicted annual-mean NO_2 concentrations range between 31.4 and 37.6 $\mu g.m^{-3}$, and are all more than 5% below the AQS objective of 40 $\mu g.m^{-3}$ and are classified as APEC-A. Furthermore, as the annual-mean NO_2 concentration is predicted to be less than 60 $\mu g.m^{-3}$, the hourly-mean AQS objective is expected to be met.

6.19 The predicted annual-mean PM_{10} concentrations range between 19.7 and 21.0 $\mu g.m^{-3}$ and are classified as APEC-A.

6.20 Predicted annual-mean $PM_{2.5}$ concentrations range between 14.5 and 16.6 $\mu g.m^{-3}$ and are all more than 5% below the AQS objective of 25 $\mu g.m^{-3}$.

Significance of Effects

6.21 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.

6.22 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *"Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances."* and *"…a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."*

6.23 The results of the modelling indicate that with the development, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing receptors are below the relevant long and short-term AQS objectives. When the magnitude of change in annual-mean NO_2 , PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on existing receptors are categorised as 'negligible'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'negligible', using the descriptors adopted for this assessment.

6.24 The AQS objectives for NO_2, PM_{10} and $PM_{2.5}$ are likely to be met at the facades of the proposed development scheme P03. The predicted concentrations are conservative, since no reduction to background concentrations has been applied. On that basis, future occupants of the development will be exposed to acceptable air quality and the site is deemed suitable for its proposed future in this respect.

6.25 Using professional judgement, the resulting air quality effect is considered to be 'not significant' overall.

Sensitivity and Uncertainty

6.26 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.

6.27 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 medium for Demolition and medium for Earthworks, Construction and Trackout. The general site measures described as 'highly recommended' for medium risks are listed below. The 'highly recommended' measures for medium risk demolition sites, medium risk construction sites and medium risk trackout are also listed. There are no 'highly recommended' measures for medium risk earthworks.

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/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
Preparing and maintaining the site
▪ Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g. locating site offices between potentially dusty activities and the receptors. ▪ Erect solid screens or barriers around the site boundary. ▪ 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. ▪ Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. ▪ Depending on the duration that stockpiles will be present and their size - cover, seed, fence or water 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 practicable. ▪ 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 suppression/mitigation, using non-potable water where possible. ▪ Use enclosed chutes, conveyors and covered skips, where practicable. ▪ 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.
Medium risk 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.
Medium risk 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.
Medium risk measures specific to trackout
▪ Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site. ▪ Avoid dry sweeping of large areas. ▪ Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport. ▪ Record all inspections of haul routes and any subsequent action in a site log book. ▪ Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned. ▪ Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as practicable. ▪ Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site). ▪ Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. ▪ Access gates to be located at least 10 m from receptors where possible.

7.3 The IAQM document also provides measures described as ‘desirable’ and these may be required by the local planning authority:

Site Preparation and Maintenance
▪ Install green walls, screens or other green infrastructure to minimise the impact of dust and pollution. ▪ Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary.
Operating vehicle/machinery and sustainable travel
▪ Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Demolition
▪ Soft-strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Earthworks
▪ Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. ▪ Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. ▪ Only remove the cover in small areas during work and not all at once.
Construction
▪ Avoid scabbling (roughening of concrete surfaces) if possible. ▪ Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. ▪ For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout
▪ Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site.

7.4 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

7.5 When the change in concentration at existing sensitive receptors is considered in the context of the absolute concentration, the overall air quality impact on the surrounding area as a whole is categorised as "negligible" and the resulting effect is considered to be "not significant". On that basis, no mitigation measures are considered necessary.

Mitigation for New Population Exposure (Site Suitability)

7.6 The proposed development site is within an existing AQMA, declared by LBR Council due to high levels of NO_2 and PM_{10} attributable to road traffic emissions.

7.7 The NO_2 and PM_{10} 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.

7.8 Annual-mean $PM_{2.5}$ concentrations are also more than 5% below the AQS objective and no mitigation is considered necessary.

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 Sandycombe Road P03 development.

8.2 Impacts during the construction of the Sandycombe Road P03 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 Sandycombe Road P03 development on the surrounding area, detailed atmospheric dispersion modelling has been undertaken for the first year in which the development is expected to be fully operational, 2019. The operational impact of the Sandycombe Road P03 development on existing receptors in the local area is predicted to be 'negligible' taking into account the changes in pollutant concentrations and absolute levels. Using the criteria adopted for this assessment together with professional judgement, the overall impact on the area as a whole is described as 'negligible'.

8.4 Regarding suitability of air quality at the site for introducing new occupants, pollutant concentrations at the façades of proposed residential receptors are predicted to be within the relevant health-based air quality objectives. On that basis, future occupants of the Sandycombe Road P03 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 Sandycombe Road P03 development is considered to be 'not significant' overall.

8.6 The 'golden thread' running through the NPPF is a presumption in favour of sustainable development. 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 EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations?" The proposed development will not.

8.8 The Sandycombe Road P03 development does not, in air quality terms, conflict with national or local policies, or with measures set out in LBR'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
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.
LBR	London Borough of Richmond upon Thames
LGV	Light Goods Vehicle
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 vehicle using the network

Figures

Proposed Receptors

Existing Receptors

Modelled Road Links

Site Boundary

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Project: Sandycombe Road (Scheme P03)

Job Ref: JAR9406

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Date: 19/12/2016	**Rev: 0**
Drawn: JJ	**Checked: FP**

