Solum Regeneration (Twickenham) LLP

Station Yard, Twickenham

Air Quality Assessment

November 2019

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1	8th October 2019	First Issue
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Executive Summary

WYG have undertaken an Air Quality Assessment for the proposed residential development at Station Yard, Twickenham.

During the construction phase, the potential impacts from construction on air quality will be managed through site specific mitigation measures detailed within this assessment. With these mitigation measures in place, the effects from the construction phase are not predicted to be significant.

Wyg completed baseline NO_2 monitoring in the study area and at the development site which showed that baseline levels were below the Air Quality Objective (AQO).

During the operational phase, the assessment of the impact description of the effects of additional traffic movements associated with the proposed development with respect to NO_2, PM_{10} and $PM_{2.5}$ exposure is determined to be 'negligible' for all existing receptors.

All modelled proposed receptors at the development site are determined to be below the AQOs for NO_2, PM_{10} and $PM_{2.5}$. Therefore, no additional operational phase mitigation is required to reduce internal pollutant levels.

The Air Quality Neutral assessment has determined that the Building Emissions and Transport Emissions associated with the proposed development are below the defined benchmarks. Therefore, the proposed development is determined to be Air Quality Neutral and no additional mitigation measures are required.

Based on the assessment undertaken and data, methodology and assumptions used within this assessment it is concluded that the site is suitable for the proposed development.

1. Introduction

Solum commissioned WYG Environmental (WYG) to prepare an Air Quality Assessment to support an application for the proposed development at Station Yard, Twickenham.

1.1 Site Location and Context

The approximate United Kingdom National Grid Reference (NGR) is approximately 516046,173595. Reference should be made to Figure 1 for a map of the proposed development site and surrounding area.

The following assessment stages have been conducted as part of this assessment:

- Baseline monitoring and evaluation;
- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase;
- Air Quality Neutral Assessment; and,
- Identification of mitigation measures (as required).

The results of the assessment are detailed in the following sections of this report.

The construction phase assessment considers the potential effects of dust and particulate emissions from site activities and materials movement based on a qualitative risk assessment method based on the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction' document, published in 2014.

The assessment of the potential air quality impacts that are associated with the operational phase has focused on the predicted impact of changes in ambient nitrogen dioxide (NO_2), particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) and particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) as a result of the development at key local receptor locations. The changes have been referenced to EU air quality limits and UK air quality objectives and the magnitude and impact description of the changes have been referenced to non-statutory guidance issued by Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK).

2. Policy and Legislative Context

2.1 Documents Consulted

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- National Planning Policy Framework, Ministry for Housing, Communities and Local Government, February 2019;
- Planning Practice Guidance: Air Quality, Ministry for Housing, Communities and Local Government, November 2019;
- The Air Quality Standards (Amendments) Regulations, 2016;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG(16), Defra, 2018;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 - Air Quality, Highways Agency, 2007;
- Land-Use Planning & Development Control: Planning for Air Quality, EPUK & IAQM, 2017;
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014;
- The London Plan 2011, (Consolidated with Amendments), March 2016;
- Draft New London Plan, July 2019;
- Local Air Quality Management Note on Projecting NO_2 concentrations, Defra, April 2012;
- London Atmospheric Emissions Inventory (LAEI), Greater London Authority, 2013; and,
- Air Quality Neutral Planning Support Guidance, Greater London Authority, 2014.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Department for Transport Matrix (www.dft.go.uk/matrix);
- emapsite.com;
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/);
- Planning Practice Guidance (http://planningguidance.planningportal.gov.uk/); and,

- London Borough of Richmond upon Thames (https://www.richmond.gov.uk/).

Site Specific Reference Documents

- London Borough of Richmond Upon Thames Air Quality Annual Status Report for 2019;
- London Borough of Richmond Upon Thames Local Plan, Adopted July 2018;
- The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance, Mayor of London, July 2014.

2.2 Air Quality Legislative Framework

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};
- **Directive 2000/69/EC** – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The Fourth Daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

UK Legislation

The Air Quality Standards Regulations (Amendments 2016) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted National Standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in Table 2.1 along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines.

Table 2.1 Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as[10]	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
PM_{10}	UK	50µg/m^3 by end of 2004 (max 35 exceedances a year)	24-hour mean	1st January 2005	50µg/m^3 by end of 2004 (max 35 exceedances a year)	1st January 2005	Retain Existing
	UK	40µg/m^3 by end of 2004	Annual mean	1st January 2005	40µg/m^3	1st January 2005	
$PM_{2.5}$	UK	25µg/m3	Annual Mean	31st December 2010	25µg/m3	1st January 2010	Retain Existing
NO_2	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-Hour Mean	31st December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1st January 2010	Retain Existing
	UK	40µg/m^3	Annual Mean	31st December 2005	40µg/m^3	1st January 2010	

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality

Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Planning and Policy Guidance

National Policy

The National Planning Policy Framework (NPPF), revised February 2019, principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. The NPPF states that:

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

The Planning Practice Guidance (PPG) web-based resource was launched by the Department for Communities and Local Government (DCLG) and updated 1 November 2019 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance:

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

- *Where air quality is a relevant consideration the local planning authority may need to establish:*
- *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*

- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.*

Regional Policy

The London Borough of Richmond Upon Thames lies within the Greater London Authority (GLA) Area. The London Plan addresses the improvement of air quality. Policy 7.14 within the London Plan specifically relates to air quality improvement:

'Policy 7.14 Improving Air Quality

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

A. *Development proposals should: 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.*

<u>GLA, The draft London Plan (2019)</u>

The draft London Plan addresses the improvement of air quality. There are a number of policies highlighted below which specifically relate to air quality improvement. Policy 7.14 is to be replaced with Policy SI1.

> *'<u>Policy SI1 Improving Air Quality</u>*
>
> *A Development plans, through relevant strategic, site specific and area-based policies should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.*
>
> *B To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:*
>
> *1. Development proposals should not:*
>
> > *a) lead to further deterioration of existing poor air quality*
> >
> > *b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*
> >
> > *c) create unacceptable risk of high levels of exposure to poor air quality.*
>
> *2. In order to meet the requirements in Part 1, as a minimum:*
>
> > *a) Development proposals must be at least air quality neutral*
> >
> > *b) Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures*
> >
> > *c) Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1*
> >
> > *d) Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people, which do not demonstrate that design measures have been used to minimise exposure should be refused.*
>
> *C Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an Air Quality Positive approach. To achieve this a statement should be submitted demonstrating:*
>
> > *a) How proposals have considered ways to maximise benefits to local air quality, and*
> >
> > *b) What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this*

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

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

Local Policy

The London Borough of Richmond Upon Thames is the local planning authority for the development. The London Borough of Richmond Upon Thames Local Plan was adopted in July 2018, which outlines the broad planning strategy. Following a review of policies within the Local Plan, the following policies were identified as being relevant to the proposed development from an air quality perspective:

Policy LP 10 - Local Environmental Impacts, Pollution and Land Contamination

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

a) an air quality impact assessment, including where necessary, modelled data;
b) mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;
c) measures to protect the occupiers of new developments from existing sources;
d) 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.

3. Assessment Methodology

The potential environmental effects of the operational phase of the proposed development are identified so far as current knowledge of the site and development allows. The impact description of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017.

The methodology used to determine the potential air quality effects of the construction phase of the proposed development has been derived from the IAQM 'Guidance on the Assessment of the Impacts of Dust from Demolition and Construction' document and is summarised in Section 5.

3.1 Determining Impact Description of the Air Quality Effects

The impact description of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall impact description of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The effects are provided as a percentage of the Air Quality Assessment Level (AQAL), which may be an AQO, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)';
2. The absolute concentrations are also considered in terms of the AQAL and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQAL;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL;
4. The effects can be adverse when pollutant concentrations increase or beneficial when concentration decrease as a result of development;
5. The judgement of overall impact description of the effects is then based on severity of effects on all the individual receptors considered; and,
6. Where a development is not resulting in any change in emissions itself, the impact description of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQAL.

Table 3.1 Impact Description of Effects Matrix

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1	2-5	6-10	>10
≤75% 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 of AQAL	Moderate	Substantial	Substantial	Substantial

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance. 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'.

3.2 Diffusion Tube Monitoring Methodology

As part of the assessment an air quality survey of nitrogen dioxide has been undertaken by WYG to determine the spatial variation of NO_2 across the study area. The monitoring locations are summarised in Table 3.2 below and illustrated in Figure 1.

The scheduled monitoring diffusion tube survey programme for the first period has been summarised as follows:

- **Period 1:** 6th June 2019 – 4th July 2019;
- **Period 2:** 4th July 2019 – 5th August 2019;
- **Period 3:** 5th August 2019 – 5th September 2019; and,
- **Period 4:** 5th September 2019 – 1st October 2019.

Diffusion tubes are supplied and analysed by Gradko Laboratories using the 20% TEA in Water methodology.

