Hawkins environmental

Air Quality Assessment:

Rainbow Industrial Estate, Trout Road, West Drayton

ET Planning

15th March 2022

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Table of Contents

List of Appendices

List of Tables

List of Figures

1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been instructed by ET Planning to undertake an air quality assessment and dust risk assessment for the proposed redevelopment of Rainbow Industrial Estate, situated in West Drayton of the London Borough of Hillingdon.

The proposed development will see the *'Retention of entrance gates and change of use for use class sui generis including container and skip storage; open and closed storage of building, scaffolding and lighting materials; storage of aggregate materials; vehicle storage and sales; and associated installation of portacabins, container stores, transportable silos and other structures for a period of 12 months (retrospective application).'*

The proposals follow the refusal of planning permission by LB Hillingdon (LBH) on 19th August 2021 for *'Installation of two portacabins and retention of entrance gates and proposed change of use for Use Class Sui Generis including container storage; open and closed storage of building and scaffolding materials; storage of aggregate materials; vehicle storage and sales for a period of 36 months (part retrospective application)*' (LPA Ref: 38058/APP/2021/1327).

Reason for refusal 2 states *"The unauthorised use of the land would cause unacceptable adverse impacts arising from dust and deteriorating air quality resulting in significant harm to the living conditions and wellbeing of neighbouring residents in this Air Quality Management Area. The development therefore conflicts with paragraph 186 of the NPPF (2021), Policy SI 1 of the London Plan (2021), Policies BE1 and EM8 of the Hillingdon Local Plan: Part 1- Strategic Policies (2012) and Policies DMEI 14 and DMHB 11 of the Hillingdon Local Plan: Part 2 - Development Management Policies (2020)"*.

The application site previously had a temporary, 12-month permission to operate as an airport parking facility. Prior to this, outline planning permission and Reserved Matters has been approved for redevelopment of Rainbow Industrial Estate and the neighbouring Kirby Industrial Estates site for a mixed use development including the "*demolition of existing premises and erection of 99 residential units (C3), 50-unit extra care/dementia sheltered housing scheme (C3), 1,529.4sqm light industrial floorspace comprising 17 business units (B1c) and 611.30sqm of restaurant/cafe (A3) floorspace, associated open space, car parking and landscaping"*.

The 2021 Application was sought for a temporary period as a meanwhile use of the site whilst a new mixed-use scheme for the Rainbow and Kirby Industrial sites is discussed with the LPA during pre-application discussions and a formal planning application is then submitted and determined.

Consequently, this assessment has been completed in order to determine whether the proposed development achieves compliance with the National Air Quality Objectives, as well as national, regional and local planning policy and whether the original reasons for refusal are justified.

This assessment has been undertaken in accordance with the Department of Environment, Food and Rural Affairs' (Defra) current *Technical Guidance on Local Air Quality Management (LAQM) (TG16)* and the Institute for Air Quality Management and Environmental Protection UK's *Land-Use Planning & Development Control: Planning for Air Quality* (January 2017).

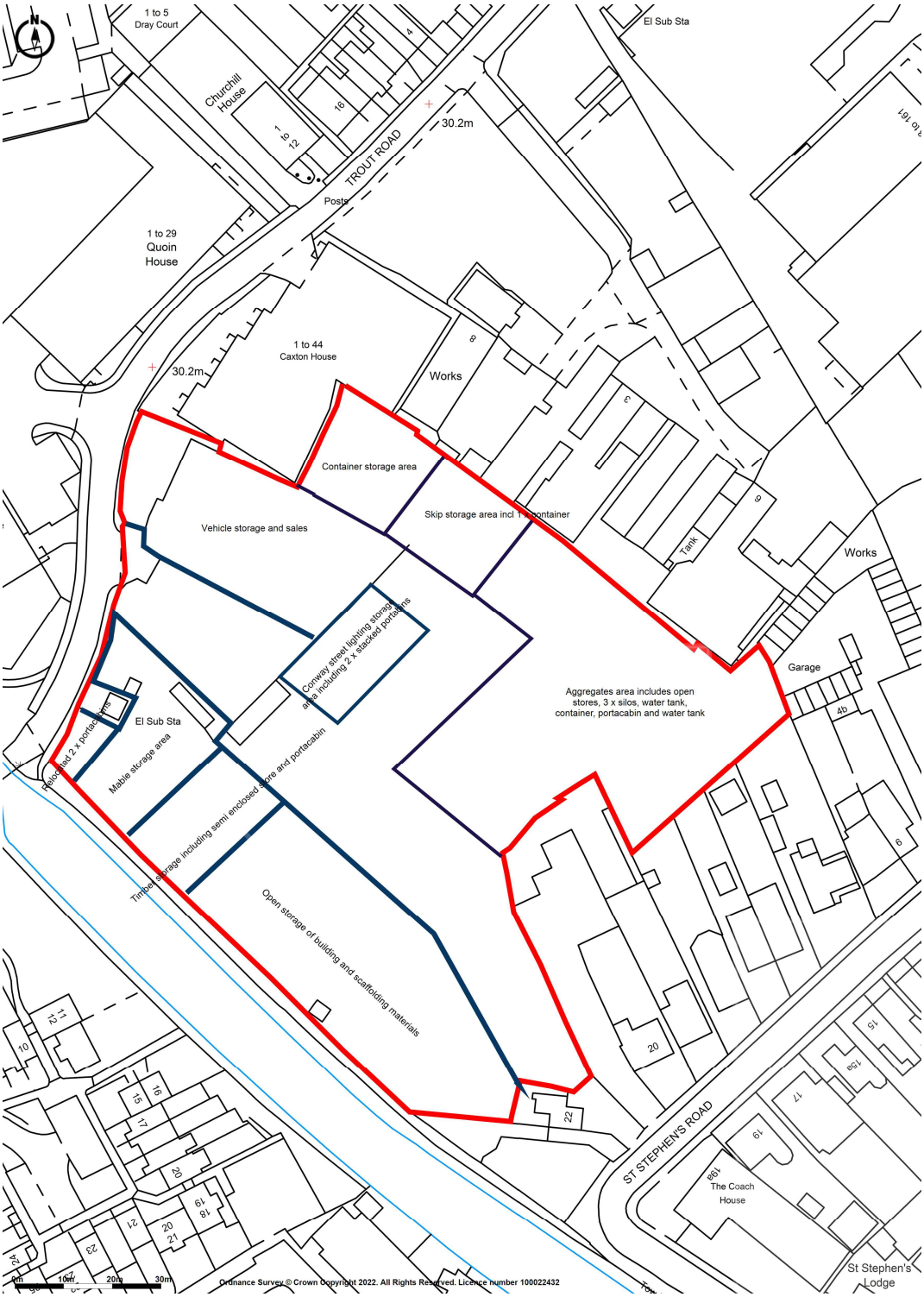
The assessment addresses the effects of air pollutant emissions from traffic using the adjacent roads and emissions associated with the development of the site. In addition, a risk-based assessment of the likely impact of dust on the air quality of the local environment has been conducted in accordance with the Institute of Air Quality Management's 2016 edition of the *Guidance on the assessment of mineral dust impacts for planning.*

