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Former ICL Private Ground: Air Quality Assessment

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Document Control & Disclaimer

Title:

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Contents

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 Scope

GEM Air Quality Ltd has been commissioned to undertake a detailed air quality assessment based on the potential impacts associated with a proposed mixed-use development on the former Imperial College London Private Ground on Udney Park Road in Teddington, London. The pollutants modelled as part of this assessment are nitrogen oxides (NOx) and particulate matter (PM_{10}).

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

It should be noted that the short-term impacts of NO_2 and PM_{10} emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

In addition to this, the assessment has also assessed the potential impact on local air quality from demolition and construction activities at the site.

An air quality neutral assessment has also been undertaken in accordance with the London Plan.

1.2 Development Proposals

The proposed scheme will see the former Imperial College London Private Ground on Udney Park Road, Teddington regenerated for a mixed-use development that will deliver high-quality sports and community facilities, alongside new public open space and affordable, care led accommodation for Older People and new GP surgery. This triple approach secures a sustainable, inclusive future for the site, the benefits of which underpin national and local planning policy.

With the creation of the Teddington Community Sports Ground Community Interest Company, three areas will be established:

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

2 London Local Air Quality Management (LLAQM), Technical Guidance, April 2016 (LLAQM.TG (16))

1. Assisted living, extra care community with new GP surgery;
2. Open parkland with community Orchard and outdoor gym; and
3. Community sports facilities.

The proposed community sports facilities will comprise of the following:

- A full-size Third Generation artificial grass pitch (3G AGP)
- Natural grass playing pitch provision
- Tennis Courts / MUGA
- Community pavilion containing changing rooms, kitchen, bar and server, flexible-use community rooms and crèche

2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

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

Table 1 – Overview of NO_2 and PM_{10}

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

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007[3]. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM_{10} and $PM_{2.5}$) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2010 which came into force on 11th June 2010. Table 2 provides the UK Air Quality Objectives for NO_2 and PM_{10}.

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

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

Pollutant	Objective	Concentration measured as
Particles (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean
	40µg/m^3	Annual mean
Particles ($PM_{2.5}$)	25µg/m^3 (except Scotland)	Annual Mean
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean
	40µg/m^3	Annual mean

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

As defined in Table 4, background $PM_{2.5}$ concentrations are well below the limit value of 25.0 µg/m^3. As such, no further consideration has been given to $PM_{2.5}$ within this assessment.

2.3 London Local Air Quality Management (LLAQM)

At the core of LLAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide (SO_2). All current Air Quality Management Areas (AQMAs) across the UK are declared for one or more of these pollutants, with NO_2 accounting for the majority. In Greater London, AQMAs are declared for NO_2 and PM_{10} in equal proportions. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

2.3.1 London Borough of Richmond upon Thames

The London Borough of Richmond upon Thames has declared an Air Quality Management Area (AQMA). The AQMA covers the entire Borough and has been declared for NO_2 and PM_{10} from road transport emissions. As such, the proposed development lies within this AQMA.

3 Planning Policy & Guidance

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The National Planning Policy Framework (NPPF) for England, released on 27th March 2013, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF replaces the Planning Policy Statement 23 (PPS23) *Planning and Pollution Control*[4].

The NPPF states that the "planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".

It goes on to state that "planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan".

3.1.2 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes[5].

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

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

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

3.2 Regional Planning Policy & Guidance

3.2.1 The Mayor's Air Quality Strategy

In October 2010, the Mayor's Air Quality Strategy[6] was released. The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from transport, homes, offices and new developments, as well as raising awareness of air quality issues and its impact on health.

3.2.2 The London Plan

In March 2016, the updated London Plan was published by the Greater London Authority[7]. The London Plan provides an overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The Plan brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

Policy 7.14 relates specifically to improving air quality and states the following:

"*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 minimize public exposure to pollution*".

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

"Development proposals should:

- *a minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3)*
- *b promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition'*

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

7 The London Plan. The Spatial Development Strategy for London. Consolidated with Alterations. March 2016

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".*

3.2.3 Supplementary Planning Guidance (SPG)

Control of Dust and Emissions during Construction and Demolition SPG

The Greater London Authority (GLA) released the "*Control of Dust and Emissions during Construction and Demolition*" SPG in July 2014[8]. The guidance seeks to reduce emissions of dust and PM_{10} from construction and demolition activities in London. It also aims to manage emissions of nitrogen oxides (NOx) from construction and demolition machinery. The SPG:

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

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

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

Sustainable Design and Construction SPG

The Greater London Authority (GLA) released the "Sustainable Design and Construction" SPG in July 2014[9]. The SPG aims to support developers, local planning authorities and neighbourhoods to achieve sustainable development. It provides guidance on to how to achieve the London Plan objectives effectively, supporting the Mayor's aims for growth, including the delivery of housing and infrastructure.

In relation to air quality the SPG provides guidance on the following key areas:

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

3.3 Local Planning Policy & Guidance

3.3.1 London Borough of Richmond upon Thames

Policy LP10 within the Councils emerging Local Plan refers specifically to air quality and states the following:

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

1. *an air quality impact assessment, including where necessary, modelled data;*
2. *mitigation measures to reduce the development's impact upon air quality, including the type of equipment installed, thermal insulation and ducting abatement technology;*
3. *measures to protect the occupiers of new developments from existing sources; and*
4. *strict mitigation for developments to be used by sensitive receptors such as schools, hospitals and care homes in areas of existing poor air quality; this also applies to proposals close to developments used by sensitive receptors*".

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

4 ASSESSMENT METHODOLOGY

4.1 Construction Phase

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

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM_{10} concentrations, as a result of dust generating activities on site; and
- An increase in concentrations or airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment on site.

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

"*The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of particulate matter in all size fractions.*