Figure 1: Modelled Road Links and Existing Receptors

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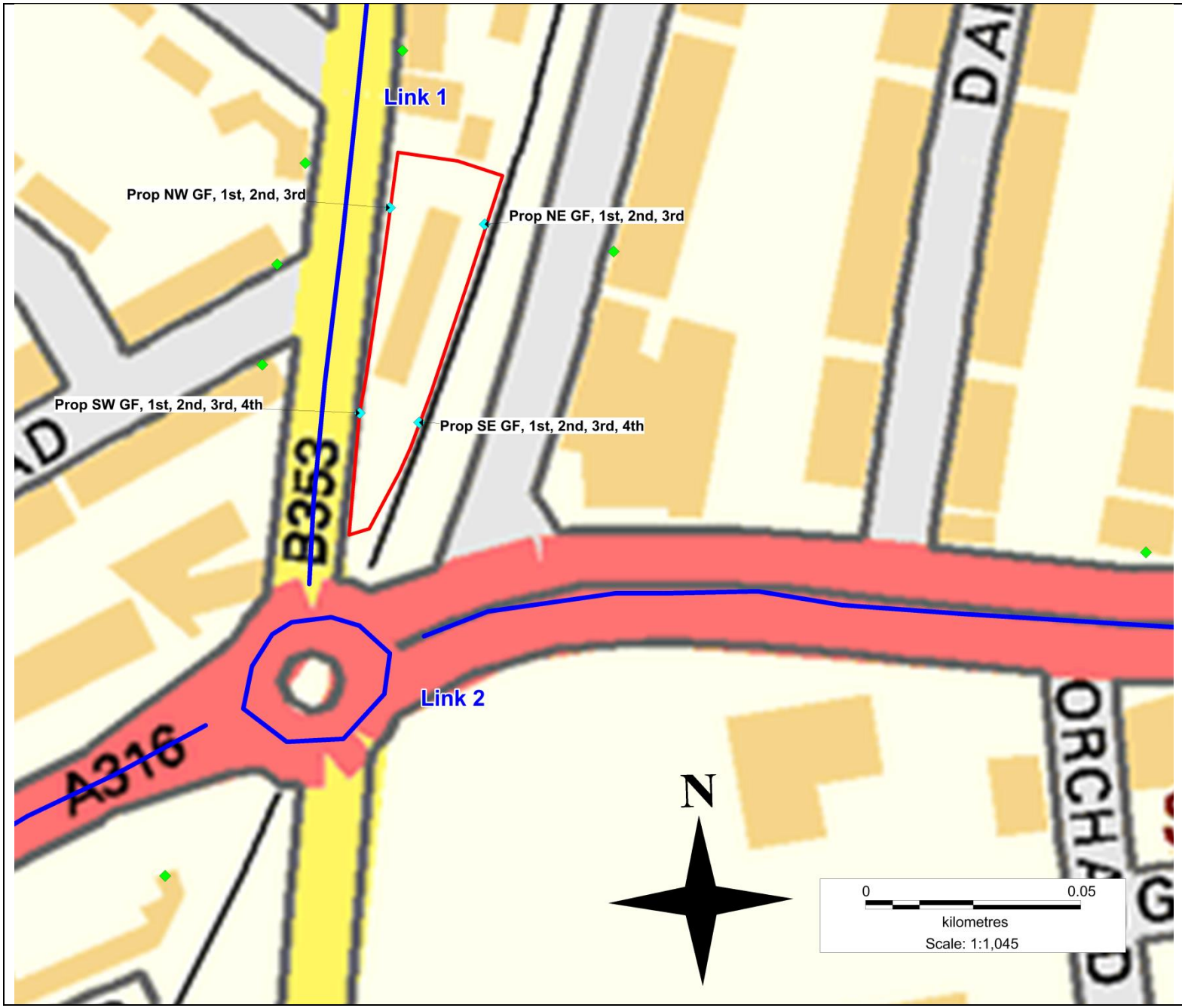

Proposed Receptors
Existing Receptors
Modelled Road Links
Site Boundary

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Figure 2: Modelled Road Links and Proposed Receptors

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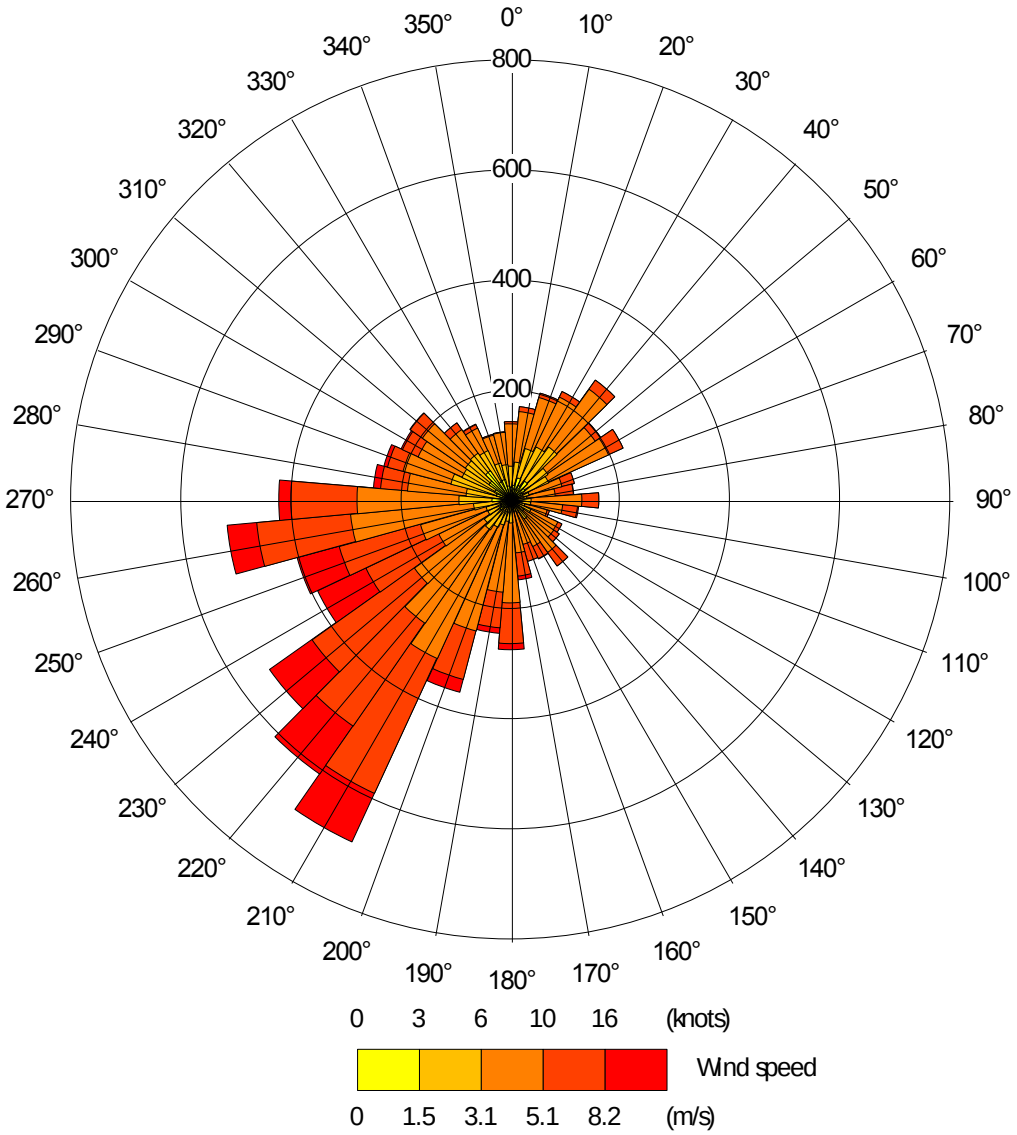