This report assesses the overall levels of nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) in the vicinity of the site. A glossary of terms is detailed in **Appendix 1.**

1.2. Site Description

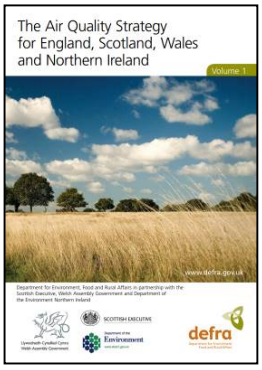
The proposed development site is situated off Trout Road in West Drayton. It is bound by the Grand Union Canal to the southwest, the rear of a car dealership and several residential properties on St Stephen's Road to the southeast, light industrial/commercial premises to the northeast and Trout Road (which provides the site access) to the northwest. A location plan of the proposed site can be seen in **Figure 1.1**.

Figure 1.1: Site Plan



2. LEGISLATION, PLANNING POLICY & GUIDANCE

2.1. National Legislation



Part IV of the Environment Act (1995), requires the UK government to produce a national Air Quality Strategy which contains standards, objectives and measures for improving ambient air quality. The National Air Quality Strategy sets out National Air Quality Objectives (NAQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.

The Clean Air for Europe (CA FE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC, its associated Daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC, and the Council Decision 97/101/EC, with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC.

Directive 2008/50/EC is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010, which came into force on 11th June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. These limit values are the basis of the NAQOs.

The National Air Quality Objectives (NAQOs) and their Limit Values will form the basis of this air quality assessment of the proposed development. The NAQOs are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health. In determining whether air pollutant levels may constrain development, the results of studies are compared against the acceptability criteria. The Air Quality Standards are displayed in **Table 2.1**.

Table 2.1: Air Quality Standards

Pollutant	Average Period	NAQO Limit Value
Sulphur Dioxide	One Hour	350 µg/m^3 Not to be exceeded more than 24 times per calendar year
	One Day	150 µg/m^3 Not to be exceeded more than 3 times per calendar year
Nitrogen Dioxide	One Hour	200 µg/m^3 Not to be exceeded more than 18 times per calendar year
	Calendar Year	40 µg/m^3
Benzene	Calendar Year	5 µg/m^3

Pollutant	Average Period	NAQO Limit Value
Lead	Calendar Year	0.5 µg/m^3
PM_{10}	One Day	50 µg/m^3 Not to be exceeded more than 35 times per calendar year
	Calendar Year	40 µg/m^3
$PM_{2.5}$	Calendar Year	25 µg/m^3
Carbon Monoxide	Maximum daily running 8-hour mean	10 mg/m^3

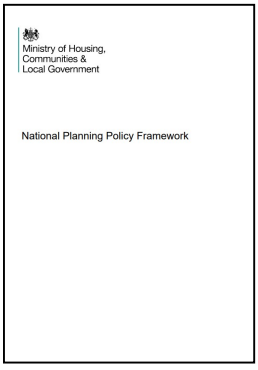
2.2. Clean Air Strategy (2019)

The Government's Clean Air Strategy was launched on the 14th January 2019 and sets out a range of initiatives that will help reduce air pollution, providing healthier air to breathe, enhancing the economy and protecting nature.

The Clean Air Strategy highlights action to be taken to reduce emissions across all sectors, including transport, the home, farming, and industrial sources. This includes actions to reduce particulate matter from domestic emissions, by introducing new legislation to prohibit the sales of the most polluting fuels and ensuring only the cleanest stoves are available for sale by 2022.

In addition, the Clean Air Strategy sets out proposals to halve the population living in areas with concentrations of fine particulate matter ($PM_{2.5}$) above the World Health Organisation (WHO) guideline levels of 10 µg/m^3 by 2025.

2.3. National Planning Policy Framework (2021)



The National Planning Policy Framework (NPPF) was first published in March 2012 and revised in July 2018, February 2019 and most recently July 2021. The NPPF outlines the Government's environmental, economic and social policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 7, 8 10 and 11). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

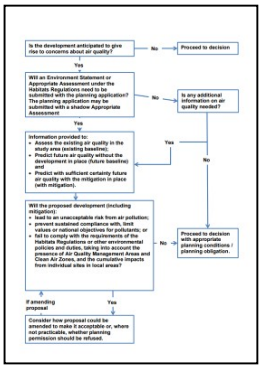
The NPPF states that in the planning system *"Planning policies and decisions should contribute to and enhance the natural and local environment by… e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever*

possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans" (Paragraph 174).

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

2.4. Planning Practice Guidance (2019)

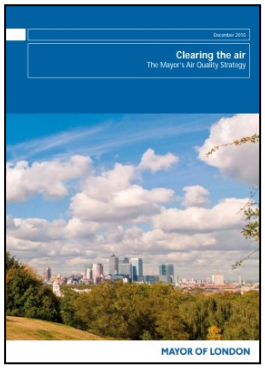
The Planning Practice Guidance (PPG) was launched on 6th March 2014 and has undergone regular revision, with the most recent changes to Air Quality in November 2019. It provides additional guidance and interpretation to the Government's strategic policies, outlined within the NPPF, in a web-based resource. This is updated regularly.



Matters of relevance to the air quality assessment include:

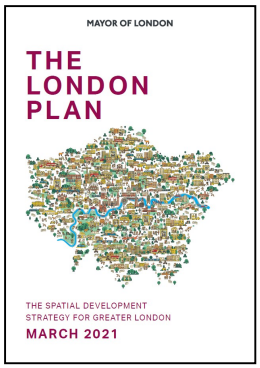
- The provision of *"guidance on how planning can take account of the impact of new development on air quality"*. The PPG provides signposts as to how to address air quality in planning applications and highlights the importance of local plans.
- The statement that *"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with relevant Limit Values"* and *"It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit"* (Reference ID: 32-001-20191101). The PPG goes on to say that *"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)"* (Reference ID: 32-005-20191101).
- The identification of the content of an air quality assessment, stating clearly that *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific"* (Reference ID: 32-007-20191101).

2.5. 'Clearing the Air' – The Mayor's Air Quality Strategy (2010)



In December 2010, the Mayor of London's Air Quality Strategy was published by the Greater London Authority (GLA). The strategy sets out a framework for delivering improvements to London's air quality and includes measures aimed at reducing emissions from all types of new development, as well as raising awareness of air quality issues and its impacts on health.