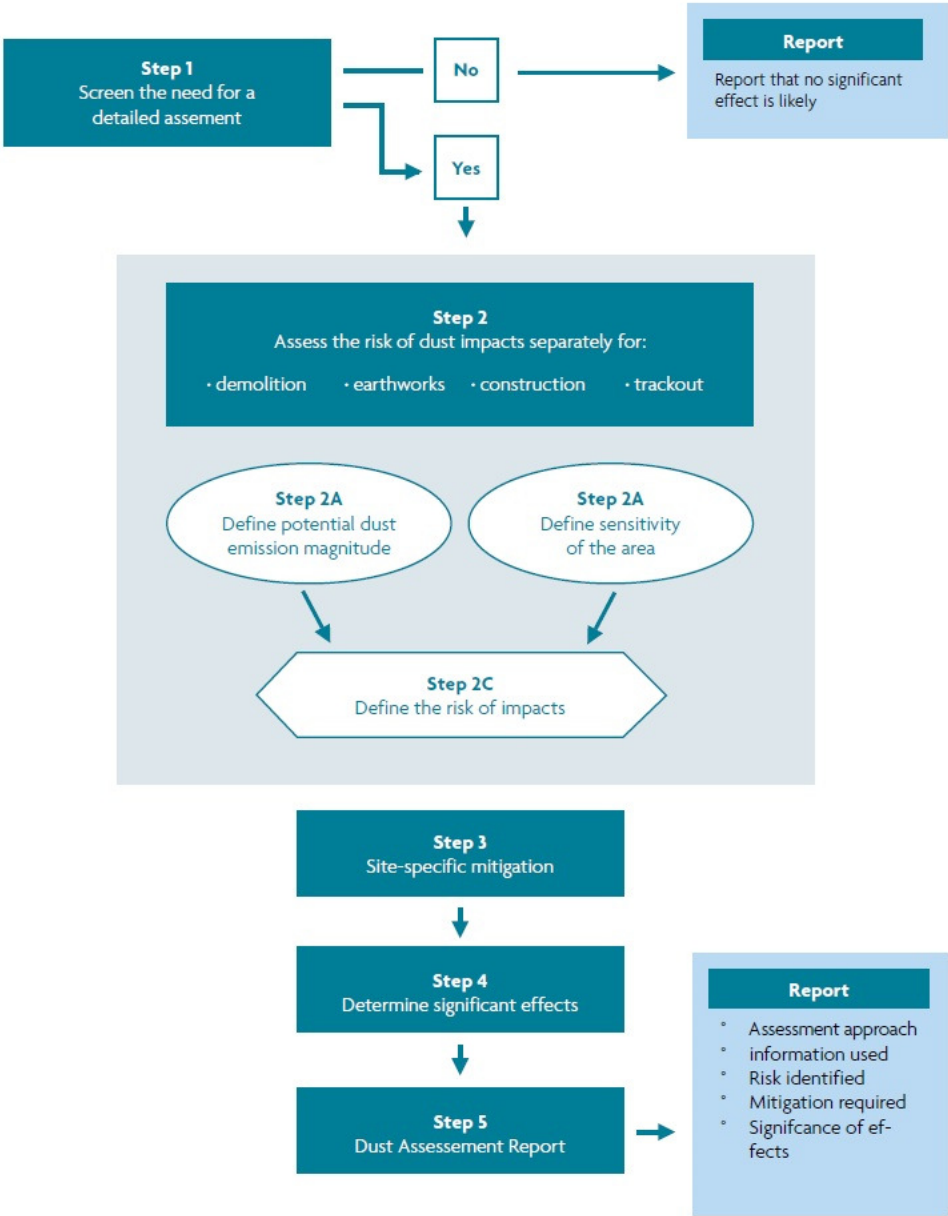
Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed".

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

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

With regards to the proposed development the potential for dust emissions is assessed for each activity that is likely to take place. The assessment procedure assumes no mitigation measures are applied. The conditions with no mitigation thus form the baseline or "do-nothing" situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in Figure 1.

Figure 1 – Dust Assessment Procedure



4.2 Operational Phase (Traffic Emissions)

4.2.1 Modelled Scenarios

A modelled baseline year of 2016 has been used as this corresponds with the latest year of monitoring undertaken by the Council. A future year has also been chosen (2020) representing a future year with the proposed scheme in place and includes changes to traffic flows due to the scheme. Overall, three scenarios have been adopted as part of the assessment. These are as follows:

- **Scenario 1** – existing levels of air quality / model verification (2016);
- **Scenario 2** – 2020 Future Baseline; and
- **Scenario 3** – 2020 Future Baseline + Proposed Development.

Scenarios 2 and 3 will be used to determine the potential impact on existing receptors adjacent to the modelled road network as a result of the proposed extension to the school.

4.2.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model[10]. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

4.2.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 7.0) which incorporates updated NOx emissions factors and vehicle fleet information[11]. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment emission factors for 2016 have been used for all modelled years.

4.2.4 Traffic Data

Modelled traffic flow data has been provided by Bellamy Roberts LLP and are shown in in Table 3. The location of these modelled roads is provided in Figure 2. Not all the minor roads surrounding the proposed development have been modelled due to the low number of vehicle movements along these links. However, the minor roads have been modelled

[10] Model Version: 4.1.1.0. Interface Version 4.1.0 (16/02/2017)

[11] http://laqm.defra.gov.uk/documents/EFT2016_v7.0.xlsm.zip

where they join either the A313 High Street or A310 Kingston Road as the combined impacts could be significant at these junctions.

The committed developments included in these figures are as follows:

- 219 flats at Teddington Studios, Broom Road, Teddington (Ref. 14/0914/FUL) approximately 400m to the north east of the site; and
- 2 High Street, Teddington 23 flats and 3 commercial / ground office units. (Ref. 16/2647/FUL) approximately 430m to the north west of the site

For the modelled speeds, the figures provided above have been used. However, where a link approaches a junction a speed of between of 20 kph has been modelled in order to represent queuing traffic at a junction. This is the approach recommended by the Local Air Quality Management Technical Guidance (LAQM.TG16) for modelling queuing traffic at junctions by way of reducing the modelled vehicle speeds.