Figure 3: Wind Rose – Heathrow, 2015

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Client:	**Goldcrest Land Plc.**	**Rev :**	**0**	**Drawn By:**	**JJ**
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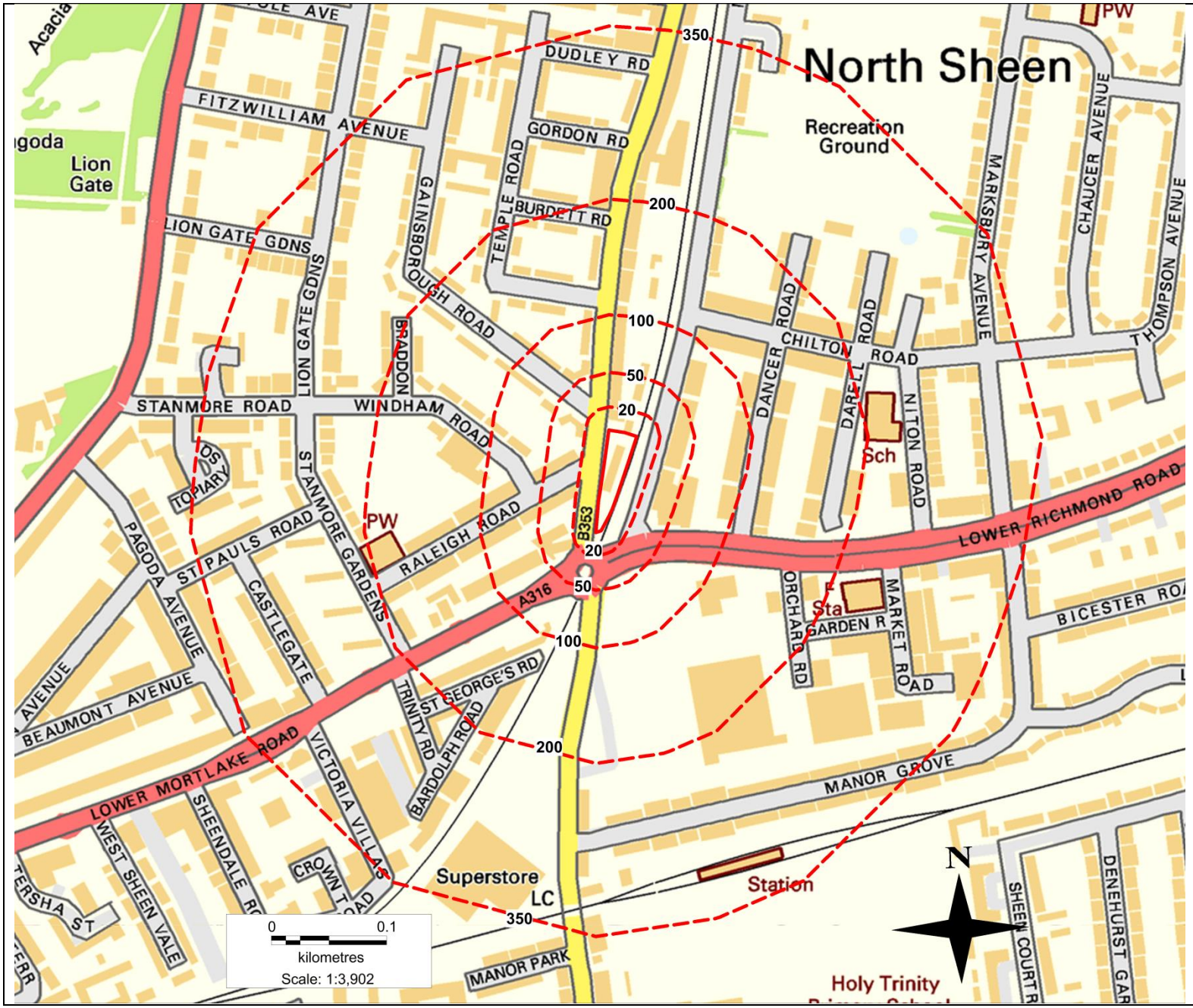

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Date: 05/12/2016	**Rev: 0**
Drawn: JJ	**Checked: FP**

Figure 4: Assessment of Construction Dust

NOT TO SCALE

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Appendices

Appendix A: Detailed Construction Dust Assessment Methodology

Source

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
Demolition - building over 50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level. **Earthworks** – total site area over 10,000 m^2, 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. **Construction** - total building volume over 100,000 m^3, activities include piling, on-site concrete batching, sand blasting. Period of activities more than two years. **Trackout** – 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 20,000 to 50,000 m^3, potentially dusty construction material and demolition activities 10 - 20 m above ground level. **Earthworks** – total site area between 2,500 to 10,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 to 100,000 tonnes. **Construction** - total building volume between 25,000 and 100,000 m^3, 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. **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.	Medium
Demolition - building less than 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during winter months. **Earthworks** – total site area less than 2,500 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 10,000 tonnes earthworks during winter months. **Construction** - total building volume below 25,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). Period of construction activities less than one year. **Trackout** – < 10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

Pathway and Receptor - Sensitivity of the Area

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.