2.6. The London Plan (2021)



The New London Plan was formally published on the 2nd of March 2021 and replaces the previous London Plan.

The London Plan 2021 takes an even tougher approach to air quality than its predecessor. The Plan notes that *"Poor air quality is a major issue for London which is failing to meet requirements under legislation. Poor air quality has direct impacts on the health, quality of life and life expectancy of Londoners. The impacts tend to be most heavily felt in some of London's most deprived neighbourhoods, and by people who are most vulnerable to the impacts, such as children and older people. London's air quality should be significantly improved and exposure to poor air quality, especially for vulnerable people, should be reduced* (para 9.1.1). *The Mayor is committed to making air quality in London the best of any major world city, which means not only achieving compliance with legal limits for Nitrogen Dioxide as soon as possible and maintaining compliance where it is already achieved, but also achieving World Health Organisation targets for other pollutants such as Particulate Matter* (para 9.1.2)".

This last point is reinforced in Paragraph 9.1.4 which states "*where this policy refers to 'existing poor air quality' this should be taken to include areas where legal limits for any pollutant, or World Health Organisation targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5 per cent of these limits* (para 9.1.4)". Consequently, which not legal limits on air pollution, air quality assessments within London now require the consideration of the lower WHO targets on PM_{10} and $PM_{2.5}$.

Policy SI1 – Improving Air Quality states that:

A. *"Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.*

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

   1) *Development proposals should not:*

a) *lead to further deterioration of existing poor air quality*

b) *create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*

c) *create unacceptable risk of high levels of exposure to poor air quality.*

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

a) *development proposals must be at least Air Quality Neutral*

b) *development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures*

c) *major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1*

d) *development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.*

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

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

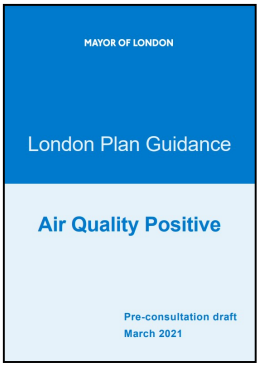
2) *what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.*

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

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

The 2021 London Plan is supported by various supplementary London Plan Guidance (LPG) documents, of which ones relating to previous versions of the London Plan are still referred to as Supplementary Planning Guidance (SPGs). Relevant LPGs and those SPGs that are still adopted are discussed below.

2.6.1. Draft Air Quality Positive London Plan Guidance (2021)

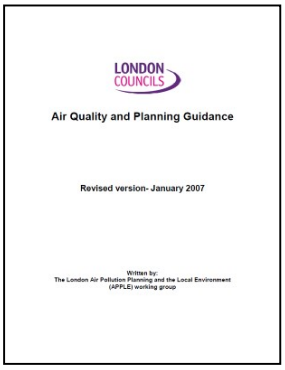


The 2021 London Plan is supported by supplementary London Plan Guidance (LPG) documents, several of which are currently undergoing consultation. The Draft Air Quality Positive LPG explains how to apply the air quality positive approach to large scale developments, required by Policy SI1 (part C) of the London Plan. This approach aims to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality.

This guidance sets out the approach and structure of an Air Quality Positive (AQP) Statement that is required as part of the planning application process. This statement requires applicants to detail the adopted measures used to reduce emissions, contributing to an overall reduction in London's air pollution. This guidance has been prepared by the Greater London Authority (GLA) with input and advice from air quality specialists. It has been developed following feedback from stakeholders at various events including the Atmospheric Dispersion Modelling System user groups and Institute of Air Quality Management conference.

The Air Quality Positive guidance will be formally consulted on in autumn 2021.

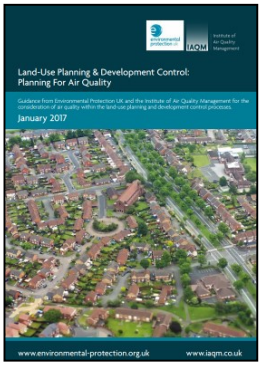
2.7. Air Quality and Planning Guidance (2007)



Written by the London Air Pollution Planning and the Local Environment (APPLE) working group of the London Councils, an umbrella organisation comprising all 32 London Borough and the City of London, the Air Quality and Planning Guidance provides technical advice on how to conduct air quality assessments for planning applications.

Whilst some of this guidance is now out of date, as it has not been updated in line with changes in other guidance documents or policy, the document does still provide useful guidance, especially in relation to detailed dispersion modelling. The guidance also offers advice in relation to determining the significance of exposure to air pollution and the levels of mitigation required.

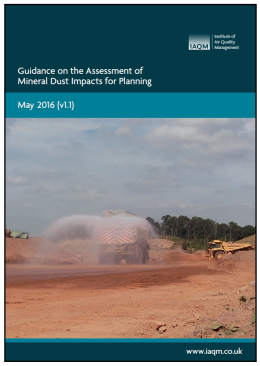
2.8. Land-Use Planning & Development Control: Planning for Air Quality (2017)



Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 and updated in January 2017, provides general guidance on air quality and planning.

Specifically, the guidance provides details on the scoping of effects, how to assess the impacts in relation to air quality, as well as details on how to assess the significance of impacts.

2.9. Guidance on the Assessment of Mineral Dust Impacts for Planning (2016)

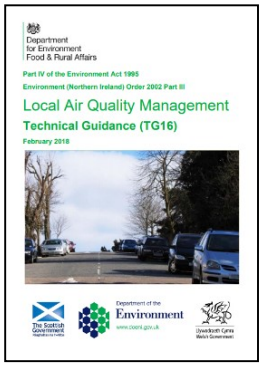


The Institute of Air Quality Management (IAQM) has published *Guidance on the Assessment of Mineral Dust Impacts for Planning* (IAQM, 2016).

The guidance has been prepared to assist practitioners in undertaking dust assessments for the operational phases of minerals developments.

Although the proposed development is not a minerals development, it is considered that dust generating activities at the site would be similar to some minerals operations and the source-pathway-receptor approach underlying the IAQM dust assessment method is appropriate for assessing the impacts of the operation of the proposed development.

2.10. London Local Air Quality Management Technical Guidance TG16 - (2016)



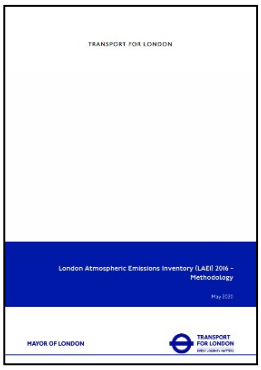
Specifically designed to provide technical guidance to Local Planning Authorities (LPAs) in relation to their review and assessment of air quality, TG(16) provides useful guidance in relation to the appropriate methods of air quality modelling and monitoring, which can be as equally useful to the assessment of air quality impacts.