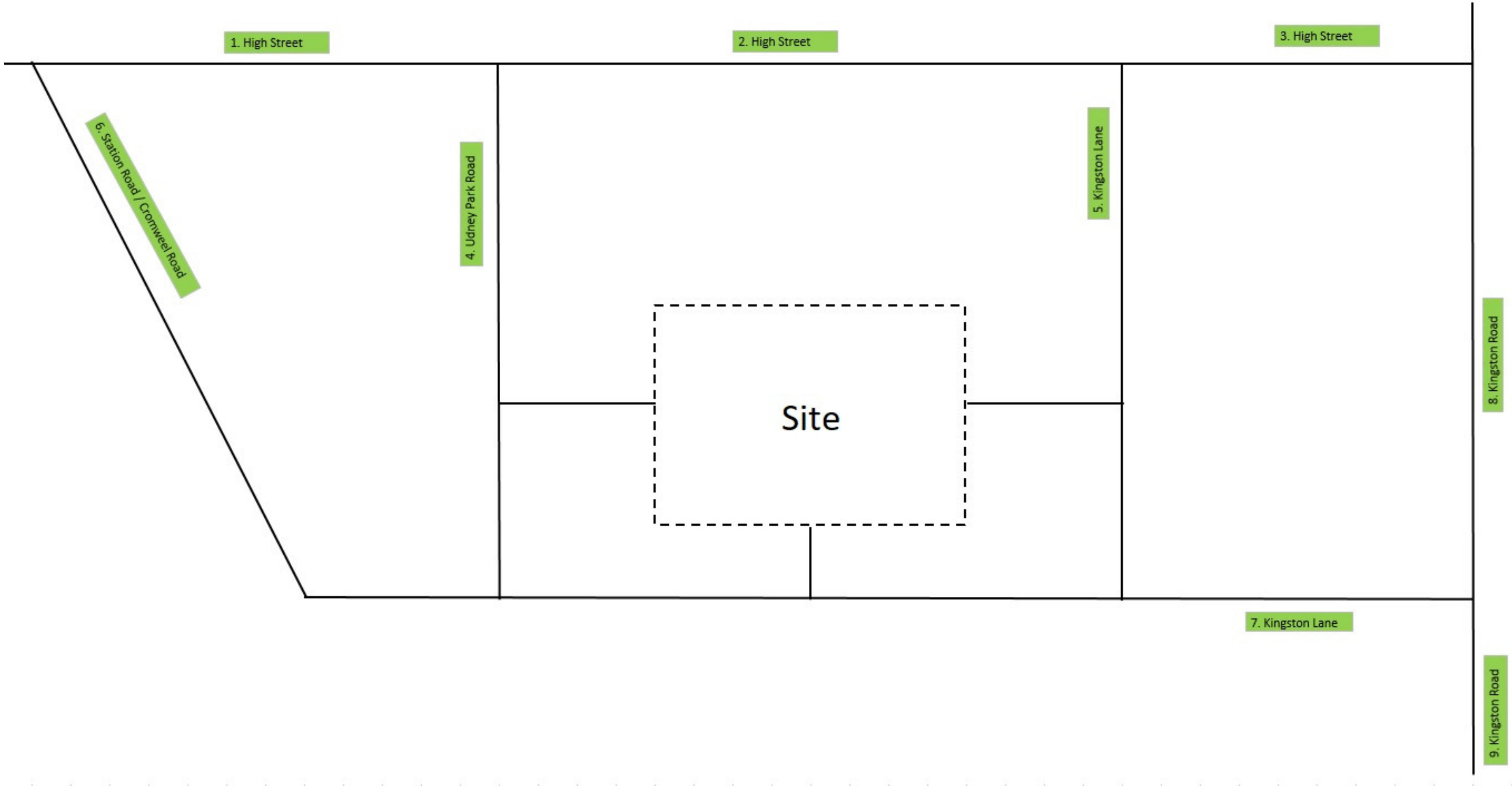
4.2.5 Street Canyons

A street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. Street canyons may result in elevated pollutant concentrations from road traffic emissions due to a reduced likelihood of the pollutants becoming dispersed in the atmosphere. Street canyons have been modelled as part of this assessment along the A313 High Street.

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

Modelled Year/ Scenario	Link	Baseline Flows			Development Flows			Committed & Development Flows		
		24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)
Modelled Baseline (2016)	1. High Street	9,245	6.4%	48						
	2. High Street	7,205	6.4%	48						
	3. High Street	6,900	6.4%	48						
	4. Udney Park Rd	515	0.0%	48						
	5. Kingston Ln	580	0.0%	48						
	6. Station Rd / Cromwell Rd	4,470	0.9%	48						
	7. Kingston Ln	2,325	0.9%	48						
	8. Kingston Rd	9,215	14.1%	48						
	9. Kingston Rd	10,470	17.6%	48						
Year of Completion (2020)	1. High Street	9,550	6.4%	48	437	0.0%	48	544	0.0%	48
	2. High Street	7,443	6.4%	48	428	0.0%	48	536	0.0%	48
	3. High Street	7,128	6.4%	48	279	0.0%	48	388	0.0%	48
	4. Udney Park Rd	532	0.0%	48	65	0.0%	48	66	0.0%	48
	5. Kingston Ln	599	0.0%	48	678	0.0%	48	679	0.0%	48
	6. Station Rd / Cromwell Rd	4,618	0.9%	48	401	0.0%	48	421	0.0%	48
	7. Kingston Ln	2,402	0.9%	48	468	0.0%	48	469	0.0%	48
	8. Kingston Rd	9,519	14.1%	48	113	0.0%	48	143	0.0%	48
	9. Kingston Rd	10,816	17.6%	48	355	0.0%	48	386	0.0%	48

Figure 2 – Modelled Roads



4.3 Background Concentrations

Background NOx, NO_2 and PM_{10} concentrations have been obtained from Defra[12]. These 1 km x 1 km grid resolution maps are derived from a base year of 2013 (for NOx, NO_2, PM_{10} and $PM_{2.5}$ only), which are then projected to future years (2016). Background concentrations of NOx, NO_2, PM_{10} and $PM_{2.5}$ derived from Defra are provided in Table 4.

Table 4 – Background NOx, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Pollutant	X	Y	2016
NO_2	516500	171500	22.4
NOx			34.0
PM_{10}			16.9
$PM_{2.5}$			12.3

In order to undertake a worst-case assessment, 2016 background concentrations have been assumed for all modelled scenarios.

4.4 Surface Roughness

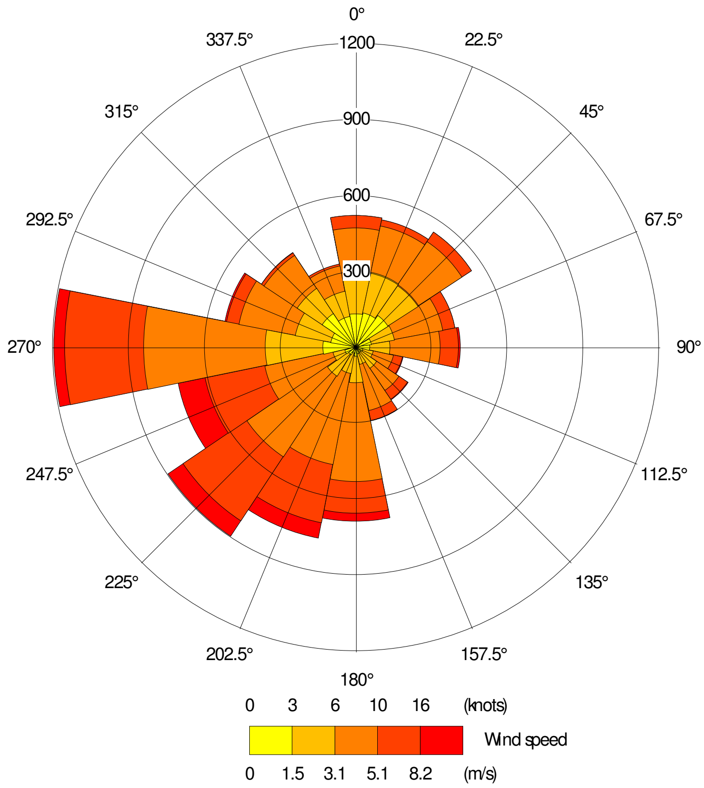
A surface roughness of 1.5 metre has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for large urban areas. This value has been used across the modelled domain.

[12] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

4.5 Meteorological Data

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

Figure 3 – Wind Speed and Direction Data, Heathrow Airport (2016)



4.6 Model Output

4.6.1 NOx/NO_2 Relationship

Following recent evidence that shows the proportion of primary NO_2 in vehicle exhaust has increased[13]. As such, a new NOx to NO_2 calculator has been devised[14]. This new calculator has been used to determine NO_2 concentrations for this assessment, based on predicted NOx concentrations using ADMS-Roads. Converted NO_2 concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable then the NOx concentrations are adjusted before conversion to NO_2.