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.

Table A.2 and Table A.3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM_{10} respectively.

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

Receptor	Sensitivity
Principles:- ▪ 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:- ▪ Dwellings. ▪ Museums and other culturally important collections. ▪ Medium and long-term car parks and car showrooms.	High
Principles:- ▪ 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. Indicative Examples:- ▪ Parks. ▪ Places of work.	Medium
Principles:- ▪ 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. Indicative Examples:- ▪ 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 PM_{10}

Receptor	Sensitivity
Principles:- ▪ 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 PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Residential properties. ▪ Schools, hospitals and residential care homes.	High
Principles:- ▪ 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 PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- ▪ Locations where human exposure is transient exposure. Indicative Examples:- ▪ Public footpaths. ▪ Playing fields, parks. ▪ Shopping streets.	Low

The IAQM methodology combines consideration of the pathway and receptor to derive the 'sensitivity of the area'. Table A.4 and Table A.5 show how the sensitivity of the area has been derived for this assessment.

Table A.4 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.

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.

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.

Table A.5 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.

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.

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.

The matrices in Table A.6, Table A.7, Table A.8 and Table A.9 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.6 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.7 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.8 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.9 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

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 NOx/NO_2 concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion monitoring.

Section 7.519 of LLAQM.TG16 states:

"Kerbside sites are generally not recommended for the adjustment of road traffic modelling results as the inclusion of these sites may lead to an over-adjustment of modelling at roadside sites. The exception is where kerbside sites are relevant for exposure, for example properties fronting directly onto the road. In that case, kerbside sites may be used in the model verification process."

The proposed units at Sandycombe Road would be approximately 40 metres away from the A316, and approximately 5 metres away from the B353. Therefore it is not strictly appropriate to include kerbside sites in this instance. Kerbside monitoring sites have nonetheless been included in this conservative model verification as the council specifically mentioned monitoring at site 18, a kerbside site, during the initial consultation to agree the scope and methodology.

LBR council monitors roadside NO_2 concentrations passively using diffusion tubes at a number of locations in the vicinity of the Application Site.

Whilst it was noted in consultation that 2015 air quality results should be treated with caution, this model verification has used the 2015 data to be consistent with the DfT base year data used in the assessment. The concentrations monitored in 2015 for the sites closest to the proposed development are provided in Table B.1.

Table B.1 Measured Annual-mean NO_2 Concentrations (μg.m^{-3})

Monitoring Site	Monitoring Site Type	2015 Measured Annual-mean NO_2 Concentrations (μg.m^{-3})
18	Kerbside	67
19	Kerbside	48
55	Kerbside	50
58	Kerbside	46
54	Kerbside	51
20	Kerbside	48
52	Kerbside	55
21	Roadside	37

Monitoring Site	Monitoring Site Type	2015 Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)
44	Kerbside	39
26	Kerbside	40
50	Kerbside	57
36	Kerbside	49
25	Roadside	45
49	Kerbside	39
42	Roadside	47

Kerbside = Less than 1 m from nearest road. Roadside = 1 to 5 m from nearest road

Ideally, any model verification study should use concentrations, emissions factors and meteorological data relating to the same year. On that basis, 2015 traffic flow data (DfT) and 2015 meteorological data (London Heathrow) have been used in the model.

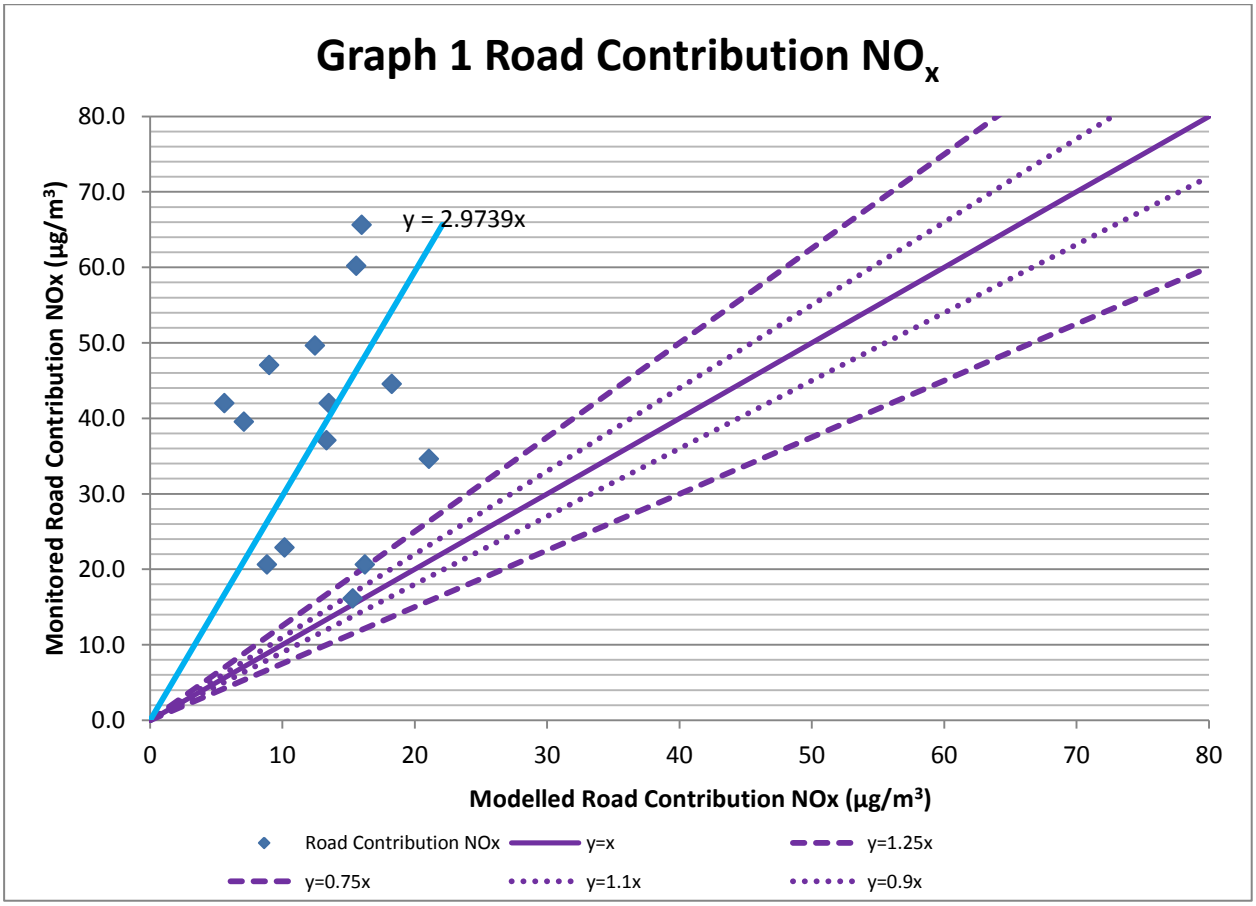
The monitored annual-mean NOx road contributions have been derived from the monitored annual-mean NO_2 concentrations using the LLAQM.TG16 calculator. The monitored annual-mean NO_X road contributions have then been compared with the modelled annual-mean NO_X road contributions. This comparison is provided in Table B.2 below.