2.11. Air Quality Neutral Planning Support Update: GLA 80371 (2014)

The Air Quality Neutral Planning Support Update document GLA 80371 provides a detailed methodology in support of the London Plan in relation to how to assess air quality neutrality and what constitutes an air quality neutral development.

The document provides useful guidance in relation to the appropriate methods of air quality modelling and monitoring, which can be as equally useful to the environmental impact assessment of air quality.

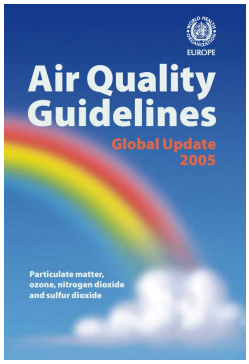
2.12. London Atmospheric Emissions Inventory (2016)



The London Atmospheric Emissions Inventory (LAEI), published in 2013 and update in 2016, includes maps of the Air Quality Focus Areas in London. Air Quality Focus Areas were defined across London in locations where the EU annual mean limit value for NO_2 was exceeded, coupled with a high level of human exposure. These were not designed to be an exhaustive list of London's air pollution hotspots, but locations where the problem was the most acute. The Focus Areas were defined to address concerns raised by boroughs within the LAQM review process and forecasted air pollution trends. There are currently 187 Air Quality Focus Areas across London.

The Focus Areas have been used by GLA, TfL and the Boroughs to inform local air quality management, the development of air quality interventions and the planning process. Under London Local Air Quality Management guidelines, Boroughs are required to have regard to the focus areas in their Borough when devising their Air Quality Action Plans.

2.13. World Health Organization Air Quality Guidelines (2021)



The WHO Air Quality Guidelines propose threshold limits for key air pollutants that pose health risks. The guidelines cover a range of pollutants and suggest threshold levels at which health effects are unlikely to occur, based on the latest scientific evidence. For a number of pollutants, the WHO levels are equivalent to the levels determined by the EU, which were then exacted into the National Air Quality Objectives in the UK; however, the guidelines offer recommended exposure levels for particulate matter (PM_{10} and $PM_{2.5}$) which are lower than the National Air Quality Objectives as set out in the Air Quality Standards Regulations 2010. The WHO Guidelines also provides interim targets for areas of high air pollution.

Since WHO's last 2005 global update, there has been a marked increase of evidence that shows how air pollution affects different aspects of health. For that reason, and after a systematic review of the accumulated evidence, WHO has adjusted almost all the AQGs levels downwards in 2021.

Table 2.2 summarises the WHO Guideline values.

Table 2.2: WHO Air Quality Guidelines

Pollutant	Average Period	WHO Guideline Value
Nitrogen Dioxide	One Day	25 µg/m^3
	Calendar Year	10 µg/m^3
PM_{10}	One Day	45 µg/m^3 (99th Percentile)

Pollutant	Average Period	WHO Guideline Value
	Calendar Year	15 µg/m^3
$PM_{2.5}$	One Day	15 µg/m^3 (99th Percentile)
	Calendar Year	5 µg/m^3

3. ASSESSMENT METHODOLOGY

3.1. Methodology Overview

The assessment of air quality considered several different areas, specifically:

1. The constraints that the existing air quality has on the Proposed Development;
2. The impact of the changes in road traffic flows on air pollutant concentrations, at nearby sensitive receptors;
3. The impact of emissions from the Proposed Development's plant (such as biomass boilers or combined heat and power (CHP) plants) on air pollutant concentrations at nearby sensitive receptors (if applicable); and
4. The impact of dust at nearby sensitive receptors.

Land-Use Planning & Development Control: Planning for Air Quality states with respect to the identification of local receptors, they should include *"residential and other properties close to and within the proposed development, as well as alongside roads significantly affected by the development, even if well away from the development site, and especially if within AQMAs. These receptors will represent locations where people are likely to be exposed for the appropriate averaging time (dependent on the air quality objective being assessed against)"*. The last point is critical as this identifies that sensitivity in relation to air quality is directly related to the amount of time one spends in a location. For example, when considering annual mean objectives (such as that of NO_2), any area where one might spend large parts of the year might be considered a sensitive receptor. An example could be a dwelling, where one might expect to spend at least half of their time during one day. Health centres, hospitals, schools and nurseries could all expect to be considered sensitive receptors, partially due to the length of exposure spent in these locations, but also due to vulnerable members of society (e.g. the very young, the very old, or the ill) spending significant amounts of time at these locations. Offices would not normally be considered to be a highly sensitive receptor since most visitors would be healthy adults and would only spend around 8 hours per day, 5 days per week there (i.e. less than 25% of the year), whereas people could spend over 50% of their time within a dwelling. Hotels would not be considered sensitive receptors in terms of the annual mean since residents would only normally expect to spend a small number of nights in that location; however, hostels, sheltered accommodation and student accommodation would be considered as sensitive as dwellings, as residents could be expected to stay for several months.

The baseline scenario will consider two separate sets of site conditions, specifically the 2019 baseline conditions (the latest date for which data is available) and the existing 2022 baseline site conditions, which represents the opening year of the proposed development. The consideration of a future baseline for air quality is important as it takes into account future changes in both traffic flow, but also pollutant concentrations, which could vary.

To determine the baseline conditions, the following was undertaken:

1. A review of the most recent progress reports on air quality carried out by the local planning authority, as submitted to the Department for the Environment, Food and Rural Affairs (Defra);

2. Determination of whether the site is situated within a designated Air Quality Management Area (AQMA);
3. A review of local air quality monitoring within the area of the site;
4. A review of the Environment Agency's register of industrial sites under the EC Integrated Pollution Prevention and Control Directive (IPPC) to determine whether industrial sources of air pollution could be affecting the site;
5. Review of the list of registered Part A2 and Part B permitted premises under the PPC Regulations to determine whether any other sources of air pollution could be affecting the site;
6. Using the methodology described in the ADMS-Roads Detailed Dispersion Model (details of which can be seen in **Appendix 2**, utilising data described in **Appendix 3**), predict concentrations of air pollutants on-site within the current baseline year and the future baseline year.

3.2. Methodology for Determining Effects of Traffic

To determine the operational effects of the Proposed Development, the change in traffic flow at sensitive receptors in the future opening year of the proposed development, both with and without development related traffic, was modelled using the methodology described in the ADMS-Roads Detailed Dispersion Model (details of which can be seen in **Appendix 2**, utilising data described in **Appendix 3**).

To determine the impact of the proposed development on surrounding local sensitive receptors, the impact magnitude has been derived from Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the IAQM and EPUK. **Table 3.1** identifies the advice given in the IAQM / EPUK Guidance regarding impact descriptors upon individual receptors.