4.6.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO_2 and PM_{10}. Research undertaken in 2003[15] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3.

For PM_{10}, a relationship between the annual mean and the number of 24-hour mean exceedences has been devised and is as follows:

- No. 24-hour mean exceedences = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

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

4.6.3 Model Verification

The monitored concentrations from the monitoring site located along the A313 High Street have been used for the purposes of model verification during the baseline year (2016). The location of this verification site is provided in Table 5.

Table 5 – Modelled Verification Locations

Monitoring ID	Location	X	Y	Height (m)
45	154 High Street, Teddington	516383	171154	2.2

[13] Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007
[14] http://laqm.defra.gov.uk/documents/no2tonox9_ja-forweb_june2016.xls
[15] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

4.6.4 Receptor Locations

In order to assess the potential impact of the development on existing receptors, a number of receptors have been identified adjacent to the modelled road network. These receptors represent the façade of the property and have been chosen given their proximity to the modelled road network. Commercial premises have not been modelled but first floor residential units have been considered. These have been modelled with a receptor height of 4.5 metres.

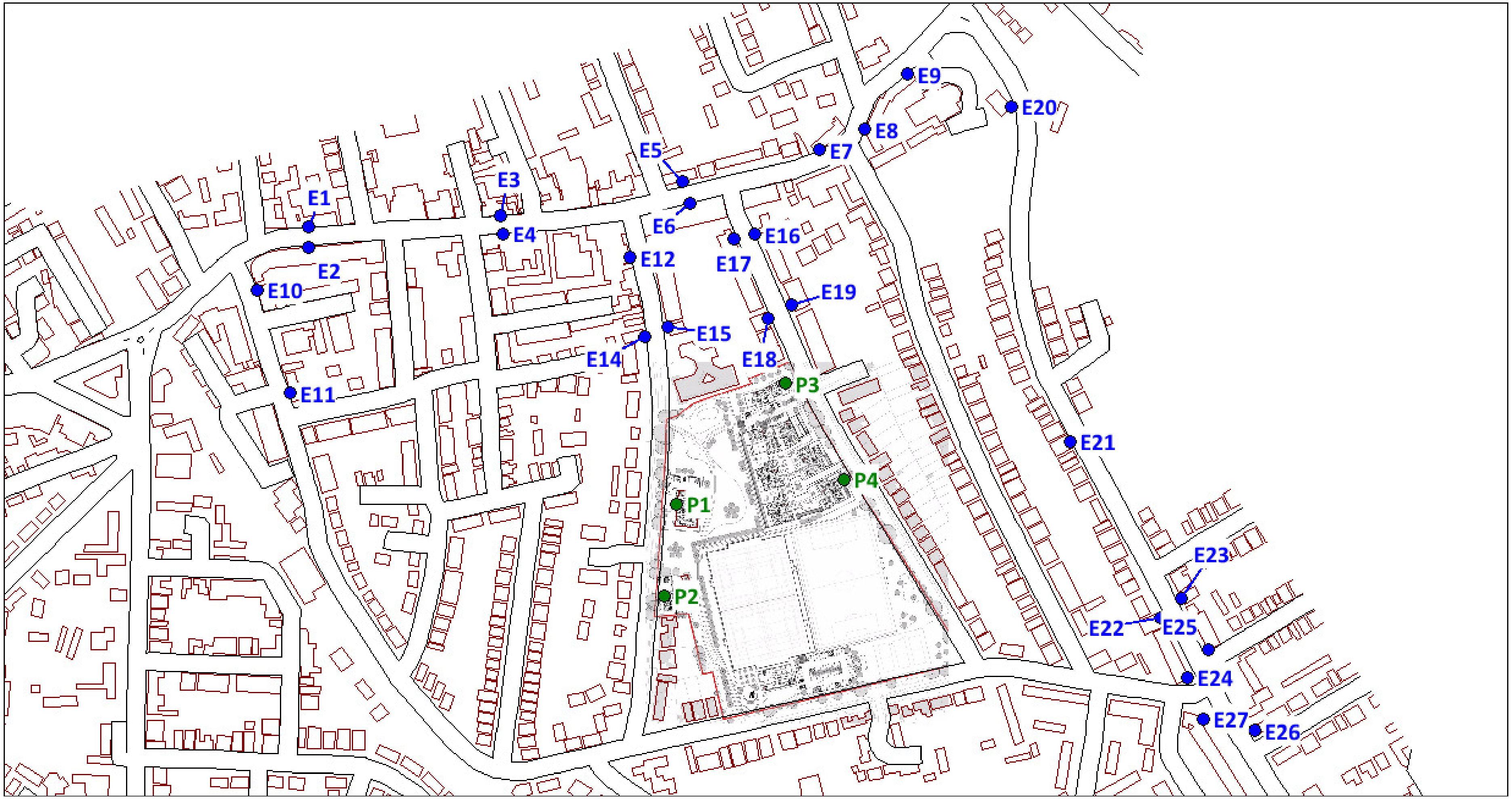
A number of receptors representing the proposed development have also been modelled (P1 – P4).

The location of these receptors is provided in Table 6. The location of the modelled receptors is shown in Figure 4.

Table 6 – Modelled Receptor Locations

AQA ID	X	Y	Height (m)	AQA ID	X	Y	Height (m)
R1	516024	171124	4.5	**R17**	516402	171115	1.5
R2	516024	171105	4.5	**R18**	516432	171045	1.5
R3	516194	171135	4.5	**R19**	516453	171057	1.5
R4	516197	171118	4.5	**R20**	516648	171233	1.5
R5	516356	171165	4.5	**R21**	516701	170938	1.5
R6	516363	171146	4.5	**R22**	516781	170783	1.5
R7	516478	171194	1.5	**R23**	516800	170800	1.5
R8	516518	171212	1.5	**R24**	516805	170730	1.5
R9	516555	171261	1.5	**R25**	516823	170756	1.5
R10	515979	171068	1.5	**R26**	516865	170684	1.5
R11	516008	170977	1.5	**R27**	516819	170694	1.5
R12	516309	171098	1.5	**P1**	516352	170881	1.5
R13	516330	171099	1.5	**P2**	516341	170800	1.5
R14	516322	171029	1.5	**P3**	516448	170988	1.5
R15	516344	171037	1.5	**P4**	516500	170903	1.5
R16	516421	171119	1.5				

Figure 4 – Modelled Receptor Locations



4.7 Significance Criteria

4.7.1 Construction Phase

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

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

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

Table 7 – Dust Emission Magnitude

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level	Total building volume 20,000 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area 2,500 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting	Total building volume 25,000 m3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100 m;	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 8 – Risk of Dust Impacts