Table B.2 Comparison of Monitored and Modelled Annual-mean Road NO_X Contribution ($\mu g.m^{-3}$)

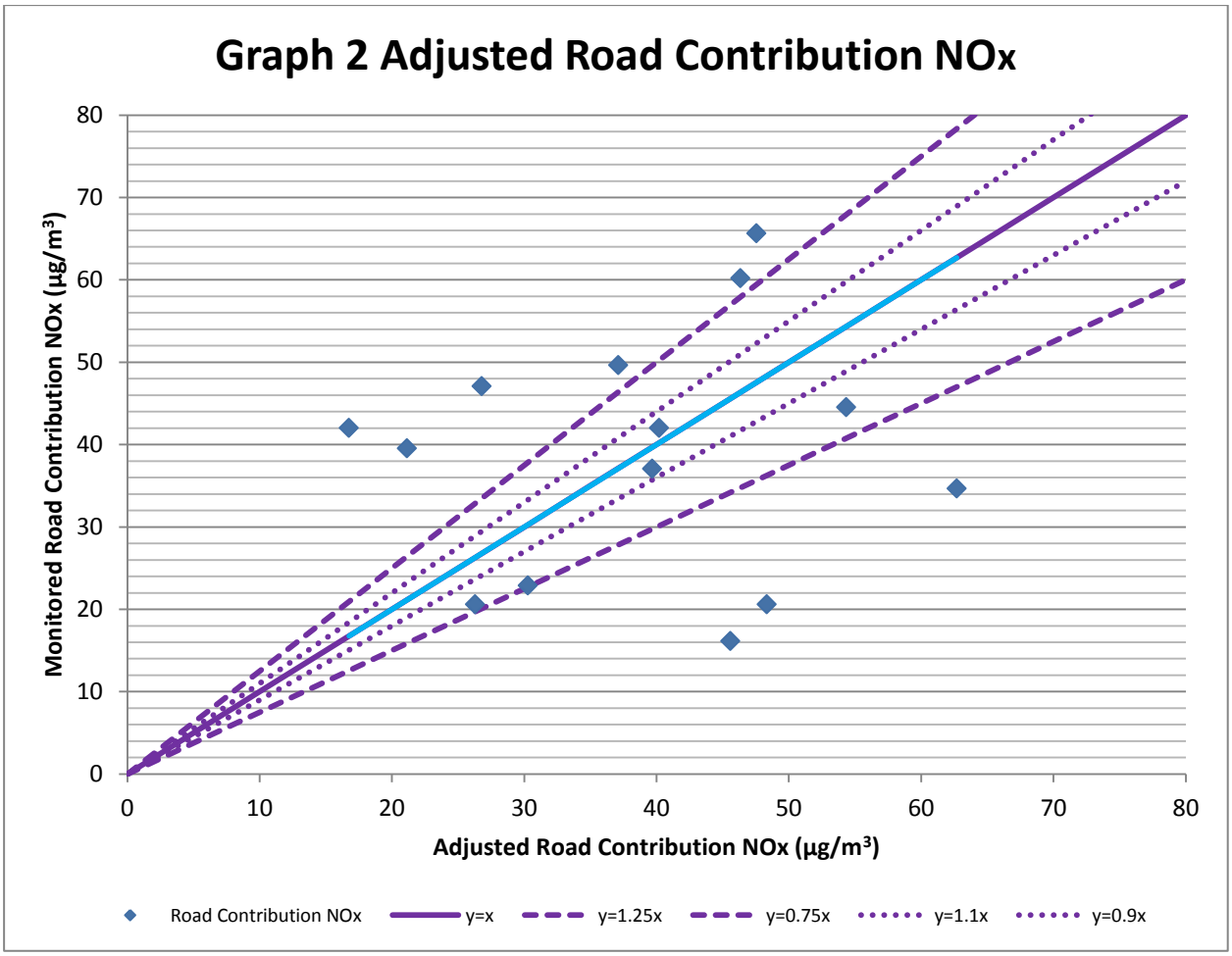
Monitoring Site	Annual-mean NO_2 Concentration ($\mu g.m^{-3}$)		Percentage Difference = (Modelled – Monitored)/Monitored (%)
	Monitored	Modelled	
18	67	38.8	-42.0
19	48	32.1	-33.1
55	50	33.7	-32.6
58	46	35.7	-22.3
54	51	35.3	-30.7
20	48	35.8	-25.4
52	55	36.8	-33.2
21	37	36.6	-1.0
44	39	33.6	-13.7
26	40	34.3	-14.3
50	57	36.9	-35.2
36	49	38.0	-22.5
25	45	39.2	-12.9
49	39	37.1	-5.0
42	47	32.8	-30.1

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 designates passive NO2 samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results, Table B.2 above indicates that the model is under-predicting at all monitoring locations.