Table 3.1: Impact Descriptors for Individual Receptors

Long-Term Average Concentration at Receptor in Assessment Year	% Change in Concentrations Relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Source: Table 6.3 of the IAQM Guidance

The guidance goes on to offer the following explanation (taken from the footnotes of Table 6.3 of the IAQM Guidance):

"AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

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.

The Table is only designed to be used with annual mean concentrations.

Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

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

3.3. Methodology for Determining Effects of Dust

The methodology outlined in the IAQM Guidance on the *Assessment of Mineral Dust Impacts for Planning* has been used for this assessment.

A detailed dust assessment would usually be required where there is a human or sensitive ecological receptor within 250 m of a sand and/or gravel site, or within 400 m of a hard rock quarry, measured from the nearest dust generating activities. Where there are no such receptors within these bands, it would normally be assumed that a detailed dust assessment is not required.

Locations sensitive to dust emitted during site operations will be places where members of the public are regularly present. Residential properties and commercial operations close to the application site will be most sensitive to operational dust. Any areas of sensitive vegetation or ecology that are very close to dust sources may also be susceptible to negative effects.

The guidance describes a qualitative source-pathway-receptor approach to determine the risk of dust effects. The assessment method uses a number of steps to determine the site characteristics and baseline conditions, an estimate of the dust impact risk and an estimate of the likely magnitude of effects. Potential dust sources and activities are identified and the risk of impacts at sensitive receptors determined based on the prevailing meteorological conditions and topography, the likely magnitude of emissions (with mitigation in place) and the distances over which effects may occur.

The IAQM minerals dust guidance divides activities on minerals sites into seven types to reflect their different potential impacts. A series of steps then consider the potential impact due to the risk of health effects, loss of amenity due to dust deposition (annoyance), and harm to the natural environment.

The assessment is undertaken as follows:

1. Determine sensitivity (rated "low" to "high") for each of the three receptor categories (health, amenity, nature).
2. Determine residual source emissions for each of the seven activity types determined (rated "small" to "large").
3. Determine pathway effectiveness (based on meteorological factors and distance to receptors).

Having determined the above three factors based on indicative suggestions within the guidance, they are then combined in the following ways:

4. Combine residual source emissions (2) and pathway effectiveness (3) to determine the "amenity dust risk".
5. Combine sensitivity (1) and "amenity dust risk" (4) to determine the magnitude of the dust effect.
6. Determine the significance of the magnitude of the dust effect.

3.4. Significance Criteria

Land-Use Planning & Development Control: Planning for Air Quality provides a framework to assess significance in air quality assessments. As described in the guidance, the *"assessment framework for describing impacts can be used as a starting point to make a judgement on significance of effect, but there will be other influences that might need to be accounted for. The impact descriptors set out in Table 6.3* [Replicated in **Table 3.1** of this chapter] *are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it may be that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances (Paragraph 7.4)".*

The Land-Use Planning & Development Control guidance goes on to state that any significance needs to be assessed using a certain amount of professional judgement and should take into account *"the existing and future air quality in the absence of the development; the extent of current and future population exposure to the impacts; and the influence and validity of any assumptions adopted when undertaking the prediction of impacts"* (Paragraph 7.7). For example, for a large development, a major adverse impact on a single dwelling might be considered insignificant; however, a minor impact to 100,000 dwellings might be considered to be highly significant. Furthermore, the absolute level of pollutant concentrations are also important in determining significance; for example, a moderate impact to a small group of dwellings might be considered highly significant if the concentrations of NO_2 were well in excess of the NAQO level, however, that same moderate impact might be considered insignificant if concentrations were well below the NAQO.

4. SCOPING

4.1. Overview

The National Planning Practice Guidance on Air Quality is explicit in stating that *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific"* (Reference ID: 32-007-20191101). This is reiterated in *Land-Use Planning & Development Control: Planning for Air Quality*, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 and updated in January 2017, which provided guidance on screening as to whether an air quality assessment is required and what needs to be assessed.

4.2. Impacts of the Local Area on the Development

The IAQM/EPUK Guidance suggests that whether an assessment of the impacts of the local area on the proposed development is required is a matter of judgement, but should take into account:

- *"the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular NO_2), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development."*

4.3. Impacts of the Development on the Local Area

To determine whether an assessment of the impacts of the development on the local environment is required, the IAQM/EPUK Guidance suggests a two-stage approach. The guidance states that *"The **first stage** is intended to screen out smaller development and/or developments where impacts can be considered to have insignificant effects. The **second stage** relates to specific details regarding the proposed development and the likelihood of air quality impacts."*

Figure 4.1 reproduces Stage 1 of the IAQM/EPUK Guidance' two-stage approach. In order to proceed to Stage 2, development needs to meet both one of the criteria in "A", and one of the criteria in "B". If the development fails to meet these criteria, then an air quality assessment looking at the impacts of the development on the local area will not be required.

Figure 4.2 reproduces Stage 2 of the IAQM/EPUK Guidance' two-stage approach. If the development meets the criteria contained within Stage 1, *"more specific guidance as to when an air quality assessment is likely to be required to assess the impacts of the proposed development on the local area."* If the development then meets any of the eight criteria in Stage 2, an assessment of the impacts of the proposed development on the surrounding environment will be required.

Figure 4.1: IAQM/EPUK Guidance – Stage 1 Criteria

Criteria to Proceed to Stage 2

A. If any of the following apply:

- 10 or more residential units or a site area of more than 0.5ha
- more than 1,000 m^2 of floor space for all other uses or a site area greater than 1ha

B. Coupled with any of the following:

- the development has more than 10 parking spaces
- the development will have a centralised energy facility or other centralised combustion process

Note: Consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

Figure 4.2: IAQM/EPUK Guidance – Stage 2 Criteria

The development will:	Indicative Criteria to Proceed to an Air Quality Assessment [a]
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
3. Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
4. Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.
5. Introduce or change a bus station.	Where bus flows will change by: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.
6. Have an underground car park with extraction system.	The ventilation extract for the car park will be within 20 m of a relevant receptor. Coupled with the car park having more than 100 movements per day (total in and out).
7. Have one or more substantial combustion processes, where there is a risk of impacts at relevant receptors. NB. this includes combustion plant associated with standby emergency generators (typically associated with centralised energy centres) and shipping.	Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec[a] is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates. Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable.

[a] As a guide, the 5 mg/s criterion equates to a 450 kW ultra low NO_x gas boiler **or** a 30kW CHP unit operating at <95mg/Nm^3. Users of this guidance should quantify the NO_x mass emission rate from the proposed plant, based on manufacturers' specifications and operational conditions.

4.4. Site Specific Scoping Assessment

The proposed development is located in an Air Quality Management Area; however, no new high sensitivity receptors are introduced (i.e., not a housing development, school, care home etc.), therefore **an assessment of the impacts of the local area on the development is not required**.