Table 3.2 WYG Nitrogen Dioxide Diffusion Tube Locations

Monitoring Method	Location Reference	United Kingdom National Grid Reference	
		X	Y
Passive Diffusion Tube	D1	516049	173584
Passive Diffusion Tube	D2	516156	173540
Passive Diffusion Tube	D3	516055	173605
Passive Diffusion Tube	D4	516075	173614
Passive Diffusion Tube	D5	516069	173731
Passive Diffusion Tube	D6	516106	173733
Passive Diffusion Tube	D7	516151	173741

The survey results for nitrogen dioxide have been bias corrected and seasonally adjusted in general accordance with the guidance in Local Air Quality Management Guidance TG (16) as detailed overleaf.

3.3 Bias Correction

Survey results are 'bias corrected' in order to provide an adjustment to account for the relative precision of the monitoring technique used. The bias correction factor used is obtained from the on-line spreadsheet based tool at http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html which publishes the bias correction factors of numerous surveys from across the UK in order to obtain a national average correction factor for the analysis technique. The bias correction factor used is taken from the most recently published data. A summary of the surveys and the bias correction factor calculated is included in Table 3.3 below.

Table 3.3 September 2019 Bias Corrected Adjustment Factor for Gradko 20% TEA Analysis

Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (μg/m^3)	Automatic Monitor Mean Conc. (Cm) (μg/m^3)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
Ards and North Down Borough Council	12	16	13	26.8%	G	0.79
Gedling Borough Council	11	32	29	9.2%	G	0.92
Lisburn & Castlereagh City Council	12	26	24	6.0%	G	0.94
Monmouthshire County Council	12	36	37	-2.5%	G	1.03
Northampton Borough Council	12	43	40	6.1%	G	0.94
Bedford Borough Council	12	28	34	-17.5%	G	1.21
Borough Council of King's Lynn and West Norfolk	12	37	34	8.9%	G	0.92
Cheshire West and Chester	12	32	28	12.6%	G	0.89
Cheshire West and Chester	12	35	34	0.3%	G	1.00
Fareham Borough Council	12	44	37	19.4%	G	0.84
Fareham Borough Council	9	48	50	-3.7%	G	1.04
Fareham Borough Council	11	28	32	-12.0%	G	1.14
NOTTINGHAM CITY COUNCIL	12	42	38	10.2%	G	0.91
Bracknell Forest Borough Council	12	27	28	-4.4%	G	1.05
Brighton & Hove City Council	12	29	25	13.9%	G	0.88
Eastleigh Borough Council	12	32	29	10.8%	G	0.90
Eastleigh Borough Council	9	40	41	-1.8%	G	1.02
Eastleigh Borough Council	12	38	33	13.2%	G	0.88
Gateshead Council	12	40	39	4.0%	G	0.96
Gateshead Council	10	30	27	8.8%	G	0.92
Gateshead Council	11	93	85	9.3%	G	0.91
Wokingham Borough Council	12	21	20	6.3%	G	0.94
Bath & North East Somerset	12	53	52	2.3%	S	0.98
Bedford Borough Council	12	34	30	15.1%	G	0.87
Marylebone Road Intercomparison	12	31	24	28.8%	G	0.78
South Gloucestershire Council	12	27	25	9.2%	S	0.92
Thurrock Borough Council	12	32	27	16.4%	G	0.86
Thurrock Borough Council	12	44	34	32.1%	G	0.76
Thurrock Borough Council	11	39	35	12.4%	G	0.89

Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
Thurrock Borough Council	11	31	34	-8.5%	G	1.09
Belfast City Council	12	20	18	11.0%	G	0.90
City of Lincoln Council	12	26	20	28.8%	G	0.78
Lancaster City Council	11	50	48	4.3%	G	0.96
Lancaster City Council	11	24	19	29.3%	G	0.77
Liverpool City Council	12	37	35	3.6%	G	0.97
Blackburn with Darwen Borough Council	11	47	46	1.9%	G	0.98
Dartford Borough Council	12	16	13	26.8%	G	0.79
Dudley MBC	11	32	29	9.2%	G	0.92
Dudley MBC	12	26	24	6.0%	G	0.94
Dudley MBC	12	36	37	-2.5%	G	1.03
Overall factor based on 40 studies						**0.92**

3.4 Seasonal Adjustment

Nitrogen dioxide levels are known to vary throughout the year due to changes in emissions and the effects of seasonal weather changes. The application of a 'seasonal adjustment factor' is necessary to account for the relative influence of weather conditions during the survey period compared to annualised weather conditions. Box 7.10 of Local Air Quality Management Technical Guidance LAQM.TG(16) provides a method to adjust short term monitoring data to extrapolate annualised averages.

The seasonal correction factor for all roadside monitoring locations has been obtained from the nearest Automatic Monitoring Station (AMS) to the proposed development site. The AMS station nearest to the development and the seasonal correction factor calculation is summarised in Table 3.4.

Table 3.4 Seasonal Adjustment Calculation for WYG Diffusion Tube Results

Station Location	2018 Annual Mean (µg/m³)	Period Mean (µg/m³)	Seasonal Adjustment Factor	Period Mean (µg/m³)	Seasonal Adjustment Factor	Period Mean (µg/m³)	Seasonal Adjustment Factor	Period Mean (µg/m³)	Seasonal Adjustment Factor
		Period 1		Period 2		Period 3		Period 4	
London Hillingdon	46.44	35.01	1.33	35.72	1.30	45.31	1.03	38.98	1.19
London N Kensington	29.10	17.11	1.70	14.49	2.01	19.32	1.51	21.58	1.35
Average		-	**1.51**	-	**1.65**	-	**1.27**		**1.27**

Table 3.5 Final Adjusted WYG Diffusion Tube Results

Monitoring Location	Period of Monitoring	Raw Data (µg/m³)	Seasonal Adjusted (µg/m³)	Nationally Adjusted (µg/m³)
D1	P1-4	20.44	29.14	26.81
D2	P1-4	30.38	43.32	39.86
D3	P2-4	19.72	27.55	25.34
D4	P2-4	20.20	28.21	25.95
D5	P2-4	29.64	41.39	38.08
D6	P2-4	21.49	30.01	27.61
D7	P2-4	19.08	26.64	24.51

4. Baseline Conditions

4.1 Air Quality Review

This section provides a review of the existing air quality in the vicinity of the proposed development site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the proposed development site has been defined from a number of sources, as described in the following sections.

Local Air Quality Management (LAQM)

As required under section 82 of the Environment Act 1995, London Borough of Richmond Upon Thames (LBRUT) has undertaken an ongoing exercise to review and assess air quality within its area of jurisdiction. The assessments have indicated that concentrations of NO_2 and PM_{10} are above the relevant AQOs at a number of locations of relevant public exposure within the Council. LBRUT have declared on Air Quality Management Area (AQMA) as outlined below;

- Richmond AQMA: The Whole Borough

The proposed development is located within the Richmond AQMA, and so receptors within the AQMA have been included within the modelling assessment.

Air Quality Monitoring

Monitoring of air quality within LBRUT is undertaken through both continuous and non-continuous monitoring methods.

Continuous Monitoring

LBRUT have their own air pollution monitoring networks to review and assess air quality within their area of jurisdiction. These consist of four permanent monitoring stations recording continuous concentrations of NO_2 and PM_{10}. The most recently available monitoring data from 2013-2018 is displayed below in Table 4.1.

Table 4.1 Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Inlet Height (m)	Distance from Kerb of Nearest Road (m)	NO_2 Annual Mean Concentration (μg/m^3)					
					2013	2014	2015	2016	2017	2018
RI1	Castelnau Library, Barnes	Roadside	2.35m	3m	39	37	34	36	31	31
RI2	Wetlands Centre, Barnes	Suburban	3.2m	N/A	24	25	21	25	21	20
RHG	Mobile Air Quality Unit, Chertsey Rd,TW2	Roadside	2.9m	1.6m	43	42	N/A	N/A	37	34

Site ID	Location	Site Type	Inlet Height (m)	Distance from Kerb of Nearest Road (m)	NO_2 Annual Mean Concentration (µg/m^3)					
					2013	2014	2015	2016	2017	2018
TD0	NPL - Teddington AURN	Suburban	N/A	N/A	21	27	19	22	N/A	N/A

All automatic monitoring locations outlined in Table 4.1, monitored annual average NO_2 concentrations below the AQO for NO_2 in 2018.

Non-Continuous Monitoring

LBRUT operates a network of passive diffusion tubes which measure NO_2 concentrations across the borough. The most recently available monitoring data is for 2018 and the monitoring locations within the study area are detailed below in Table 4.2.

Table 4.2 Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Inlet Height (m)	Distance from Kerb of Nearest Road (m)	NO_2 Annual Mean Concentration 2018 (µg/m^3)
13	Whitton Rd, Whitton, (opp. rugby ground)	Kerbside	2.2	0.8	39
31	A316 (Chudleigh Rd)	Roadside	2.2	1.0	49
32	Kings St,Twickenham	Roadside	2.2	1.0	56
58	London Road, Twickenham	Kerbside	2.2	0.7	43
59	Whitton Rd, Twickenham (near Twickenham bridge)	Kerbside	2.2	0.6	40
61	London Road, Twickenham (near Waitrose)	Roadside	2.2	1.8	43
65	York Street, Twickenham	Kerbside	2.2	0.4	55

As shown in Table 4.2, all diffusion tube locations, except monitoring location 13, exceeded the AQO for NO_2 in 2018.