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

4.7.2 Operational Phase

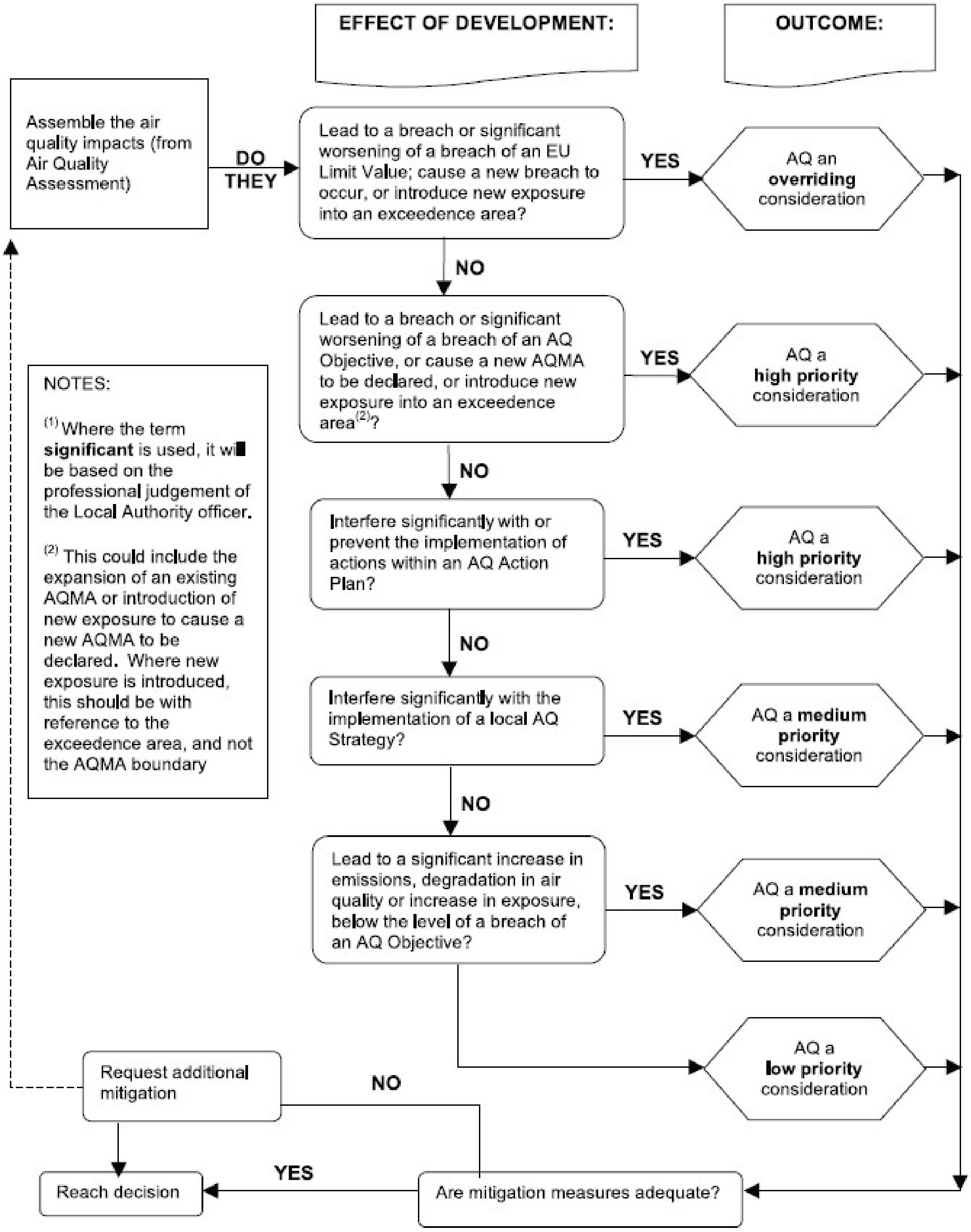
The guidance released by Environmental Protection UK provides steps for a Local Authority to follow in order to assess the significance of air quality impacts of a development proposal. This procedure, shown in Figure 5, has also been applied to the modelled results.

The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in Table 9.

Table 9 – Impact Descriptors for Individual Receptors

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

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



5 Air Quality Assessment

5.1 Impact from Construction Activities

The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the site. Using the criteria provided in Table 8 the dust emission magnitude for each activity is as follows:

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

Based on the "*Control of Dust and Emissions during Construction and Demolition*" SPG guidance the sensitivity of the surrounding area is summarised in Table 10.

Table 10 – Sensitivity of the Surrounding Area

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

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

Table 11 – Summary of Dust Risk

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

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

5.2 Impact of Vehicle Emissions

5.2.1 Model Verification

Using the guidance provided within the Local Air Quality Management Technical Guidance TG(16), the modelled output has been verified against the monitoring data obtained from the sites listed in Table 5. The following tables provide a summary of the model verification process for NOx/NO_2 concentrations.

Table 12 – Comparison of Modelled and Monitored NO_2 and PM_{10} Concentrations (µg/m^3)

Verification Location	Modelled Concentration	Monitored Concentration[(a)]	Difference [(modelled - monitored)/ monitored] x100
45	27.7	39.0	-28.9%
(a) Average concentration recorded between 2014 and 2016			

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

5.2.2 Model Adjustment

In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NOx (excluding background). The modelled road contribution NOx is taken directly from the ADMS-Roads output before it has been converted to NO_2 using the NOx to NO_2 calculator described in Section 4.6.1. The NOx to NO_2 calculator can also be used to derive monitored road contributions of NOx from NO_2 diffusion tube results. A summary of these calculations is provided in Table 13.

Table 13 – Monitored NOx and NO_2 concentrations

Verification Location	Monitored Total NO_2	Defra Background NO_2	Monitored road contribution NO_2 (total – background)	Monitored road contribution NOx (total – background)	Modelled road contribution NOx (excludes background)	Ratio of monitored road contribution NOx / modelled road contribution NOx
45	39.0	22.4	16.6	36.6	11.0	3.3

Once the monitored and modelled road contributions of NOx (excluding background) have been derived the contributions of NOx are compared and a ratio derived. In this case the ratio is 3.3 and this factor has been used to adjust the modelled road contribution of NOx. This is shown in Table 14.

Table 14 – Adjustment of Modelled NOx Contributions

Verification Location	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NOx	Modelled total NO_2 (based on empirical NOx/NO_2 relationship)	Monitored total NO_2	% Difference [(modelled – monitored) / monitored] x 100
45	6.1	67.0	38.9	39.0	-0.3%

Following adjustment of the modelled NOx concentrations by a factor of 3.3 the total NO_2 concentration at the model verification location has been calculated using the method described in Section 4.6.1. The revised NO_2 concentration, shown in Table 14, indicates a more acceptable model performance when compared against the monitored NO_2 concentrations. As such, an adjustment factor of 3.3 has been applied to all modelled NOx concentrations across the model domain before conversion to NO_2.

5.2.3 Nitrogen Dioxide

Predicted annual mean concentrations for NO_2 at existing receptors using all future scenarios (2020) are provided in Table 15 (Proposed Development flows only) and Table 16 (Proposed + Committed Development flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

When comparing the predicted NO_2 concentrations in 2020 with and without the proposed development the impact is considered negligible or slight, depending on the location of the modelled receptor. When taking into account and proposed and committed development flows the impact is considered negligible or moderate, depending on the location of the modelled receptor.