As concern over the impacts of the proposed development arising from traffic generation and dust have been raised as part of the Enforcement Notice, **an assessment of the impacts of the development on the local area in terms of both traffic and dust is required**.

There would be no gas use at the proposed development; therefore, an air quality neutral assessment with regards building emissions would not be required. The planning application is for Sui Generis use; therefore, it is not possible to compare the scheme trip data with any land use class in the guidance on the application of the air quality neutral policy. Therefore, it is not possible to undertake an air quality neutral assessment with regards transport emissions. As the proposed development is for a temporary use, it is considered that the cumulative impact on overall air quality in London due to transport emissions from the proposed development would not be significant.

5. BASELINE CONDITIONS

5.1. Air Quality Review and Assessment

Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the NAQOs. Where these objectives are unlikely to be achieved, local authorities must designate these areas as Air Quality Management Areas (AQMAs) and prepare a written action plan to achieve the NAQOs.

The review of air quality takes on several prescribed stages, of which each stage is reported. The review of historic Air Quality Assessment reports for the London Borough of Hillingdon indicates that exceedances of the annual mean objective for NO_2 has been experienced across the Borough, primarily centred on the main roads, and these exceedances are predicted to continue. It is understood that exceedances of the annual mean objectives for both PM_{10} and $PM_{2.5}$ are not expected within the Borough in future years.

As a consequence of the exceedances of the NAQOs, the London Borough of Hillingdon have declared an Air Quality Management Area (AQMA) encompassing the entire southern extent of the Borough, including the development site and the area around the site.

The London Atmospheric Emissions Inventory (LAEI) notes that the site is located within one of the London Borough of Hillingdon's Air Quality Focus Areas, specifically Area 100, which encompasses large parts of West Drayton and Yiewsley.

Concentrations of SO_2, Benzene, Lead and CO are not considered to be significant within the Borough. Consequently, no further consideration is given to these pollutants as it is highly unlikely that they would be of concern on the proposed development site.

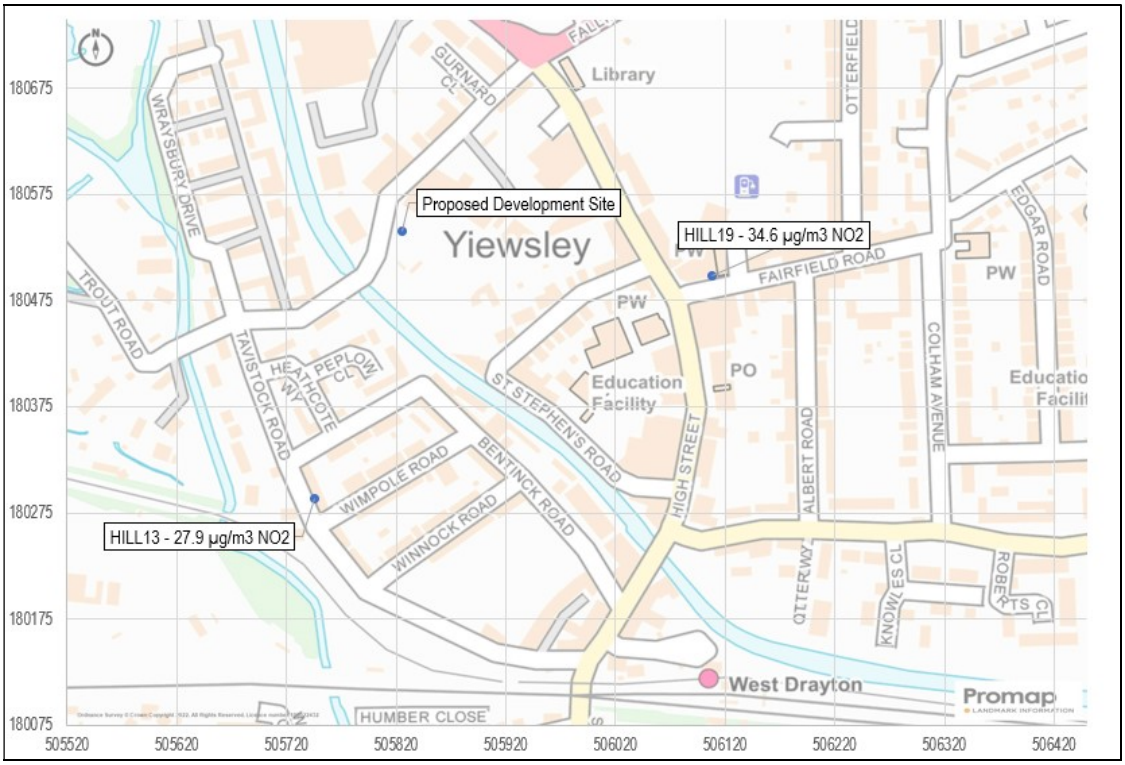
5.2. Local Air Quality Monitoring

The London Borough of Hillingdon has conducted air quality monitoring, including at two sites in the vicinity of the proposed development site for which traffic counts are available for the adjacent roads, and would therefore be suitable for the verification of an air quality model. **Table 5.1** summarises the air quality monitoring data which is displayed graphically in **Figure 5.1**.

Table 5.1: Air Quality Monitoring

Location	Site Type	Annual Mean Concentrations of NO_2 (µg/m^3)				
		2015	2016	2017	2018	2019
HILL13 – 31 Tavistock Road	Roadside	28.7	25.8	26.9	29.5	27.9
HILL19 – 104 Yiewsley High Street	Roadside	40.9	32.0	37.0	35.0	34.6

Figure 5.1: Monitoring Locations



5.3. Industrial Emissions

Both the Environment Agency's register of industrial sites under the EC Integrated Pollution Prevention and Control Directive (IPPC) and the Local Authority's list of registered Part A2 and Part B permitted premises under the Pollution, Prevention and Control Act 1999 and the Environmental Permitting (England and Wales) Regulations 2010 have shown that there are no sites within close proximity of the development site that could be affecting air pollutant levels.

5.4. Baseline Onsite Pollution Concentrations

Background concentrations of air pollutants have been obtained from the UK National Air Quality Information Archive. The archive predicts background concentrations for the whole of the UK at a 1 km^2 resolution. Background pollutant concentrations for the 1 km^2 grid square centred at 505500 180500 (that of the proposed development site) were determined to be 23.03 $\mu g/m^3$ NO_2, 16.69 $\mu g/m^3$ PM_{10} and 11.14 $\mu g/m^3$ $PM_{2.5}$; well below the respective annual NAQOs of 40 $\mu g/m^3$ NO_2, 40 $\mu g/m^3$ PM_{10} and 25 $\mu g/m^3$ $PM_{2.5}$.