4.2 WYG Monitoring

Table 4.3 Monitored Annual Mean NO_2 Concentrations

Site ID	Location	Site Type	Inlet Height (m)	NO_2 Annual Mean Concentration 2018 (µg/m^3)
D1	Station Yard Site boundary	Roadside	2.5	26.77
D2	London Road, Station Yard Junction	Roadside	2.5	40.70
D3	North of Proposed Site Boundary	Roadside	2.5	25.50
D4	North East of Proposed Site Boundary	Roadside	2.5	25.77
D5	Crane Road	Roadside	2.5	41.01

Site ID	Location	Site Type	Inlet Height (m)	NO_2 Annual Mean Concentration 2018 (µg/m^3)
D6	Crane Road	Roadside	2.5	28.60
D7	Crane Road	Roadside	2.5	25.02

As shown in Table 4.3, diffusion tube monitoring locations D2 and D5 monitored annual mean concentrations of NO_2 above the annual average AQO in 2019. These diffusion tubes are located on junctions with high traffic flows, and are subjected to elevated concentrations of NO_2. They are not representative of receptors. Monitoring Locations D1, D3 and D4 are all on the proposed site boundary, all of these monitoring locations monitor well below the AQO and it is expected that proposed residents will not experience concentrations of NO_2 above the AQO.

4.3 Meteorology

Meteorological conditions have significant influence over air pollutant concentrations and dispersion. Pollutant levels can vary significantly from hour to hour as well as day to day, thus any air quality predictions need to be based on detailed meteorological data. The ADMS model calculates the dispersion of pollutants on an hourly basis using a year of local meteorological data. The 2018 meteorological data used in the assessment is derived from London Heathrow Meteorological Station. This is the nearest meteorological station, which is considered representative of the development site, with all the complete parameters necessary for the ADMS model. Reference should be made to Figures 2 for an illustration of the prevalent wind conditions at the London Heathrow Meteorological Station site.

4.4 Emission Sources

A desktop assessment has identified that traffic movements are likely to be the most significant local source of pollutants affecting the site and its surroundings. The principal traffic derived pollutants likely to impact local receptors are NO_2, PM_{10} and $PM_{2.5}$.

The assessment has therefore modelled all roads within the immediate vicinity of the proposed development site which are considered likely to contribute to pollutant levels on site as a result of the proposed development. Reference should be made to Figure 1 for a graphical representation of the traffic data utilised within the ADMS Roads 4.1 model.

It should be noted that the pollutant contribution of minor roads and rail sources that are not included within the dispersion model is considered to be accounted for by using background air quality levels.

4.5 Sensitive Receptors

Receptors that are considered as part of the air quality assessment are primarily those existing receptors that are situated along routes predicted to experience changes in traffic flow as a result of the proposed development and the proposed receptors.

The existing receptor locations are summarised in Table 4.4 and the spatial locations of all modelled receptors are illustrated in Figure 1.

Table 4.4 Modelled Existing Sensitive Receptor Locations

Discrete Sensitive Receptor		Height of Receptors
R1	2 Grosvenor Road	1.5
R2	88 Holly Road	1.5
R3	10 York Street	4.0
R4	Premier House	4.0
R5	2 Cole Park Road	1.5
R6	18 Whitton Road	1.5
R7	118 Whitton Road	1.5
R8	123 Whitton Road	1.5
R9	1A Cole Park Road	1.5

The locations of these receptors are displayed in Figure 1.

There are five proposed receptors at the development site. These are shown on Figure 1.

4.6 Ecological Receptors

Air quality impacts associated with the proposed re-development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The IAQM guidance on 'Air Quality Impacts on Designated Nature Conservation Sites' (2019) document outlines the types of designated nature sites within 2 km of the proposed development which require air quality assessment. These are inclusive of;

- Sites of Special Scientific Interest (SSSIs);
- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Ramsar Sites;
- Areas of Special Scientific Interest (ASSIs);
- National Nature Reserves (NNRs);
- Local Nature Reserves (LNRs);
- Local Wildlife Sites (LWSs); and,
- Areas of Ancient Woodland (AW).

The Conservation of Habitats and Species Regulations (2017) additionally requires competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Consultation with the project ecologists (RPS) has also been undertaken.

Following a search within a 2 km radius of the site boundary, the following ecological receptors were identified.

Table 4.5 Ecological Receptors

Site ID	Site	Designation	UK NGR (m)		Distance from Site (km)
			X	Y	
E1	Ham Lands	LNR	516488	173003	0.8

This ecological receptor has not been assessed as it is located across the River Thames. The closest crossing point is located 1.65km east of the proposed site. As the proposed development will not generate additional vehicle movements or energy emissions, assessment of the Ecological receptor has been screened out.

5. Assessment of Air Quality Impacts - Construction Phase

5.1 Pollutant Sources

The main emissions during construction are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from construction materials. The main potential effects of dust and particulate matter are:

- Visual - dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
- Physical and/or chemical contamination and corrosion of artefacts;
- Coating of vegetation and soil contamination; and,
- Health effects due to inhalation e.g. asthma or irritation of the eyes.

A number of other factors such as the amount of precipitation and other meteorological conditions will also greatly influence the amount of particulate matter generated.

Construction activities can give rise to short-term elevated dust/PM_{10} concentrations in neighbouring areas. This may arise from vehicle movements, soiling of the public highway or windblown stockpiles.

5.2 Particulate Matter (PM_{10})

The UK Air Quality Standards seek to control the health implications of respirable PM_{10}. However, the majority of particles released from construction will be greater than this in size.

Construction works on site have the potential to elevate localised PM_{10} concentrations in the area. On this basis, mitigation measures should still be taken to minimise these emissions as part of good site practice.

5.3 Dust

Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. Although there are no formal standards or criteria for nuisance caused by deposited particles, the IAQM 'Guidance on Monitoring in the Vicinity of Demolition and Construction Sites' (October 2018) and the Environment Agency Technical Guidance Note (TGN) M17 states that dust is usually compared with a 'complaints likely' guideline of 200mg/m^2/day. Therefore, a deposition rate of 200mg/m^2/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

Construction activities have the potential to suspend dust, which could result in annoyance of residents surrounding the site. Measures will be taken to minimise the emissions of dust as part of good site practice. Recommended mitigation measures proportionate to the risk associated with the development and based on best practice guidance are discussed in the following sections.

5.4 Methodology

The construction phase assessment utilises the IAQM Guidance on the Assessment of Dust from Demolition and Construction document published in February 2014.

Four construction processes are considered; these are demolition, earthworks, construction and trackout. For each of these phases, the impact description of the potential dust impacts is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore assessing worst case impacts. A full explanation of the methodology is contained in Appendix A.

5.5 Assessment Results

Based on the methodology detailed in Appendix A, the scale of the anticipated works has determined the potential dust emission magnitude for each process, as presented in the Table 5.1 below.

Table 5.1 Dust Emission Magnitude

Construction Process	Comments	Dust Emission Magnitude
Demolition	No demolition as part of scheme	N/A
Earthworks	Total Site Area < 2,500m^2	Small
Construction	Total Building Volume < 25,000m^2	Small
Trackout	< 10 HDV	Large

The sensitivity of the surrounding area to each construction process has been determined following stage 2B of the IAQM guidance. The assessment has determined the area sensitivities as shown in the Table 5.2.

Table 5.2 Sensitivity of the Area

Source	Area Sensitivity					
	Dust Soiling		Health Effects of PM_{10}		Ecological	
Demolition	N/A	No demolition as part of the proposals	N/A	No demolition as part of the proposals	N/A	No demolition as part of the proposals
Earthworks	Medium	1-10 receptors within 20m of the site	Low	Background PM_{10} level <24µg/m^3	No ecological receptors within 500m of roads from the site	N/A
Construction	Medium	1-10 receptors within 20m of the site	Low	Background PM_{10} level <24µg/m^3	No ecological receptors within 500m of roads from the site	N/A
Trackout	High	1-10 receptors within 20m of the site	Low	Background PM_{10} level <24µg/m^3	No ecological receptors within 500m of roads from	N/A

Source	Area Sensitivity					
	Dust Soiling		Health Effects of PM_{10}		Ecological	
					the site	

The dust emission magnitude determined in Table 5.1 has been combined with the sensitivity of the area determined in Table 5.2, to determine the risk of impacts prior to the implementation of appropriate mitigation measures. The potential impact description of dust emissions associated with the construction phase, without mitigation, is presented below in Table 5.3 (overleaf).

Table 5.3 Impact Description of Construction Activities without Mitigation

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Low	Negligible	N/A
Construction	Low	Negligible	N/A
Trackout	High	Low	N/A

Appropriate mitigation measures are detailed and presented in Section 9. Following the adoption of these measures, the subsequent impact description of the construction phase is not predicted to be significant.