In terms of introducing new exposure, predicted concentrations across the proposed development are below the relevant air quality objective.

Nitrogen dioxide also has an hourly objective of 200 $\mu g/m^3$ not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO_2 concentrations was very weak. Nonetheless, research undertaken in 2003[16] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 $\mu g/m^3$. Given that predicted NO_2 concentrations in 2016 and 2020 are well below 60 $\mu g/m^3$ at all modelled receptors the likelihood of the short-term objective for NO_2 being exceeded is considered low.

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

Table 15 – Comparison of Predicted Annual Mean NO_2 Concentrations (µg/m^3) 2020, Proposed Development Flows Only

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact Descriptor
R1	26.9	27.1	67.8%	0.2	0.74%	Negligible
R2	28.0	28.2	70.5%	0.2	0.71%	Negligible
R3	39.1	39.6	99.0%	0.5	1.28%	Slight
R4	38.6	39.1	97.8%	0.5	1.30%	Slight
R5	25.7	25.8	64.5%	0.1	0.39%	Negligible
R6	27.4	27.6	69.0%	0.2	0.73%	Negligible
R7	28.6	28.8	72.0%	0.2	0.70%	Negligible
R8	29.2	29.4	73.5%	0.2	0.68%	Negligible
R9	29.5	29.7	74.3%	0.2	0.68%	Negligible
R10	28.8	29.1	72.8%	0.3	1.04%	Negligible
R11	25.9	26.2	65.5%	0.3	1.16%	Negligible
R12	25.0	25.2	63.0%	0.2	0.80%	Negligible
R13	24.9	25.0	62.5%	0.1	0.40%	Negligible
R14	23.7	23.7	59.3%	0.0	0.00%	Negligible
R15	23.7	23.8	59.5%	0.1	0.42%	Negligible
R16	24.8	25.3	63.3%	0.5	2.02%	Negligible
R17	24.7	25.1	62.8%	0.4	1.62%	Negligible
R18	23.7	24.0	60.0%	0.3	1.27%	Negligible
R19	23.7	24.0	60.0%	0.3	1.27%	Negligible
R20	30.5	30.6	76.5%	0.1	0.33%	Negligible
R21	31.3	31.3	78.3%	0.0	0.00%	Negligible
R22	31.2	31.3	78.3%	0.1	0.32%	Negligible
R23	31.8	31.9	79.8%	0.1	0.31%	Negligible
R24	33.2	33.4	83.5%	0.2	0.60%	Negligible
R25	35.5	35.7	89.3%	0.2	0.56%	Negligible
R26	37.4	37.6	94.0%	0.2	0.53%	Negligible
R27	31.8	32.0	80.0%	0.2	0.63%	Negligible
P1	N/A	23.2	58.0%	N/A	N/A	N/A
P2	N/A	23.0	57.5%	N/A	N/A	N/A
P3	N/A	23.6	59.0%	N/A	N/A	N/A
P4	N/A	23.5	58.8%	N/A	N/A	N/A
Objective	**40.0**					

Table 16 – Comparison of Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2020, Proposed and Committed Development Flows

Receptor	Future Baseline	Future Baseline + Proposed & Committed Development	% of AQ Objective	Change	% Change	Impact Descriptor
R1	26.9	27.1	67.8%	0.2	0.74%	Negligible
R2	28.0	28.3	70.8%	0.3	1.07%	Negligible
R3	39.1	39.7	99.3%	0.6	1.53%	Moderate
R4	38.6	39.2	98.0%	0.6	1.55%	Moderate
R5	25.7	25.8	64.5%	0.1	0.39%	Negligible
R6	27.4	27.6	69.0%	0.2	0.73%	Negligible
R7	28.6	28.8	72.0%	0.2	0.70%	Negligible
R8	29.2	29.5	73.8%	0.3	1.03%	Negligible
R9	29.5	29.7	74.3%	0.2	0.68%	Negligible
R10	28.8	29.1	72.8%	0.3	1.04%	Negligible
R11	25.9	26.2	65.5%	0.3	1.16%	Negligible
R12	25.0	25.2	63.0%	0.2	0.80%	Negligible
R13	24.9	25.0	62.5%	0.1	0.40%	Negligible
R14	23.7	23.7	59.3%	0.0	0.00%	Negligible
R15	23.7	23.8	59.5%	0.1	0.42%	Negligible
R16	24.8	25.3	63.3%	0.5	2.02%	Negligible
R17	24.7	25.1	62.8%	0.4	1.62%	Negligible
R18	23.7	24.0	60.0%	0.3	1.27%	Negligible
R19	23.7	24.0	60.0%	0.3	1.27%	Negligible
R20	30.5	30.6	76.5%	0.1	0.33%	Negligible
R21	31.3	31.4	78.5%	0.1	0.32%	Negligible
R22	31.2	31.3	78.3%	0.1	0.32%	Negligible
R23	31.8	31.9	79.8%	0.1	0.31%	Negligible
R24	33.2	33.4	83.5%	0.2	0.60%	Negligible
R25	35.5	35.7	89.3%	0.2	0.56%	Negligible
R26	37.4	37.6	94.0%	0.2	0.53%	Negligible
R27	31.8	32.0	80.0%	0.2	0.63%	Negligible
P1	N/A	23.2	58.0%	N/A	N/A	N/A
P2	N/A	23.0	57.5%	N/A	N/A	N/A
P3	N/A	23.6	59.0%	N/A	N/A	N/A
P4	N/A	23.5	58.8%	N/A	N/A	N/A
Objective	**40.0**					

5.2.4 Particulate Matter

Predicted annual mean concentrations for PM_{10} at existing receptors using all future scenarios (2020) are provided in Table 17 (Proposed Development flows only) and Table 18 (Proposed + Committed Development flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

When comparing the predicted NO_2 concentrations in 2020 with and without the proposed development the impact is considered negligible or slight, depending on the location of the modelled receptor. When taking into account and proposed and committed development flows the impact is considered negligible or moderate, depending on the location of the modelled receptor.

In terms of introducing new exposure, predicted concentrations across the proposed development are below the relevant air quality objective.

Based on the predicted annual mean PM_{10} concentrations across all receptors the maximum number of days when the short term PM_{10} objective is exceeded is 1. This is well below the objective of 35 days.