6. IMPACTS OF THE DEVELOPMENT ON THE LOCAL AREA

6.1. Traffic-Related Emissions

To assess the impact of a proposed development on local air quality, the methodology from Land-Use Planning & Development Control: Planning for Air Quality, jointly published by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) in May 2015 (updated 2017) has been implemented.

Traffic generation data was prepared for the 2021 planning application by Yes Engineering indicates the number of vehicle movements generated by the proposed development. To characterise the change in air quality as a consequence of the proposed development, predictions of air pollutant concentrations at sensitive receptors have been carried out for the current year (2022) both with and without the proposed development traffic.

Appendix 2 provides a description of the methodology used in the assessment, including the method to calculate NO_2 from NO_x. **Appendix 3** outlines the input data, including traffic data, background concentrations. In addition, details of the verification factor applied to the predicted concentrations of NO_x can also be found in **Appendix 3**.

Concentrations have been calculated for four sensitive receptors at locations likely to be most affected by changes in both relative and absolute traffic flows. The results of these predictions can be seen in **Table 6.1** and **Table 6.2**, for without with development related traffic flows respectively.

The results of these predictions can be used to identify the increase in pollutant concentrations as a consequence of the proposed traffic generation. These calculations can be seen in **Table 6.3**. The results show that the impact of the increase in traffic flow is very small at the worst affected sensitive receptors, such that the percentage change in concentrations relative to AQAL is very small. Consequently, the proposed development will not have an impact on the air quality of the local area and the impact is considered to be *"negligible".*

Table 6.1: Air Pollutant Concentrations 2022 – Without Development Related Traffic

Receptor		NO_2 (µg/m³)	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)
		Annual Mean	Annual Mean	Days >50 µg/m³	Annual Mean
Quoin House 1	Ground Floor	25.18	17.40	0.98	11.67
	1st Floor	24.45	17.20	0.85	11.55
	2nd Floor	23.93	17.05	0.77	11.47
	3rd Floor	23.69	16.99	0.73	11.43
Quoin House 2	Ground Floor	25.38	17.46	1.01	11.70
	1st Floor	24.59	17.24	0.88	11.57
	2nd Floor	24.01	17.07	0.78	11.48
	3rd Floor	23.74	17.00	0.74	11.43
Caxton House	Ground Floor	26.04	17.65	1.14	11.81
	1st Floor	24.91	17.32	0.93	11.62
	2nd Floor	24.10	17.10	0.80	11.49
	3rd Floor	23.77	17.01	0.75	11.44
Rowlock House	Ground Floor	24.94	17.33	0.93	11.62
	1st Floor	24.43	17.19	0.85	11.54
	2nd Floor	23.97	17.06	0.78	11.47
	3rd Floor	23.71	16.99	0.74	11.43
NAQO		**40**	**40**	**35**	**25**

Table 6.2: Air Pollutant Concentrations 2022 – With Development Related Traffic

Receptor		NO_2 (µg/m³)	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)
		Annual Mean	Annual Mean	Days >50 µg/m³	Annual Mean
Quoin House 1	Ground Floor	25.20	17.40	0.98	11.67
	1st Floor	24.46	17.20	0.85	11.55
	2nd Floor	23.93	17.05	0.77	11.47
	3rd Floor	23.69	16.99	0.73	11.43
Quoin House 2	Ground Floor	25.40	17.46	1.01	11.70
	1st Floor	24.60	17.24	0.88	11.57
	2nd Floor	24.01	17.07	0.78	11.48
	3rd Floor	23.74	17.00	0.74	11.43
Caxton House	Ground Floor	26.07	17.65	1.14	11.81
	1st Floor	24.92	17.32	0.93	11.62
	2nd Floor	24.11	17.10	0.80	11.49
	3rd Floor	23.77	17.01	0.75	11.44
Rowlock House	Ground Floor	24.95	17.33	0.93	11.62
	1st Floor	24.44	17.19	0.85	11.54
	2nd Floor	23.98	17.06	0.78	11.47
	3rd Floor	23.71	16.99	0.74	11.43
NAQO		**40**	**40**	**35**	**25**

Table 6.3: Assessment of the Impacts of the Increases in Traffic Flow

Receptor		NO_2 (µg/m³) Annual Mean		% Change in Conc. Relative to Air Quality Assessment Level (AQAL)	Long-Term Average Concentration at Receptor in Assessment Year	Impact Descriptor
		Without Development	With Development			
Quoin House 1	Ground Floor	25.18	25.20	0.05	63% of AQAL	*Negligible*
	1st Floor	24.45	24.46	0.025	61% of AQAL	*Negligible*
	2nd Floor	23.93	23.93	0	60% of AQAL	*Negligible*
	3rd Floor	23.69	23.69	0	59% of AQAL	*Negligible*
Quoin House 2	Ground Floor	25.38	25.40	0.05	64% of AQAL	*Negligible*
	1st Floor	24.59	24.60	0.025	62% of AQAL	*Negligible*
	2nd Floor	24.01	24.01	0	60% of AQAL	*Negligible*
	3rd Floor	23.74	23.74	0	59% of AQAL	*Negligible*
Caxton House	Ground Floor	26.04	26.07	0.075	65% of AQAL	*Negligible*
	1st Floor	24.91	24.92	0.025	62% of AQAL	*Negligible*
	2nd Floor	24.10	24.11	0.025	60% of AQAL	*Negligible*
	3rd Floor	23.77	23.77	0	59% of AQAL	*Negligible*
Rowlock House	Ground Floor	24.94	24.95	0.025	62% of AQAL	*Negligible*
	1st Floor	24.43	24.44	0.025	61% of AQAL	*Negligible*
	2nd Floor	23.97	23.98	0.025	60% of AQAL	*Negligible*
	3rd Floor	23.71	23.71	0	59% of AQAL	*Negligible*
NAQO		**40**	**40**	**-**	**-**	**-**

6.2. Mitigation

As a consequence of traffic generated by the proposed development, there will not be a significant increase in pollutant concentrations and therefore mitigation is not seen to be necessary.

7. DUST RISK ASSESSMENT

7.1. Screening

The proposed development as described in the 2021 Application could potentially give rise to dust emissions. Given that there are human receptors within 250 m of the site boundary a detailed assessment is required. Although not designated a sensitive habitat, the Grand Union Canal has been highlighted in the Enforcement Notice and this has therefore also been included as a sensitive receptor in the assessment.

7.2. Dust Generating Activities

Parts of the proposed development would be used for the reception and storage of aggregate materials and building and scaffolding materials. The use would be for a temporary period of three years.

Up to thirty standard shipping containers for general closed storage are proposed within the site. The number of containers would be flexible depending on tenant demand and these would be located in two distinct closed storage areas.