6. Traffic Modelling

The operational phase assessment consists of the quantified predictions of NO_2, PM_{10} and $PM_{2.5}$ for the operational phase of the development. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

In accordance with the provided traffic data, as contained within the supporting Traffic Assessment (TA), the operational phase assessment has been undertaken with an assumed development opening year of 2022. The assessment scenarios are therefore:

- 2018 Baseline = Existing baseline conditions;
- 2022 "Do Minimum" = Baseline conditions + committed development flows; and
- 2022 "Do Something" = Baseline conditions + committed development flows + proposed development flows.

6.1 Existing and Predicted Traffic Flows

Baseline 2018 data and projected 2022 'do minimum' and 'do something' traffic data has been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT).

The proposed development is a car free scheme, therefore there are no additional traffic flows associated with the proposed development.

Baseline 2018 traffic data was downloaded from the Department for Transport website.

The opening year is assumed to be 2022. A TEMPro growth factor of 1.0383 has been applied to the Baseline 2018 data to derive the 2022 AADT flows for the 'do minimum' scenario.

As there a no additional traffic flows for the proposed development, the 'do something' traffic flows are the same as the 'do minimum' scenario.

Emission factors for the 2018 baseline and 2022 projected 'do minimum' and 'do something' scenarios have been calculated using the Emission Factor Toolkit Version 9.0 (May 2019).

It is assumed the average vehicle speeds on the local road network in an opening year of 2022 will be broadly the same as the ones in 2018 as well. Where unavailable, traffic speeds have been estimated based on-site observations and national speed limits.

A 50m 20km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in Figure 1. Detailed traffic figures are provided in the Table 6.1.

Table 6.1 Traffic Data

Link	Speed (km/h)	2018		2022			
		AADT	HGV %	Do Minimum		Do Something	
				AADT	%HGV	AADT	%HGV
Station Road East of Site	48	3160	0.91	3281	0.91	3281	0.91
Station Road West of Site	48	3160	0.91	3281	0.91	3281	0.91
King Street South of Station Road	48	14859	1.68	15428	1.68	15428	1.68
London Road East of Site	48	17640	7.70	18316	7.70	18316	7.70
Whitton Road	48	6359	2.00	6603	2.00	6603	2.00
London Road North of Whitton Road	48	11281	2.54	11713	2.54	11713	2.54
York Street	32	16062	0.84	16677	0.84	16677	0.84
Chertsey Road	64	44733	2.32	46446	2.32	46446	2.32

6.2 Background Concentrations

The use of background concentrations within the modelling process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants include industrial, domestic and rail emissions within the vicinity of the study site. Several sources have been used to obtain representative background levels as discussed below.

The background concentrations used within the assessment have been determined with reference to the IAQM Guidance and TG (16).

The IAQM Guidance states:

> "*A matter of judgement should take into account the background and future background air quality and whether it is likely to approach or exceed the value of the AQO.*"

Additionally, TG (16) states:

> "*Typically, only the process contributions from local sources are represented within the output from the dispersion model. In these circumstances, it is necessary to add an appropriate background concentration(s) to the modelled source contributions to derive the total pollutant concentrations.*"

In accordance with this guidance, a review of all available background pollutant concentrations has been conducted on an individual receptor by receptor basis. This review compares sources from Defra, London Authorities Emissions Inventory (LAEI) and LA Monitoring data. The analysis and final utilised background concentrations for each modelled receptor are detailed in the sections below.

Defra Published Background Mapped data/Concentrations

Background concentrations considered include the levels from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the development site. In May 2019, Defra issued revised 2018 based background maps for nitrogen oxide (NO_X), NO_2, PM_{10} and $PM_{2.5}$ which incorporate updates to Defra's input data.

The published 2017 background maps predicted pollutant concentrations for the existing and proposed receptors are listed in Table 6.3 below.

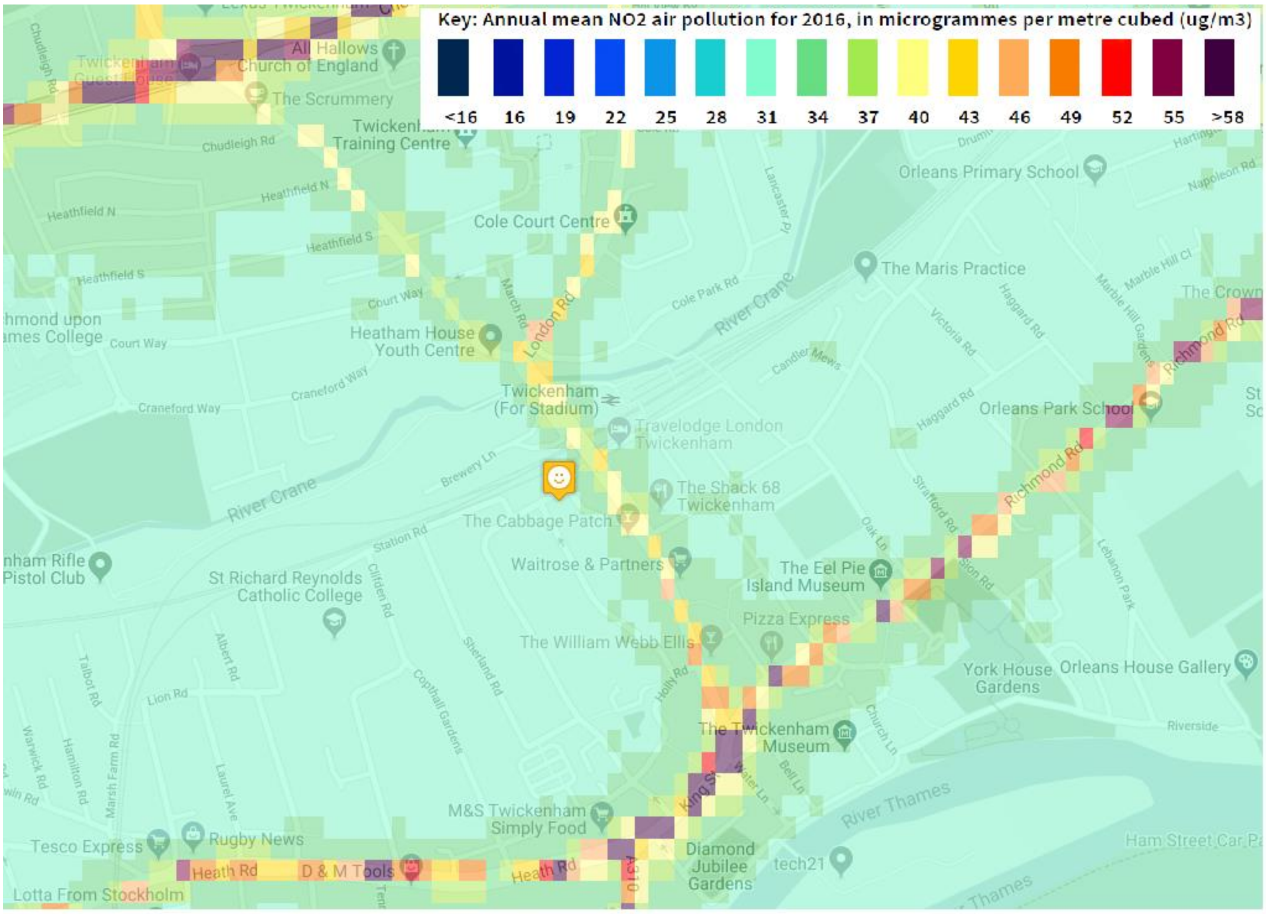
Table 6.3 Published Background Air Quality Levels for Monitoring Sites (µg/m^3)

Receptor Location	2018			
	NO_2	NO_x	PM_{10}	$PM_{2.5}$
Monitoring Locations				
D1	22.57	34.54	16.62	11.59
D2	22.57	34.54	16.62	11.59
65	22.57	34.54	16.62	11.59
61	22.57	34.54	16.62	11.59
58	22.57	34.54	16.62	11.59
59	22.56	34.54	16.58	11.67
31	22.39	34.22	16.31	11.44
Receptor Locations				
R1	22.57	34.54	16.62	11.59
R2	22.57	34.54	16.62	11.59
R3	22.57	34.54	16.62	11.59
R4	22.57	34.54	16.62	11.59
R5	22.57	34.54	16.62	11.59
R6	22.56	34.54	16.58	11.67
R7	22.39	34.22	16.31	11.44
R8	22.39	34.22	16.31	11.44
R9	22.57	34.54	16.62	11.59
PR1	22.57	34.54	16.62	11.59
PR2	22.57	34.54	16.62	11.59
PR3	22.57	34.54	16.62	11.59
PR4	22.57	34.54	16.62	11.59
PR5	22.57	34.54	16.62	11.59

London Atmospheric Emissions Inventory Analysis

To monitor and inform the public of air quality issues across London, the Environmental Research Group from Kings College London have joined up with the Local Authorities for each of the Boroughs of London. As part of this ongoing research, the London Atmospheric Emissions Inventory (LAEI) has been created, which has modelled all emission sources for NO_2, NO_x, PM_{10} and $PM_{2.5}$ for 2016 and 2020 on a 20m by 20m spatial resolution. The LAEI is inclusive of all emissions sources, including transport, across the boroughs of London. This data has been utilised to produce the LondonAir Maps which visually present the spatial trends in NO_2 concentrations across London. The most recently available map was produced for the year of 2016, as this is the most recently available reliable dataset. This is shown in Figure 6.1 below.