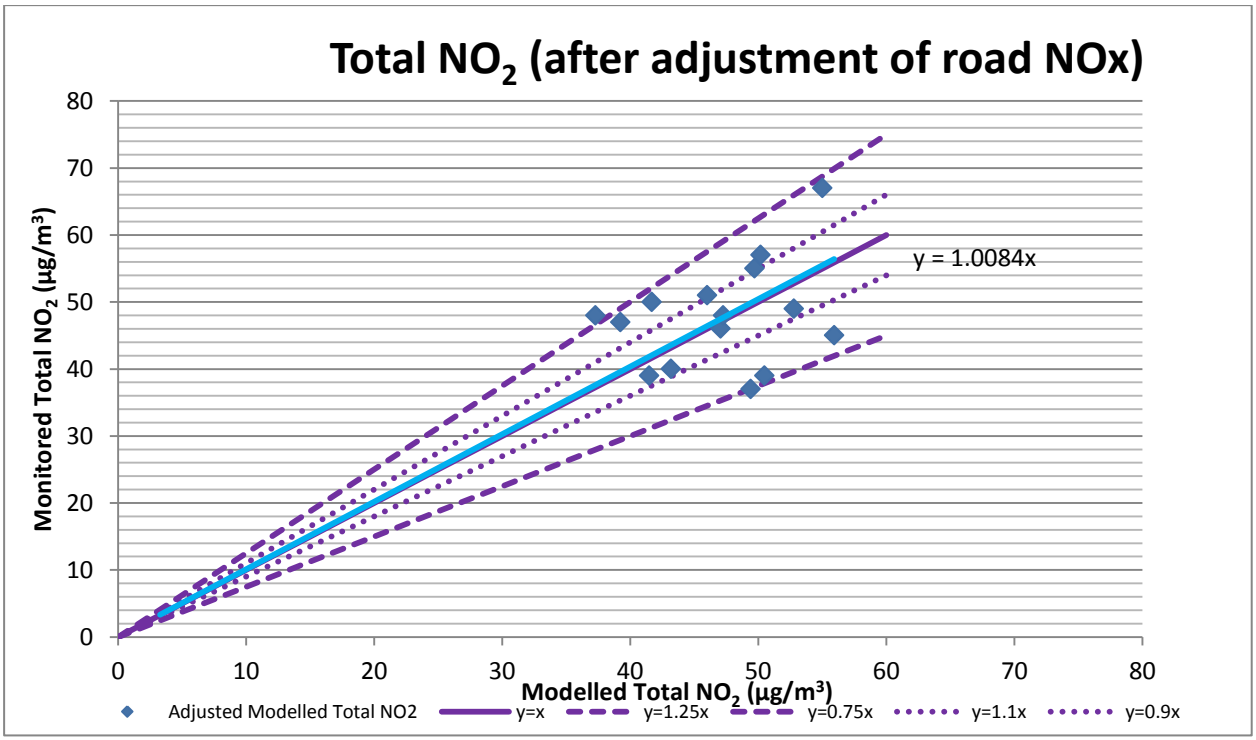
The modelled annual-mean NOx road contributions for the 2015 concentrations have been plotted against the monitored annual-mean NOx road contributions in Graph 1.



The modelled NOx contributions have been multiplied by the gradient of the trend line (2.9739) to determine the corrected NOx contributions. The corrected modelled annual-mean NOx road contributions have been plotted against the monitored annual-mean NOx road contributions in Graph 2.



Modelled annual-mean NO_2 concentrations have been derived from the corrected modelled annual-mean NO_X road contributions. The corrected modelled annual-mean NO_2 concentrations have been plotted against the monitored annual-mean NO_2 concentrations in Graph 3.



The corrected modelled annual-mean NO_2 concentrations are all within 25% of the monitored annual-mean NO_2 concentrations. The correction factor therefore improves the modelled concentrations and has been applied to all predictions used within the assessment.

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 ($\mu g.m^{-3}$)

Monitoring Site	Annual-mean NO_2 Concentration ($\mu g.m^{-3}$)	
	Monitored	Corrected Modelled
18	67	55.0
19	48	37.3
55	50	41.7
58	46	47.1
54	51	46.0
20	48	47.3
52	55	49.7
21	37	49.4
44	39	41.5
26	40	43.2
50	57	50.2

Monitoring Site	Annual-mean NO_2 Concentration ($\mu g.m^{-3}$)	
	Monitored	Corrected Modelled
36	49	52.8
25	45	55.9
49	39	50.5
42	47	39.2
Average	**47.9**	**47.1**

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:

(Average Monitored NO_X Concentration – Average Predicted NOx Concentration) / 0.5 x (Average Monitored NO_X + Average Predicted NOx Concentration)

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.

The fractional bias for this study is therefore (47.9 – 47.1) / 0.5 x (47.9 + 47.1) = 0.02. As the fractional bias is close to zero, there is no evidence of a tendency to over or under-predict and the adjusted model is performing well.

Appendix C: EHO Consultation

Thanks for the confirmation Carol,

Josh

Joshua Jones (Brighton)
Assistant Consultant - Air Quality - RPS Planning & Development
6-7 Lovers Walk,
Brighton, East Sussex, BN1 6AH.
United Kingdom
Tel: +44 (0) 1273 546 800
Email: J.Jones@rpsgroup.com
www: www.rpsgroup.com

From: Carol Lee [mailto:Carol.Lee@richmond.gov.uk]
Sent: 09 December 2016 14:52
To: Joshua Jones (Brighton)
Subject: RE: Air Quality Assessment for proposed development at 1-9 Sandycombe Road, North Sheen, TW9 2EP

Dear Josh

Ah, this sounds like the same planning application.