Table 17 – Comparison of Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2020, Proposed Development Flows Only

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact Descriptor
R1	17.1	17.2	17.2	43.0%	0.1	0.6%
R2	17.2	17.2	17.2	43.0%	0.0	0.0%
R3	17.9	17.9	17.9	44.8%	0.0	0.0%
R4	17.9	17.9	17.9	44.8%	0.0	0.0%
R5	17.1	17.1	17.1	42.8%	0.0	0.0%
R6	17.2	17.2	17.2	43.0%	0.0	0.0%
R7	17.2	17.3	17.3	43.3%	0.1	0.6%
R8	17.3	17.3	17.3	43.3%	0.0	0.0%
R9	17.3	17.3	17.3	43.3%	0.0	0.0%
R10	17.2	17.2	17.2	43.0%	0.0	0.0%
R11	17.1	17.1	17.1	42.8%	0.0	0.0%
R12	17.0	17.0	17.1	42.5%	0.0	0.0%
R13	17.0	17.0	17.0	42.5%	0.0	0.0%
R14	17.0	17.0	17.0	42.5%	0.0	0.0%
R15	17.0	17.0	17.0	42.5%	0.0	0.0%
R16	17.0	17.1	17.1	42.8%	0.1	0.6%
R17	17.0	17.0	17.0	42.5%	0.0	0.0%
R18	17.0	17.0	17.0	42.5%	0.0	0.0%
R19	17.0	17.0	17.0	42.5%	0.0	0.0%
R20	17.3	17.3	17.3	43.3%	0.0	0.0%
R21	17.3	17.3	17.3	43.3%	0.0	0.0%
R22	17.3	17.3	17.3	43.3%	0.0	0.0%
R23	17.3	17.3	17.3	43.3%	0.0	0.0%
R24	17.3	17.3	17.3	43.3%	0.0	0.0%
R25	17.3	17.3	17.3	43.3%	0.0	0.0%
R26	17.4	17.4	17.4	43.5%	0.0	0.0%
R27	17.2	17.2	17.2	43.0%	0.0	0.0%
P1	N/A	16.9	42.3%	N/A	N/A	N/A
P2	N/A	16.9	42.3%	N/A	N/A	N/A
P3	N/A	17.0	42.5%	N/A	N/A	N/A
P4	N/A	17.0	42.5%	N/A	N/A	N/A
Objective	**40.0**					

Table 18 – Comparison of Predicted Annual Mean PM_{10} Concentrations (µg/m^3) 2020, Proposed and Committed Development Flows

Receptor	Future Baseline	Future Baseline + Proposed & Committed Development	% of AQ Objective	Change	% Change	Impact Descriptor
R1	17.1	17.2	43.0%	0.1	0.6%	Negligible
R2	17.2	17.2	43.0%	0.0	0.0%	Negligible
R3	17.9	17.9	44.8%	0.0	0.0%	Negligible
R4	17.9	17.9	44.8%	0.0	0.0%	Negligible
R5	17.1	17.1	42.8%	0.0	0.0%	Negligible
R6	17.2	17.2	43.0%	0.0	0.0%	Negligible
R7	17.2	17.3	43.3%	0.1	0.6%	Negligible
R8	17.3	17.3	43.3%	0.0	0.0%	Negligible
R9	17.3	17.3	43.3%	0.0	0.0%	Negligible
R10	17.2	17.2	43.0%	0.0	0.0%	Negligible
R11	17.1	17.1	42.8%	0.0	0.0%	Negligible
R12	17.0	17.1	42.8%	0.1	0.6%	Negligible
R13	17.0	17.0	42.5%	0.0	0.0%	Negligible
R14	17.0	17.0	42.5%	0.0	0.0%	Negligible
R15	17.0	17.0	42.5%	0.0	0.0%	Negligible
R16	17.0	17.1	42.8%	0.1	0.6%	Negligible
R17	17.0	17.0	42.5%	0.0	0.0%	Negligible
R18	17.0	17.0	42.5%	0.0	0.0%	Negligible
R19	17.0	17.0	42.5%	0.0	0.0%	Negligible
R20	17.3	17.3	43.3%	0.0	0.0%	Negligible
R21	17.3	17.3	43.3%	0.0	0.0%	Negligible
R22	17.3	17.3	43.3%	0.0	0.0%	Negligible
R23	17.3	17.3	43.3%	0.0	0.0%	Negligible
R24	17.3	17.3	43.3%	0.0	0.0%	Negligible
R25	17.3	17.3	43.3%	0.0	0.0%	Negligible
R26	17.4	17.4	43.5%	0.0	0.0%	Negligible
R27	17.2	17.2	43.0%	0.0	0.0%	Negligible
P1	N/A	16.9	42.3%	N/A	N/A	N/A
P2	N/A	16.9	42.3%	N/A	N/A	N/A
P3	N/A	17.0	42.5%	N/A	N/A	N/A
P4	N/A	17.0	42.5%	N/A	N/A	N/A
Objective	**40.0**					

6 AIR QUALITY NEUTRAL ASSESSMENT

6.1 Introduction

The air quality neutral assessment has followed the methodology outlined in the Sustainable Design and Construction Supplementary Planning Guidance (SPG)[17] and the Air Quality Neutral Planning Support Update[18]. Within these documents, benchmarks have been provided in relation to building emissions, together with a methodology for calculating the building and transport related emissions for a particular development.

6.2 Building Emissions

The Building Emissions Benchmarks (BEBs) for the land use category applicable to residential properties are provided in Table 19. Emissions of PM_{10} have not been considered as oil and/or solid fuel are not proposed to be used at the development.

Table 19 – Building Emissions Benchmarks (BEBs)

Land Use Class	NOx (g/m²/annum)
C2	68.5
C3	26.2
D1 (a)	43.0
D2 (a-d)	90.3

Building emissions data has been provided by Hodkinson Consultancy. Using the method described within the Air Quality Neutral Planning Support Update, the site specific benchmarked emissions have been calculated using the emission rate in Table 19. These are summarised in Table 20. The total building NOx emissions have then been calculated and are summarised in Table 21.

Table 20 – Calculation of Benchmarked NOx Emissions Using Building Emissions Benchmarks for Each Land Use Category

Land Use	GFA (m²)	Building Emissions Benchmarks (g/m²/annum)	Benchmarked Emissions (kg/annum)
C2	836	68.5	57.3
C3	7,933	26.2	207.8
D1 (a)	1,231	43.0	52.9
D2 (a-d)	910	90.3	82.2
Total			400.3

17 Sustainable Design and Construction Supplementary Planning Guidance (SPG), Mayor of London, April 2014
18 Air Quality Neutral Planning Support Update: GLA 80371, April 2014

Table 21 – Calculation of Total Building NOx Emissions

Land Use	Gas Usage (kWh/annum)	Default Emission Factors (kg/kWh)	Total Building Emissions (kg/annum)
C2	34,246	0.0000785	2.7
C3	455,766	0.0000785	35.8
D1 (a)	9,061	0.000194	1.8
D2 (a-d)	364,178	0.000194	70.7
Total			110.9

Based on the comparison between the total building emissions and Building Emissions Benchmarks (see Table 22) the proposed development meets the air quality neutral requirements and no mitigation is required.