Figure 6.1 LondonAir Map 2016 Concentrations, Station Yard, Twickenham



The monitored NO_2 concentrations across LBRUT and the predicted concentrations detailed in the LAEI have been reviewed. The LAEI data did not follow the NO_2 trends monitored in 2018 as outlined in Table 6.4. The LAEI database is unrepresentative of NO_2 concentrations in the study area and so has not been used to inform this assessment.

<u>Model Traffic NO_2 Contribution Analysis</u>

As these diffusion tubes monitor roadside NO_2, to determine the likely background NO_2 for each area, the unadjusted baseline ADMS model output NO_2 for each monitoring location has been subtracted from the monitored NO_2. A review of the potential background contributions (monitored results less modelled traffic contribution) in each area has been undertaken to determine the most appropriate background levels (accounting for variation in monitored levels due to micro-siting and local non-traffic sources).

Table 6.5 Roadside Modelled Contribution at Tubes

Monitoring Location	Monitored NO_2 (µg/m³)	Modelled Contribution NO_2 (µg/m³)	Non-Modelled NO_2 (µg/m³)
D1	26.77	1.25	25.56
D2	40.70	3.94	35.92
65	55.00	5.14	49.86
61	43.00	5.56	37.44
58	43.00	4.78	38.22
59	40.00	3.34	36.66
31	49.00	7.25	41.75

From the review of all the above sources, it was determined that Defra was most representative.

Table 6.6 Background Concentrations Used in Modelling Assessment

Receptor location	Background Source	Background Concentration Utilised	
		NO_2	NO_x
Monitoring Locations			
D1	DEFRA	22.57	34.54
D2		22.57	34.54
65		22.57	34.54
61		22.57	34.54
58		22.57	34.54
59		22.56	34.54
31		22.39	34.22
Modelled Receptors			
R1	DEFRA	22.57	34.54
R2	DEFRA	22.57	34.54
R3	DEFRA	22.57	34.54
R4	DEFRA	22.57	34.54
R5	DEFRA	22.57	34.54
R6	DEFRA	22.56	34.54
R7	DEFRA	22.39	34.22
R8	DEFRA	22.39	34.22
R9	DEFRA	22.57	34.54
PR1	DEFRA	22.57	34.54
PR2	DEFRA	22.57	34.54
PR3	DEFRA	22.57	34.54
PR4	DEFRA	22.57	34.54
PR5	DEFRA	22.57	34.54

6.3 Model Verification

Model verification involves the comparison of modelled data to monitored data in order to gain the best possible representation of current pollutant concentrations for the assessment years. The verification process is in general accordance with that contained in Section 7 of the TG16 guidance note and uses the most recently available diffusion tube monitoring data to best represent this.

The verification process consists of using the monitoring data and the published background air quality data in the UK National Air Quality Information Archive to calculate the road traffic contribution of NO_X at the monitoring locations. Outputs from the ADMS Roads model are provided as predicted road traffic contribution NO_X emissions. These are converted into predicted roadside contribution NO_2 exposure at the relevant receptor locations based on the updated approach to deriving NO_2 from NO_X for road traffic sources published in Local Air Quality Management TG16. The calculation was derived using the NO_X to NO_2 worksheet in the online LAQM tools website hosted by Defra. Table 6.7 summarises the final model/monitored data correlation following the application of the model correction factor.

Table 6.7 Comparison of Roadside Modelling & Monitoring Results for NO_2

Monitoring Location	NO_2 µg/m^3		
	Monitored NO_2	Modelled NO_2	Difference (%)
D1	26.81	27.88	3.99
D2	39.86	39.77	-0.23
65	55.00	46.50	-15.46
61	43.00	46.49	8.11
58	43.00	43.47	1.09
59	40.00	37.35	-6.64
31	49.00	53.65	9.50

The final model produced data at the monitoring locations to within 25% of the monitoring results, as the requirement by TG16 guidance.

The final verification model correlation coefficient (representing the model uncertainty) is 1.07[1]. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

The 'ideal value' correlation coefficient recommended in Box 7.17 of TG16 is 1.00. The model is therefore considered to be verified and suitably representative of local emissions and exposures.

[1] This was achieved by applying a model correction factor of 4.25 to roadside predicted NO_X concentrations before converting to NO_2

6.4 Summary of Model Inputs

Table 6.8 Summary of ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**London Heathrow Meteorological Station**, hourly sequential data
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1.5m** representing a typical surface roughness for **Large Urban areas**.
Latitude	Allows the location of the model area to be set	United Kingdom = **51.45**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Large Conurbations >1 million = **100m.**
Elevation of Road	Allows the height of the road link above ground level to be specified.	All road links were set at ground level = **0m**.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link.
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**London (Outer)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a "street canyon".	No canyons were used.
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.	The **EFT** Version **9.0 (2019)** dataset was used.
Year	Predicted EFT emissions rates depend on the year of emission.	**2018** data for verification and baseline operational phase assessment **2022** data for the operational phase assessment.

6.5 ADMS Modelling Results

Traffic Assessment

The ADMS Model has predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at relevant receptor locations adjacent to roads likely to be affected by the development, as summarised in the following tables.

Assessment Scenario:

For the assumed development opening year of 2022, assessment of the effects of emissions from the proposed traffic associated with the scheme, has been undertaken using the Emissions Factor Toolkit (EFT) 2022 emissions rates which consider of the rate of reduction in emission from road vehicles into the future with the following factors:

- 2018 Baseline = Existing baseline conditions;
- 2022 "Do Minimum" = Baseline conditions + committed development flows;

- 2022 "Do Something" = Baseline conditions + committed development flows + proposed development flows (none).

An additional theoretical scenario has also been undertaken using emission factors from 2018 for the 'do minimum' and 'do something' based on a recent appeal decision that favoured the uncertainty of emissions forecasts. It should be noted that this is a theoretical scenario which assumes that the Government (Defra) predictions for reduction in emissions over the forthcoming years will not occur. However, this should not be considered as a 'more correct' scenario in accordance with the 2010 note [http://laqm.defra.gov.uk/laqm-faqs/faq5.html] which confirms that: *'There is no evidence to suggest that background concentrations associated with the other (non-traffic) source contributions should not behave as forecast. This disparity in the historical data highlights the uncertainty of future year projections of both NO_x and NO_2, but at this stage there is no robust evidence upon which to base any revised road traffic emissions projections*.

- 2022 'Do Minimum' Theoretical Scenario = Baseline + committed development (**using 2018 traffic emission factors**);
- 2022 'Do Something' Theoretical Scenario = Baseline + committed development + Proposed development (**using 2018 traffic emission factors**).

The additional theoretical scenario assessment results are presented in **Appendix B**.

<u>Nitrogen Dioxide</u>

Table 6.9 presents a summary of the predicted change in NO_2 concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.9 Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 ($\mu g/m^3$)			
		Baseline 2018	Do Minimum 2022	Do Something 2022	Development Contribution
R1	2 Grosvenor Road	28.67	27.05	27.05	0.00
R2	88 Holly Road	27.35	26.25	26.25	0.00
R3	10 York Street	37.61	34.38	34.38	0.00
R4	Premier House	31.94	29.70	29.70	0.00
R5	2 Cole Park Road	38.07	33.53	33.53	0.00
R6	18 Whitton Road	29.70	27.92	27.92	0.00
R7	118 Whitton Road	37.25	33.48	33.48	0.00
R8	123 Whitton Road	44.32	38.95	38.95	0.00
R9	1A Cole Park Road	32.94	30.20	30.20	0.00
PR1	Proposed Residential Receptor	-	-	26.57	-
PR2	Proposed Residential Receptor	-	-	26.83	-
PR3	Proposed Residential Receptor	-	-	27.21	-
PR4	Proposed Residential Receptor	-	-	27.49	-
PR5	Proposed Residential Receptor	-	-	28.48	-

As indicated in Table 6.9, the maximum predicted increase in the annual average NO_2 concentration at any modelled existing receptor is 0.00 µg/m^3 at all proposed receptor locations

All modelled proposed receptors are predicted to be below the annual mean AQO for NO_2, and therefore no additional mitigation measures will be required.

All proposed receptors predict NO_2 concentrations of below 60 µg/m^3 in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

The impact description of changes in traffic flow associated with the development with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6.10.