Yes – that would make sense - to wait until planning permission is granted. It was not refused on grounds of air quality.

It may well also require a MVHR scheme for ventilation both on grounds of noise and air quality but this can also wait.

Kind regards

Carol

Carol Lee
Environmental Health Senior Pollution Practitioner (Air Quality)
Regulatory Services Partnership
London Boroughs of Merton and Richmond upon Thames
2nd Floor Civic Centre, 44 York Street, Twickenham TW1 3BZ

From: Joshua Jones (Brighton) [mailto:J.Jones@rpsgroup.com]
Sent: 09 December 2016 13:44
To: Carol Lee
Subject: RE: Air Quality Assessment for proposed development at 1-9 Sandycombe Road, North Sheen, TW9 2EP

Dear Carol,

If the planning application is granted permission, could we present the DMP and Emissions Control Scheme at that stage?

Thanks,
Josh

Joshua Jones (Brighton)
Assistant Consultant - Air Quality - RPS Planning & Development
6-7 Lovers Walk,
Brighton, East Sussex, BN1 6AH.
United Kingdom
Tel: +44 (0) 1273 546 800
Email: J.Jones@rpsgroup.com
www: www.rpsgroup.com

From: Joshua Jones (Brighton)
Sent: 09 December 2016 13:16
To: Carol Lee
Subject: RE: Air Quality Assessment for proposed development at 1-9 Sandycombe Road, North Sheen, TW9 2EP

Good afternoon Carol,

Thanks for your swift response. I will return to the developer with your comments.

The proposed scheme would be for B1 offices on the ground floor, with three to four residential floors above.

Apologies for the confusion regarding the construction phase site access. This should indeed read Sandycombe Road.

I hope to get back to you early next week with further details regarding the proposed scheme.

Many thanks,
Josh

Joshua Jones (Brighton)
Assistant Consultant - Air Quality - RPS Planning & Development
6-7 Lovers Walk,
Brighton, East Sussex, BN1 6AH.
United Kingdom
Tel: +44 (0) 1273 546 800
Email: J.Jones@rpsgroup.com
www: www.rpsgroup.com

From: Carol Lee [mailto:Carol.Lee@richmond.gov.uk]
Sent: 09 December 2016 11:47
To: Joshua Jones (Brighton)
Subject: RE: Air Quality Assessment for proposed development at 1-9 Sandycombe Road, North Sheen, TW9 2EP

Dear Josh

Thank you for your email.

I am rather puzzled that RPS have been asked to undertake an air quality assessment for a proposed residential development at 1-9 Sandycombe Road, North Sheen, Richmond. The only development of

which I am aware for this site was a mixed use development which was refused in August 2016 and as far as I am aware is going to appeal.

I have no details of a residential only development. What height would the buildings be, which windows face towards the A316, are balconies/winter gardens proposed, what outside space is proposed? It is difficult to comment on Air Quality requirements without this detail. The local environment is dominated by relatively high levels of transportation noise (both rail and road) and relatively poor levels of air quality; it is therefore considered that this site is not ideally suited for residential development. However it is considered that with the implementation of appropriate control measures, noise and air quality issues can be mitigated to within acceptable levels. We encourage the use of innovative acoustic and air quality enhancements such as water features in amenity areas and green screens which can offset some of the negative issues associated with the scheme. We discourage the use of CHP.

Pre-assessment – this is satisfactory

Construction phase – this site is in close proximity to residential dwellings so a dust management plan must be submitted to and approved by the Local Planning Authority before the commencement of the development.

- Site access will be from Wellington Road – I don't know of a Wellington Rd in the vicinity – is this correct?

We usually request:

- **Air Quality- Construction**

  Save for temporary works, no development shall be commenced until a dust management plan has been submitted to and approved by the Local Planning Authority. The dust management plan shall include the following details:

  (a) Demonstrates compliance with the guidance found in the control of dust and emissions from construction and demolition Best Practice produced by the Greater London Authority (GLA)http://static.london.gov.uk/mayor/environment/air_quality/docs/construction-dust-pg.pdf

  (b) The dust management strategy must include a risk assessment of dust generation for each phase of the demolition and construction. The assessment and identified controls must include the principles of prevention, suppression and containment and follow the format detailed in the guidance above. The outcome of the assessment must be fully implemented for the duration of the construction and demolition phase of the proposed development and include dust monitoring where appropriate.

  (c) where the outcome of the risk assessment indicates that monitoring is necessary, a monitoring protocol including information on monitoring locations, frequency of data collection and how the data will be reported to the Local Planning Authority;

  (d) details of dust generating operations and the subsequent management and mitigation of dust demonstrating full best practicable means compliance and covering construction activities, materials storage, on and off site haul routes, operational control, demolition, and exhaust emissions; and

  (e) where a breach of the dust trigger level may occur a response procedure should be detailed including measures to prevent repeat incidence

Operational phase – Traffic – this is satisfactory, including Heathrow met data for 2015 which is acceptable.

- **Operational phase – gas-fired CHP –** this is to be discouraged. We would prefer you go back to the developer and request highly efficient insulation along with other energy efficient measures and the installation of ultra-low NOx boilers with NOx emissions of less than 0.04 g/KWH of heat supplied rather than CHP. We request:

Air Quality – Emissions Control Scheme

- Details shall be submitted to and approved by the Local Planning Authority, before the development is commenced, for a scheme whose purpose shall be to contain assurances that will control and minimise emissions of pollutants from and attributable to the development. The scheme shall set out the secure measures which can, and will, be put in place designed to ensure that emissions of pollutants are minimised and, wherever practicable, reduced.