Table 22 – Comparison of Total Building NOx Emissions and Building Emissions Benchmarks

Total Benchmarked Emissions (kg/annum)	Total Building Emissions (kg/annum)	Difference (kg/annum)
400.3	110.9	-289.4

6.3 Transport Emissions

The Transport Emissions Benchmarks (TEBs) are calculated by multiplying the relevant emission benchmarks by the number of properties for residential and or floor space for office or retail use. However, no TEBs exist for the proposed C2, D1 and D2 land uses. As stated in the guidance, no TEB can be derived for D1 and D2 land uses but the TEB for C3 may be applied to the C2 land use. This is summarised in Table 23. There are no vehicle movements associated with the proposed residential dwellings (C3) so these have been excluded from the calculations.

Table 23 – Transport Emissions Benchmarks (NOx and PM_{10})

Land Use	No of Dwellings or Floor Area	Transport Emission Benchmark	Transport Emissions
NOx			
Residential Institutions (C2)	108 units	1,553 g/dwelling/annum	168 kg/annum
Total Benchmarked Transport NOx Emission			**168 kg/annum**
PM_{10}			
Residential Institutions (C2)	108 units	267 g/dwelling/annum	29 kg/annum
Total Benchmarked Transport PM_{10} Emission			**29 kg/annum**

The proposed residential institutions (C2) will generate 274 trips per day. As such, the total trip emissions for NOx and PM_{10} have been calculated in Table 24.

Table 24 – Total Transport Emissions (NOx and PM_{10})

Land Use	Total Trips Per Annum	Emission Factor	Transport Emissions
NOx			
Residential Institutions (C2)	274 * 365 = 100,010	0.353 g/veh-km	35 kg/annum
Total Transport NOx Emission			**35 kg/annum**
PM_{10}			
Residential Institutions (C2)	274 * 365 = 100,010	0.0606 g/veh-km	6 kg/annum
Total Transport PM_{10} Emission			**6 kg/annum**

Based on the comparison between the total transport emissions and transport Emissions Benchmarks (see Table 25) the proposed development meets the air quality neutral requirements and no mitigation is required.

Table 25 – Comparison of Total Transport Emissions and Transport Emissions Benchmarks

Pollutant	Total Benchmarked Transport Emissions (kg/annum)	Total Transport Emissions (kg/annum)	Difference (kg/annum)
NOx	168	35	-133
PM_{10}	29	6	-23

7 Conclusions And Recommendations

7.1 Impact from Construction Activities

A qualitative assessment of dust levels associated with the proposed development has been carried out. The impact of dust soiling and PM_{10} can be reduced to negligible through appropriate mitigation measures, which are listed in Table 26 and are applicable to a low to medium risk site. Implementation of these Best Practice Measures will help reduce the impact of the construction activities.

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

Table 26 – Mitigation of Construction Activities

Construction Activity	Mitigation Measures
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
	Display the 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.
	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.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make a complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
Monitoring	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is 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
Operating vehicle/machinery	Ensure all non-road mobile machinery (NRMM) comply with standards.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.

7.2 Impact of Vehicle Emissions

The change in predicted PM_{10} concentrations at existing receptors in 2020 following completion of the proposed and committed developments is considered negligible at all modelled receptors. Overall, using the flow chart presented in Figure 5, air quality (PM_{10}) is a low priority consideration with regards to the impact of the proposed development.

At worst, the cumulative impacts of predicted NO_2 concentrations from both the proposed and committed developments is considered negligible or moderate depending on the location of the existing receptor. Given that there are moderate impacts in areas where the air quality objective is approached or exceeded the overall impact is considered significant. Using the flow chart presented in Figure 5, air quality (NO_2) is a high priority consideration with regards to the impact of the proposed and committed developments.

When considering the proposed development alone the impact is considered negligible or slight depending on the location of the existing receptor. Given that there are slight impacts in areas where the air quality objective is approached or exceeded the overall impact is considered significant. Using the flow chart presented in Figure 5, air quality (NO_2) is a high priority consideration with regards to the impact of the proposed and committed developments.

In terms of introducing new exposure, predicted NO_2 and PM_{10} concentrations across the proposed development are below the relevant air quality objectives.

7.2.1 Mitigation of Vehicle Impacts

The Institute of Air Quality Management (IAQM) issued a position statement in relation to the mitigation of development air quality impacts[19]. Based on this statement, the IAQM recommends that the following basic hierarchy be used for mitigating the operational air quality impacts associated with the particular development:

1. Preference should be given to **preventing or avoiding** exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives;
2. **Reduction and minimisation** of exposure/impacts should next be considered, once all options for prevention/avoidance have been implemented so far as is reasonably practicable (both technically and economically). To achieve this reduction/ minimisation, preference should be given first to:
    a. mitigation measures that act on the source; before
    b. mitigation measures that act on the pathway; which in turn should take preference over
    c. mitigation measures at or close to the point of receptor exposure all subject to the efficacy, cost and practicability of the available solutions.

19 Position Statement – Mitigation of Development Air Quality Impacts, IAQM, January 2015

In each case, measures that are designed or engineered to operate passively are preferred to active measures that require continual intervention, management or a change in people's behaviours.

3. **Off-setting** a new development's air quality impact by proportionately contributing to air quality improvements elsewhere (including those identified in air quality action plans and low emission strategies) should only be considered once the solutions for preventing/avoiding, and then for reducing/minimising, impacts have been exhausted.

Based on the impacts along the local road network (particularly the A313 High Street) the reduction/minimisation of the impacts should be considered before any offsetting of emissions is undertaken. These measures should act on the source, which in this case would be the additional traffic associated with the proposed development. The mitigation measures described in Table 27 could be adopted to help mitigate the potential air quality impacts along the local road network.

In addition to the mitigation measures related to vehicle impacts the IAQM/EPUK guidance also recommends that all gas-fired boilers meet a minimum standard of <40mgNOx/kWh. Based on the boiler specifications used to undertake the air quality neutral assessment the boilers will meet this standard.

7.3 Air Quality Neutral Assessment

The air quality neutral assessment has concluded that the proposed development will meet building and transport emissions benchmarks. As such, no mitigation measures are required to reduce these emissions.

Table 27 – Mitigation of Vehicle Impacts

Mitigation Measure	Description
Electric Car Charging Points	The joint EPUK and IAQM guidance provides examples of good practice principle relating to electric car charging points, including the provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available. If applicable, awareness of such networks should be increased on a local and/or regional level and there is some scope for the developers to be involved in such actions.
Travel Plan	The joint EPUK and IAQM guidance states that where a development generates significant additional traffic a detailed travel plan should be produced, together with a provision to measure its implementation and effect. The travel plan should, where applicable, set out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, bus vouchers, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.
Car Sharing	There are a number of local and national car sharing websites that cover Greater London. The developers should help in the promotion of such car sharing schemes amongst the staff of the proposed development. This could be undertaken in a number of ways, including flyers, posters and email updates targeting the future residents. The developer may also wish to consider the promotion of car clubs, such as Zipcar. Such organisations allow users to rent a car by the hour or by the day and may result in overall car usage decreasing due to a decrease in car ownership[20].

[20] Zipcar.co.uk estimates that every Zipcar takes 6 personally-owned vehicles off the road.