Table 6.10 Impact Description of Effects at Key Receptors (NO_2)

Impact Description of NO_2 Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m^3)	% Change of AQO	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Impact Description
R1	0.00	0.00	0%	≤75% of AQAL	Negligible
R2	0.00	0.00	0%	≤75% of AQAL	Negligible
R3	0.00	0.00	0%	76-94% of AQAL	Negligible
R4	0.00	0.00	0%	76-94% of AQAL	Negligible
R5	0.00	0.00	0%	76-94% of AQAL	Negligible
R6	0.00	0.00	0%	≤75% of AQAL	Negligible
R7	0.00	0.00	0%	76-94% of AQAL	Negligible
R8	0.00	0.00	0%	95-102% of AQAL	Negligible
R9	0.00	0.00	0%	76-94% of AQAL	Negligible
*0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The impact description of any effects associated with the proposed development is determined to be 'negligible' at all modelled receptors, based on the methodology outlined in Section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

Particulate Matter (PM_{10})

Table 6.11 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.11 Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		PM_{10} ($\mu g/m^3$)			
		Baseline 2018	Do Minimum 2022	Do Something 2022	Development Contribution
R1	2 Grosvenor Road	17.91	17.86	17.86	0.00
R2	88 Holly Road	17.63	17.60	17.60	0.00
R3	10 York Street	19.58	19.46	19.46	0.00
R4	Premier House	18.68	18.61	18.61	0.00
R5	2 Cole Park Road	19.94	19.83	19.83	0.00
R6	18 Whitton Road	18.09	18.04	18.04	0.00
R7	118 Whitton Road	18.90	18.77	18.77	0.00
R8	123 Whitton Road	20.44	20.22	20.22	0.00
R9	1A Cole park Road	18.84	18.76	18.76	0.00
PR1	Proposed Residential Receptor	-	-	17.73	-
PR2	Proposed Residential Receptor	-	-	17.81	-
PR3	Proposed Residential Receptor	-	-	17.92	-
PR4	Proposed Residential Receptor	-	-	18.01	-
PR5	Proposed Residential Receptor	-	-	18.33	-
Annual Mean AQO		**40 $\mu g/m^3$**			

As indicated in Table 6.11, the maximum predicted increase in the annual average PM_{10} concentrations at all modelled existing receptors is 0.00 $\mu g/m^3$ at all receptor locations.

All modelled existing and proposed receptor locations are predicted to be below the AQO for PM_{10} in both the 'do minimum' and 'do something' scenarios.

The impact description of changes in traffic flow associated with the development with respect to annual mean PM_{10} exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6.12.

Table 6.12 Impact Description of Effects at Key Receptors (Particulate Matter)

Impact Description of PM_{10} Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) ($\mu g/m^3$)	% Change of AQO	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Impact Description
R1	0.00	0.00	0%	≤75% of AQAL	Negligible
R2	0.00	0.00	0%	≤75% of AQAL	Negligible
R3	0.00	0.00	0%	≤75% of AQAL	Negligible
R4	0.00	0.00	0%	≤75% of AQAL	Negligible
R5	0.00	0.00	0%	≤75% of AQAL	Negligible

Impact Description of PM_{10} Effects at Key Receptors					
Receptor	Change Due to Development (DS-DM) (µg/m³)	% Change of AQO	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Impact Description
R6	0.00	0.00	0%	≤75% of AQAL	Negligible
R7	0.00	0.00	0%	≤75% of AQAL	Negligible
R8	0.00	0.00	0%	≤75% of AQAL	Negligible
R9	0.00	0.00	0%	≤75% of AQAL	Negligible
*0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The impact description of any effects associated with the proposed development is determined to be 'negligible' at all modelled receptors, based on the methodology outlined in Section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

Particulate Matter ($PM_{2.5}$)

Table 6.13 presents a summary of the predicted change in annual mean $PM_{2.5}$ concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.13 Predicted Annual Average Concentrations of $PM_{2.5}$ at Receptor Locations

Receptor		$PM_{2.5}$ (µg/m³)			
		Baseline 2018	Do Minimum 2022	Do Something 2022	Development Contribution
R1	2 Grosvenor Road	12.37	12.30	12.30	0.00
R2	88 Holly Road	12.20	12.15	12.15	0.00
R3	10 York Street	13.43	13.26	13.26	0.00
R4	Premier House	12.83	12.73	12.73	0.00
R5	2 Cole Park Road	13.60	13.43	13.43	0.00
R6	18 Whitton Road	12.59	12.51	12.51	0.00
R7	118 Whitton Road	13.07	12.90	12.90	0.00
R8	123 Whitton Road	14.02	13.75	13.75	0.00
R9	1A Cole park Road	12.93	12.82	12.82	0.00
PR1	Proposed Residential Receptor	-	-	12.22	-
PR2	Proposed Residential Receptor	-	-	12.27	-
PR3	Proposed Residential Receptor	-	-	12.33	-
PR4	Proposed Residential Receptor	-	-	12.38	-
PR5	Proposed Residential Receptor	-	-	12.56	-
Annual Mean AQO		**25 µg/m³**			

As indicated in Table 6.13, the maximum predicted increase in the annual average $PM_{2.5}$ concentration at all modelled existing receptors is 0.00 µg/m³.

All modelled existing and proposed receptor locations are predicted to be below the AQO for $PM_{2.5}$ in both the 'do minimum' and 'do something' scenarios.

The impact description of changes in traffic flow associated with the development with respect to annual mean $PM_{2.5}$ exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6.14.

Table 6.14 Impact Description of Effects at Key Receptors (Particulate Matter)

Impact Description of $PM_{2.5}$ Effects at Key Receptors					
Receptor	**Change Due to Development (DS-DM) (μg/m³)**	**% Change of AQO**	**% Change in Concentration Relative to AQAL**	**% Annual Mean Concentration in Assessment Year**	**Impact Description**
R1	0.00	0.00	0%	≤75% of AQAL	Negligible
R2	0.00	0.00	0%	≤75% of AQAL	Negligible
R3	0.00	0.00	0%	≤75% of AQAL	Negligible
R4	0.00	0.00	0%	≤75% of AQAL	Negligible
R5	0.00	0.00	0%	≤75% of AQAL	Negligible
R6	0.00	0.00	0%	≤75% of AQAL	Negligible
R7	0.00	0.00	0%	≤75% of AQAL	Negligible
R8	0.00	0.00	0%	≤75% of AQAL	Negligible
R9	0.00	0.00	0%	≤75% of AQAL	Negligible
*0% means a change of <0.5% as per explanatory note 2 of table 6.3 of the EPUK IAQM Guidance.					

The impact description of any effects associated with the proposed development is determined to be 'negligible' at all modelled receptors, based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

7. Air Quality Neutral Assessment

7.1 Background

This Air Quality Neutral assessment considers the emissions of atmospheric pollutants from the development at source (i.e. from vehicles and building services plant) and compares the emissions with the benchmark levels that define neutrality.

The requirement for this Air Quality Neutral report is driven by:

- Policy 7.14 in the London Plan. The London Plan states: "development proposals should be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality"; and
- The Mayor's Air Quality Strategy (MAQS). The MAQS includes a policy which states that "New developments in London shall as a minimum be 'air quality' neutral through the adoption of best practice in the management and mitigation of emissions."

The 'air quality neutral' policy is designed to address the problem of multiple new developments that individually add only a small increment to pollution at the point of human exposure (i.e. ambient concentrations), but cumulatively lead to baseline pollution levels creeping up. The policy requires Developers to design their schemes so that they are at least Air Quality Neutral in terms of emissions at source.

The Greater London Authority (GLA) Sustainable Design and Construction Supplementary Planning Guidance (SPG), published in April 2014, provides a formal definition for the term 'air quality neutral' and allows a transparent and consistent approach to demonstrating whether a development is 'air quality neutral'. This Air Quality Neutral assessment determines whether the proposed development is air quality neutral using the GLA SPG calculation method that separately quantifies building emissions (from heating and power plant) and transport emissions.

The GLA published a report titled "Air Quality Neutral Planning support update (GLA 80371)" in April 2014. This updated report provided a guidance note on the application of the air quality neutral policy.

7.2 Benchmark Emissions

7.2.1 Buildings Emissions Benchmark

The GLA 80371 report has defined two Building Emission Benchmarks (BEB), one for NO_x and one for PM_{10}, for a series of land-use classes. The benchmarks are expressed in terms of g/m^2/annum. The gross floor area (GFA) is used to define the area.

The derived BEBs for NO_x and PM_{10} Emissions are shown in Table 7.1 (overleaf).

Table 7.1 Building Emissions Benchmarks

Land Use Class	NO_x (g/m^2)	PM_{10} (g/m^2)
Class A1	22.6	1.29
Class A3- A5	75.2	4.32
Class A2and Class B1	30.8	1.77
Class B2- B7	36.6	2.95
Class B8	23.6	1.90
Class C1	70.9	4.07
Class C21	68.5	5.97
Class C31	26.2	2.28
D1 (a)	43.0	2.47
D1 (b)	75.0	4.30
Class D1(c -h)	31.0	1.78
Class D2(a-d)	90.3	5.18
Class D2(e)	284	16.3

Note 1: These benchmarks have been calibrated for London.

7.2.2 Transport Emissions Benchmarks

The derived Transport Emission Benchmarks (TEB) for NO_x and PM_{10} Emissions are shown in Table 8.2.

Table 8.2 Transport Emissions Benchmarks

Land use	CAZ	Inner	Outer
NO_x ($g/m^2/annum$)			
Retail (A1)	169	219	249
Office (B1)	1.27	11.4	68.5
NO_x ($g/m^2/annum$)			
Residential (C3)	234	558	1553
PM_{10} ($g/m^2/annum$)			
Retail (A1)	29.3	39.3	42.9
Office (B1)	0.22	2.05	11.8
PM_{10} (g/dwelling/annum)			
Residential (C3, C4)	40.7	100	267

7.3 Air Quality Neutral Calculations

7.3.1 Building Emissions Benchmark Calculation

The proposed development is to be heated through air source heat pumps and as such there will be no building emissions associated with the proposed development.