- *Notes: Due to the development being within the AQMA with existing levels of pollutants being at or above EU limit values for nitrogen dioxide (NO2), new developments proposed in these areas must play their part in ensuring that a) these areas do not worsen and b) must contribute towards an overall improvement in air quality. Examples include quantifying the emission benefits from any travel plan, ensuring an environmental management plan is in place to secure reductions in both local and global pollutant emissions. The use of Combined heat and power* plant is not encouraged and schemes which instead use highly efficient insulation along with other energy efficient measures in addition to the installation of ultra-low NOx boilers with NOx emissions of less than 0.04 g/KWH of heat supplied will be looked at more favourably.

Air Quality Neutral - this is satisfactory

Model verification - this is satisfactory. Richmond's 2016 ASR is available here: http://www.richmond.gov.uk/progress_reports_and_air_quality_action_plans

The nearest NO2 diffusion tube is site 18 on the A316 about 150m from this site. All NO2 diffusion tubes are biased adjusted using triplicate NO2 tubes sited next to real time analysers for greater accuracy.

Please treat 2015 air quality results with caution. All results showed a decrease in levels of NO2 from previous years but it is clearly too early to know whether or not this is a true downward trend. This happened in 2011 but rose again the following year. In any event site 18 exceeded an annual mean of 60 □g m-3 which indicates that the 1 hour-mean objective may also have been exceeded.

I hope this is useful.

If you need any further information please do not hesitate to get in touch.

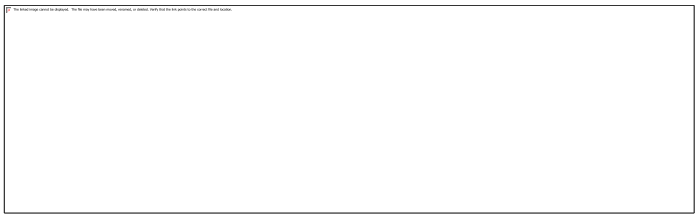
Kind regards

Carol

Carol Lee
Environmental Health Senior Pollution Practitioner (Air Quality)
Regulatory Services Partnership
London Boroughs of Merton and Richmond upon Thames
2nd Floor Civic Centre, 44 York Street, Twickenham TW1 3BZ

Tel 020 8891 7729

e-mail carol.lee@richmond.gov.uk



From: Joshua Jones (Brighton) [mailto:J.Jones@rpsgroup.com]
Sent: 05 December 2016 15:41
To: Carol Lee
Cc: Commercial EH
Subject: Air Quality Assessment for proposed development at 1-9 Sandycombe Road, North Sheen, TW9 2EP

Dear Carol,

RPS has been asked to undertake an air quality assessment for a proposed residential development at 1-9 Sandycombe Road, North Sheen, Richmond. I have attached a figure showing the site location. In accordance with the national Planning Practice Guidance, the purpose of my email is to agree the scope of the assessment and the method with you. The scope and method proposed are based on the requirements of the Mayor of London's *'Sustainable Design and Construction'* Supplementary Planning Guidance (SPG) published in April 2014.

We have assumed that the Air Quality Assessment will focus on the impacts during the construction phase and the operational phase focussing on both the impacts of the development on the local area and the impacts on the future occupants. We propose to undertake the Air Quality Assessment in line with the tasks listed below:

Pre-assessment

- Establish the current air quality in the area with specific regard to the findings of your Review and Assessment process, the results of available local monitoring and data available in the Defra maps.

Construction phase

- Undertake a risk assessment of dust and emissions during demolition / construction of the proposed development, having regard to the Mayor of London's SPG on 'The control of dust and emissions from construction and demolition' and the Institute of Air Quality Management (IAQM) 'Guidance on the assessment of dust from demolition and construction'.
- Recommend generic mitigation measures designed to control dust nuisance effects and emissions during construction, consistent with the level of risk. These will be drawn from the IAQM 'Guidance on the assessment of dust from demolition and construction' and the Mayor of London's SPG on 'The control of dust and emissions from construction and demolition'.
- Site access will be from Wellington Road.

Operational phase - Traffic

- The project's transport consultants, Cottee Transport Planning, have advised that the proposed development is expected to generate between 21 and 22 additional vehicle movements.
- The air quality impacts of this traffic on the surrounding area and on future occupants will be predicted using the ADMS-Roads model.
- Traffic data used in the assessment is to be sourced from DfT traffic count point 56694 on the A316, whilst Cottee Transport Planning have provided traffic data for Sandycombe Road.

- ADMS Roads requires the provision of meteorological data. If you have a preference for the met station location, please advise. Otherwise, we plan to use data from Heathrow, 2015.

Operational phase – gas-fired CHP

- Use ADMS 5 to model emissions from the CHP to predict the process contribution (PC) of key pollutants at existing and proposed receptors from the operation of the CHP.
- To inform the background concentrations used within the model, we would use the results of local monitoring and the Defra maps available; we will not assume reductions in background concentrations and emissions in future years to reflect the findings of recent research.
- Describe the significance of the illustrated effects using professional judgement and criteria definitions from the Environmental Protection UK (EPUK)/IAQM (May 2015) Land-Use Planning & Development Control: Planning For Air Quality document.
- Describe the significance of exposure to air pollution using the Air Pollution Exposure Criteria set out in the London Council's 'Air Quality and Planning Guidance'.
- Recommend generic mitigation measures to improve air quality during the operational phase, should initial results of the assessment show any adverse air quality effects arising from the proposed development.

Air Quality Neutral

- Compare total transport and building emissions with the relevant benchmarks to demonstrate Air Quality Neutrality.

Model verification

- Where possible, we aim to verify the model output through a comparison with the results of publically-available air quality monitoring in the study area. We have located the 2015 USA report on your website. If up to date data are available for existing and any new monitoring sites, we would aim to use these to verify the model. Please could you provide this information and, if applicable, any more recent Review and Assessment reports that you would like us to take into account of in our assessment.

Please could you advise if you consider our proposed scope and methodology appropriate. If you need any further information to comment, then please let me know.

Many thanks,
Josh

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