Therefore, the proposed development in terms of building emissions is considered to be air quality neutral, and no further mitigation would be required.

7.3.2 Transport Emissions Benchmark Calculations

The proposed development is 'car free', as a result there are no traffic flows associated with the proposed development. Therefore, no further mitigation would be required, and the development is considered 'Air Quality Neutral'.

8. Mitigation

8.1 Construction Phase

The dust risk categories have been determined in Section 5 for each of the four construction activities. The assessment has determined that the potential impact description of dust emissions associated with the construction phase of the proposed development is 'high risk' at the worst affected receptors.

Using the methodology described in Appendix A, appropriate site-specific mitigation measures associated with the determined level of risk can be found in The London Plan, Control of Dust and Emissions during Construction and Demolition SPG. The mitigation measures have been divided into general measures applicable to all sites and measures applicable specifically to earthworks, construction and trackout. They are categorised into 'highly recommended' and 'desirable' measures.

The mitigation measures for the proposed development are detailed in Table 9.1 and Table 9.2 below:

Table 9.1 Highly Recommended Construction Phase Mitigation Measures

Communications
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information
Dust Management
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to the local authority when asked.
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
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.
Cover, seed or fence stockpiles to prevent wind whipping.
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable

Ensure all vehicles switch off engines when stationary - no idling vehicles.
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced 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)
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)
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
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
Avoid bonfires and burning of waste materials.
Construction
Avoid scabbling (roughening of concrete surfaces) if possible
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

Table 9.2 Desirable Construction Phase Mitigation Measures

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
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Following the implementation of the mitigation measures detailed in the tables above, the impact description of the construction phase is not considered to be significant.

8.2 Non-Road Mobile Machinery (NRMM)

An inventory of all Non-Road Mobile Machinery (NRMM) will be kept on-site and registered on http://nrmm.London/ showing the emission limits for all equipment and will be made available to local authority offices if required. All NRMM of net power between 37kW and 560kW will be required to meet Stage IIIA of EU Directive 97/68/EC.

9. Conclusions

WYG have undertaken an Air Quality Assessment for the proposed development at Station Yard, Twickenham in accordance with the methodology and parameters described within this report.

Construction

Prior to the implementation of appropriate mitigation measures, the potential impact description of dust emissions associated with the construction phase of the proposed development has potential as 'high' at some worst affected receptors without mitigation. However, appropriate site-specific mitigation measures have been recommended based on Section 8.2 of the IAQM Guidance on the Assessment of Dust from Earthworks, Construction and Trackout. It is anticipated that with these appropriate mitigation measures in place, the risk of adverse effects due to emissions from the construction phase will not be significant.

Traffic Emissions

All modelled proposed receptors are predicted to be below the annual mean AQO for NO_2, PM_{10} and $PM_{2.5}$, and therefore no additional mitigation measures will be required. All proposed receptors predict NO_2 concentrations of below 60 µg/m^3 in all scenarios. Therefore, it is unlikely for any exceedances of the short-term NO_2 AQO to occur as outlined in LAQM TG16 technical guidance.

Air Quality Neutral

The Air Quality Neutral assessment has determined due to the proposed development being heated by air source heat pumps, and it being a 'car free' development, the proposed development is air quality neutral and no further mitigation is required.

Figures

Figure 1 Air Quality Assessment Area

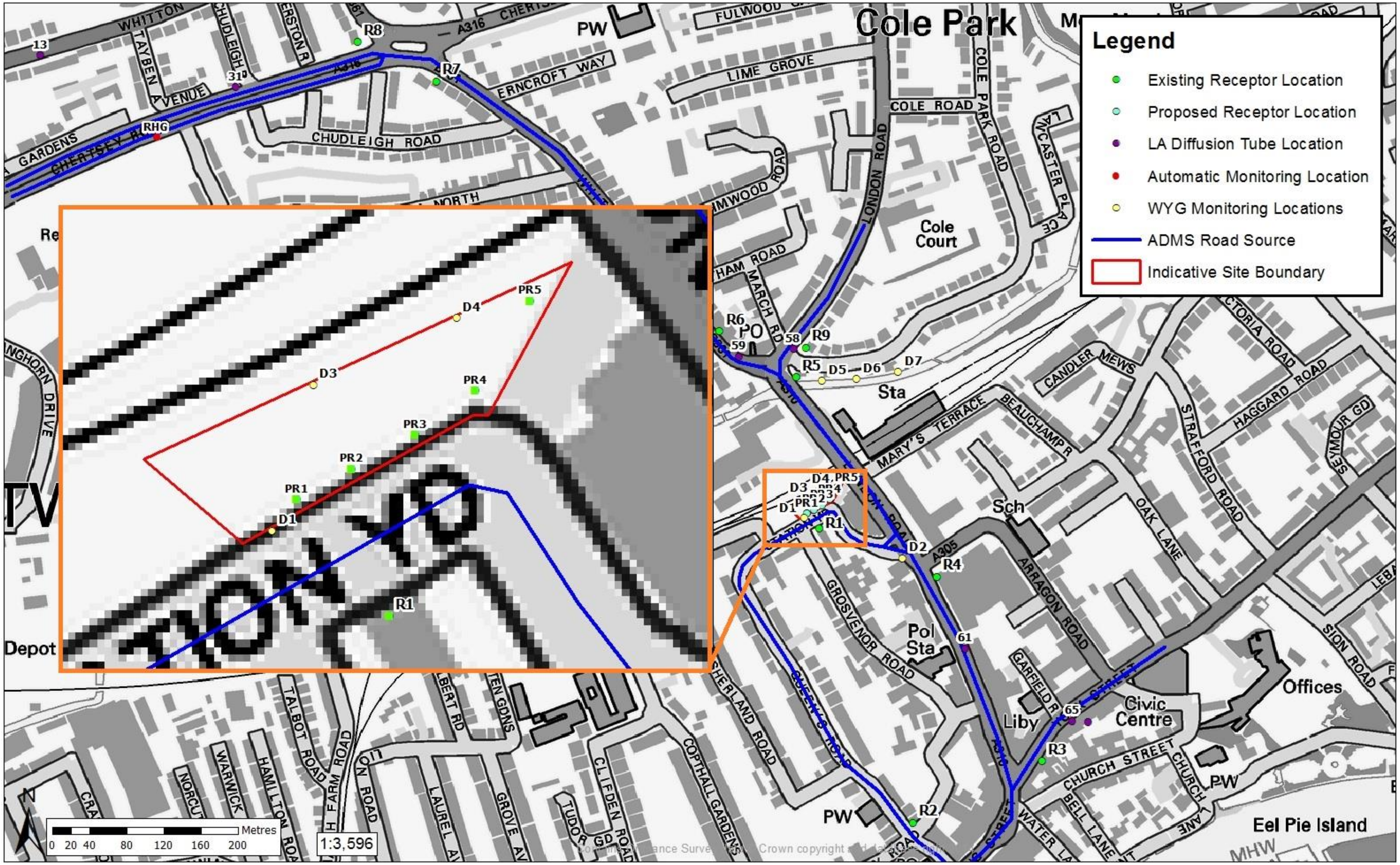
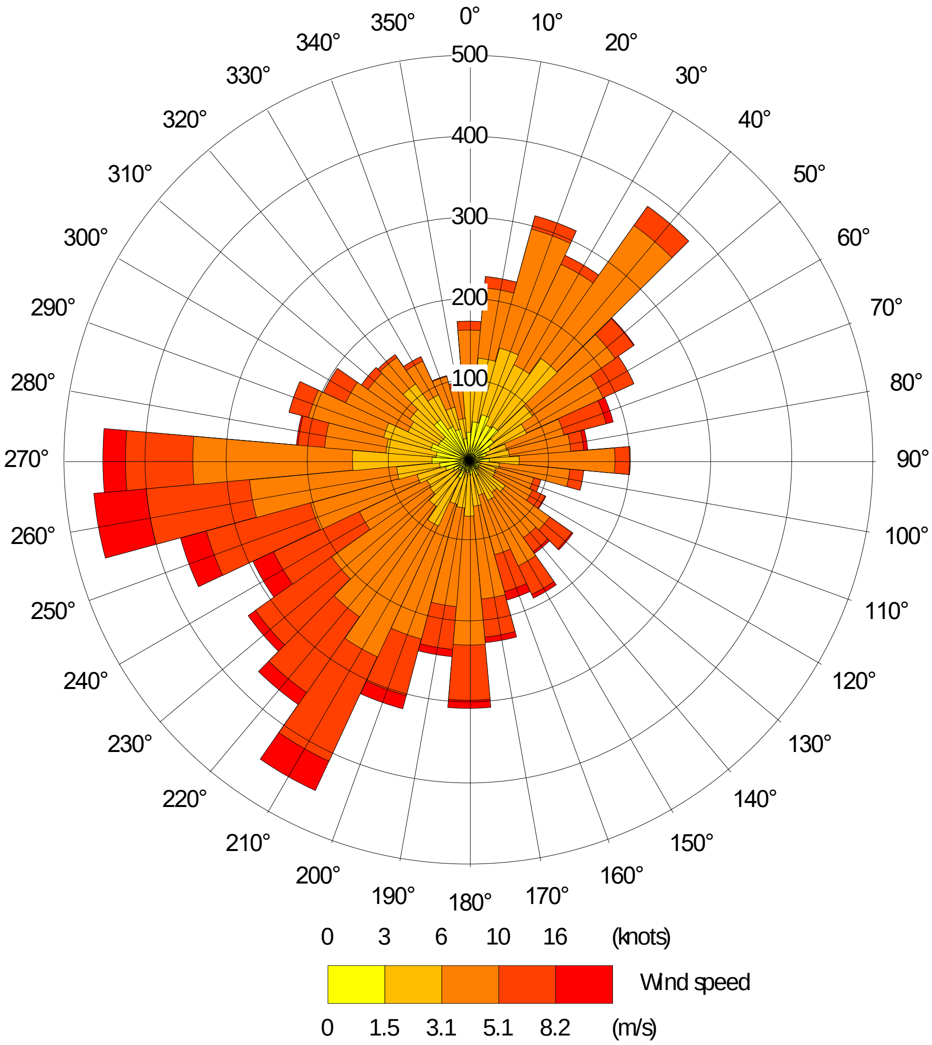


Figure 2 London Heathrow 2018 Meteorological Station Wind Rose



Appendix A Construction Phase Assessment Methodology

The following information sets out the adopted approach to the construction phase impact assessment in accordance with the aforementioned IAQM guidance[2].

Step 1 – Screen the Requirement for a more Detailed Assessment

An assessment is required if there are sensitive receptors within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the surrounding road network, or within 500m from the site entrance. A detailed assessment is also required if there is an ecological receptor within 50m of the site boundary.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude for the demolition phase has been determined based on the below criteria:

- *Large*: Total building volume >50 000m^3, potentially dusty construction (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- *Medium*: Total building volume 20 000m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and,
- *Small*: Total building volume <20 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude for the planned earthworks has been determined based on the below criteria:

- *Large:* Total site area >10 000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), > 10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100 000 tonnes;
- *Medium*: Total site area 2 500m^2 – 10 000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m-8m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- *Small:* Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude for the construction phase has been determined based on the below criteria:

- *Large:* Total building volume >100 000m^3, on site concrete batching; sandblasting
- *Medium:* Total building volume 25 000m^3 – 100 000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and,
- *Small:* Total building volume <25 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

The dust emission magnitude for trackout has been determined based on the below criteria:

- *Large:* >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;

[2] Institute of Air Quality Management 2014. *Guidance on the Assessment of dust from demolition and construction.*

- *Medium:* 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,
- *Small:* <10 HGV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B - Defining the Sensitivity of the Area

Sensitivities of People to Dust Soiling Effects

- *High:*
  - Users can reasonably expect a enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably expect to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; and,
  - Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.
- *Medium:*
  - Users can reasonably expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home;
  - The appearance, aesthetics or value of their property could be diminished by soiling;
  - 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; and,
  - Indicative examples include parks and places of work.
- *Low:*
  - The enjoyment of amenity would not reasonably be expected;
  - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling;
  - 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; and,
  - Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table 19– Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of People to the Health Effects of PM_{10}

- *High:*
    - Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day);
    - Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
- *Medium:*
    - Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day); and,
    - Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
- *Low:*
    - Locations where human exposure is transient; and,
    - Indicative examples include public footpaths, playing fields, parks and shopping streets.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table 20 - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 · g/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 · g/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 – 28 · g/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 · g/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of Receptors to Ecological Effects

- *High:*
    - Locations with an international or national designation and the designated features may be affected by dust soiling;
    - Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain; and,
    - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.

- *Medium:*
  - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;
  - Locations with a national designation where the features may be affected by dust deposition; and,
  - Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
- *Low:*
  - Locations with a local designation where the features may be affected by dust deposition; and,
  - Indicative example is a local Nature Reserve with dust sensitive features.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table 21 - Sensitivity of the Area to Ecological Impacts

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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Step 2C - Defining the Risk of Impacts

The risk of impacts with no mitigation is determined by combining the dust emission magnitude determined in Step 2A and the sensitivity of the area determined in Step 2B.

The following tables provide a method of assigning the level of risk for each activity.

Demolition

Table 22 - 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

Earthworks

Table 23 - 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

Construction

Table 24 - 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

Trackout

Table 25 - 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

Step 3 – Site Specific Mitigation

The dust risk categories for each of the four activities determined in Step 2C should be used to define the appropriate, site-specific mitigation measures to be adopted.

These mitigation measures are contained within section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

Appendix B Theoretical Scenario Results

Table B1 Theoretical Scenario NO_2 Results

Receptor		NO_2 (µg/m^3)			
		Baseline 2018	Do Minimum 2022	Do Something 2022	Development Contribution (DS-DM)
R1	2 Grosvenor Road	28.67	28.89	28.89	0.00
R2	88 Holly Road	27.35	27.53	27.53	0.00
R3	10 York Street	37.61	38.12	38.12	0.00
R4	Premier House	31.94	32.28	32.28	0.00
R5	2 Cole Park Road	38.07	38.61	38.61	0.00
R6	18 Whitton Road	29.70	29.96	29.96	0.00
R7	118 Whitton Road	37.25	37.77	37.77	0.00
R8	123 Whitton Road	44.32	45.04	45.04	0.00
R9	1A Cole park Road	32.94	33.31	33.31	0.00
PR1	Proposed Residential Receptor	-	-	28.26	-
PR2	Proposed Residential Receptor	-	-	28.67	-
PR3	Proposed Residential Receptor	-	-	29.26	-
PR4	Proposed Residential Receptor	-	-	29.78	-
PR5	Proposed Residential Receptor	-	-	31.44	-
Annual Mean AQO		**40 µg/m^3**			

Table B2 Theoretical Scenario PM_{10} Results

Receptor		PM_{10} (µg/m^3)			
		Baseline 2018	Do Minimum 2022	Do Something 2022	Development Contribution (DS-DM)
R1	2 Grosvenor Road	17.91	17.96	17.96	0.00
R2	88 Holly Road	17.63	17.67	17.67	0.00
R3	10 York Street	19.58	19.70	19.70	0.00
R4	Premier House	18.68	18.75	18.75	0.00
R5	2 Cole Park Road	19.94	20.07	20.07	0.00
R6	18 Whitton Road	18.09	18.15	18.15	0.00
R7	118 Whitton Road	18.90	19.00	19.00	0.00
R8	123 Whitton Road	20.44	20.59	20.59	0.00
R9	1A Cole park Road	18.84	18.92	18.92	0.00
PR1	Proposed Residential Receptor	-	-	17.81	-
PR2	Proposed Residential Receptor	-	-	17.90	-
PR3	Proposed Residential Receptor	-	-	18.02	-
PR4	Proposed Residential Receptor	-	-	18.12	-
PR5	Proposed Residential Receptor	-	-	18.46	-
Annual Mean AQO		**40 µg/m^3**			

Table B3 Theoretical Scenario $PM_{2.5}$ Results

Receptor		$PM_{2.5}$ ($\mu g/m^3$)			
		Baseline 2018	**Do Minimum 2022**	**Do Something 2022**	**Development Contribution (DS-DM)**
R1	2 Grosvenor Road	12.37	12.40	12.40	0.00
R2	88 Holly Road	12.20	12.23	12.23	0.00
R3	10 York Street	13.43	13.50	13.50	0.00
R4	Premier House	12.83	12.88	12.88	0.00
R5	2 Cole Park Road	13.60	13.67	13.67	0.00
R6	18 Whitton Road	12.59	12.62	12.62	0.00
R7	118 Whitton Road	13.07	13.13	13.13	0.00
R8	123 Whitton Road	14.02	14.12	14.12	0.00
R9	1A Cole park Road	12.93	12.98	12.98	0.00
PR1	Proposed Residential Receptor	-	-	12.31	-
PR2	Proposed Residential Receptor	-	-	12.36	-
PR3	Proposed Residential Receptor	-	-	12.43	-
PR4	Proposed Residential Receptor	-	-	12.49	-
PR5	Proposed Residential Receptor	-	-	12.70	-
Annual Mean AQO		**25 $\mu g/m^3$**			

For theoretical assessment scenario 2, the maximum predicted increase in the annual average NO_2 concentration at any modelled existing receptor is 0.00 $\mu g/m^3$ at all proposed receptor locations

The maximum predicted increase in the annual average PM_{10} concentration at all modelled existing receptor is 0.00 $\mu g/m^3$.

The maximum predicted increase in the annual average $PM_{2.5}$ concentrations at all modelled existing receptors is 0.00 $\mu g/m^3$.

With respect to predicted NO_2 exposure, the impact description of the proposed development is determined to be 'negligible' at all modelled existing receptors.

With respect to predicted PM_{10} and $PM_{2.5}$ exposure, the impact description of the proposed development is determined to be 'negligible' at all modelled receptors.

Appendix C EP Report Conditions

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The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

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