Two areas of open storage, used for storage of building materials (marble stone, bricks etc) and scaffolding materials (poles, scaffolding canopy and decked planks and associated fittings) are also proposed. Open steel racks will be used for the storage of the materials.

The southern open storage area would also be used for the storage of aggregates. The aggregate storage would comprise of 10 mm to 20 mm shingle and sharp sand, with one load of 20 tonnes of each. There will be no processing of aggregates on site, just storage until loading onto trucks for transport offsite.

Following the issue of the Enforcement Notice, the Applicant has agreed that aggregate storage could be stored within enclosed containers, details of which could be conditioned if the Enforcement Appeal or a revised application is allowed. Additionally, an internal spine road has been constructed within the site so that vehicles are using a concreted road rather than unmade ground which again may limit dust disturbance

The following activities identified in the IAQM mineral dust guidance based on the above are relevant to this assessment:

- Materials handling.
- On-site transportation.
- Mineral processing.
- Stockpiles.
- Off-site transportation.

7.3. Receptor Sensitivity

High sensitivity receptors within 100 m of the site have been selected and are shown in **Figure 7.1**, below. As the residual source emissions are deemed “small” (see **Section 7.4**, below), the impact at medium sensitivity commercial receptors within 100 m and highly sensitive receptors beyond 100 m of the site boundary would be negligible, regardless of the pathway effectiveness; and thus, such receptors have not been assessed.

Figure 7.1: Receptor Locations

7.4. Residual Source Emissions

Residual source emissions, i.e., the emissions expected with the designed mitigation in place, have been estimate for each of the activities listed above and are discussed below.

7.4.1. Material Handling

The residual source emissions for material handling are considered to be "small". The aggregates would be delivered to stockpiles and there would be some potential for emissions during delivery; however, the stockpiles would remain undisturbed until aggregates were taken for use offsite. The volume of stored materials would be relatively small, with just two stockpiles of 20 tonnes each, and the scale of handling of the stockpiled materials would be small. Just one shovel loader would be in use at the site.

7.4.2. On-site Transportation

The residual source emissions for on-site transportation are considered to be "small". There would be minimal transport of material on-site. Materials would be delivered and placed in storage and would then not be moved until loading onto trucks for transport off-site.

There is an area of hardstanding by the Trout Road entrance; however, much of site is unmade ground. An internal access road has been laid out following the issue of the Enforcement Notice to minimise the resuspension of dust and this, and the area of hardstanding, would be kept free from dust as much as possible.

When necessary, a road sweeper would be used on the hard surface and access road to remove dust, and water suppression would be used during dry conditions.

There would be around 60 heavy vehicle movements daily. Not all of these vehicles would travel over the unmade ground, and the distance travelled over unmade ground would be low.

7.4.3. Stockpiles

The residual source emissions for stockpiles are considered to be "small". The volume of stored aggregates would be relatively small, with just two stockpiles of 20 tonnes each.

The aggregates would be stored in stockbays, which would be high sided to prevent windblown emissions and contain the aggregates, preventing spread across the surface of the site.

The stockbays would be watered as necessary during dry conditions. There would be very little dust from the storage of the building materials and enclosed storage would further limit dust.

7.4.4. Off-site Transportation

The residual source emissions for stockpiles are considered to be "small".

There would be around 30 heavy vehicle movements out of the site daily. Many of these vehicles would carry enclosed containers and building materials with a low dust potential, with no risk of dust emissions from the load.

Heavy vehicles leaving the site with aggregate loads would be covered prior to leaving the site. HGVs leaving the site would travel over a clean hard surface before joining Trout Road. Light vehicles would only travel on the clean, hard surfaced area and would not track dust.

A road sweeper would be used as necessary on the site and the local highway to clean up any potentially dusty spillages. Additional water abatement would be used during dry conditions. The use of water abatement and the lack of dusty materials on the ground would prevent the track-out of dust onto the local road network.

Table 7.1: Residual Source Emissions Summary

Activity	Residual Source Emissions
Materials Handling	Small
On-site Transportation	Small
Stockpiles	Small
Off-site Transportation	Small

7.5. Pathway Effectiveness

Transportation of fugitive dust in the air is dependent on the prevailing meteorological conditions. Receptors downwind of the source, with regard to the prevailing wind, will be exposed to dust more frequently than those upwind. Prevailing wind direction at the site is well understood to be from the southwest, based on data from the Heathrow Airport meteorological station (5km to the south).

There is a risk that dust could be entrained from the ground even when no dust generating activities are taking place. Wind speeds greater than 5 m/s are considered strong enough to initiate the suspension of dust from the ground, and the risk is increased on dry days, i.e., when less than 0.2 mm of rainfall are recorded over a 24-hour period. Data from Heathrow show that wind speeds are likely to be below 5 m/s 69% of the time (based on 15 years' worth of data).

Average rainfall data for the area shows that, over the 30-year period from 1981 to 2010, an average of 150-160 days will be wet days, i.e., rainfall will be greater than 0.2 mm (Met Office, 2021). Therefore, for approximately 42% of the time, daily rainfall will be greater than 0.2 mm, when there will be natural dust suppression.

As per the IAQM guidance, pathway effectiveness has been determined for the receptors shown in **Figure 7.1** by combining the categorisation of frequency of potentially dusty winds described above (Table 9 of the guidance) with the categorisation of receptor distance from source (Table 10 of the guidance). This is summarised in **Tables 7.2** and **7.3**, below.

Table 7.2: Wind Frequency Category by Receptor

Receptor ID	Receptor Name	Wind Sectors Affecting Receptor Area (°)	Frequency of Wind >5m/s Towards Receptor Area (%)	Frequency of Wind >5m/s Towards Receptor Area on Dry Days (%)	Wind Frequency Category
R1	Rowlock House	80-170	16	4	Infrequent
R2	Quoin House	90-210	30	11	Moderately Frequent
R3	Caxton House	90-260	55	24	Very Frequent
R4	St Stephen's Rd	180-40	76	26	Very Frequent
R5	Grand Union Canal Moorings	320-120	34	5	Moderately Frequent
R6	Peplow Close	330-100	30	4	Infrequent
R7	Sandpiper House	40-120	17	3	Infrequent
R8	Grand Union Canal	320-130	35	5	Moderately Frequent

Table 7.3: Pathway Effectiveness by Receptor

Receptor	Frequency of Potentially Dusty Wind	Receptor Distance Category	Pathway Effectiveness
R1	Infrequent	Close	Ineffective
R2	Moderately Frequent	Close	Moderately Effective
R3	Very Frequent	Close	Highly Effective
R4	Very Frequent	Close	Highly Effective
R5	Moderately Frequent	Close	Moderately Effective
R6	Infrequent	Close	Ineffective
R7	Infrequent	Close	Ineffective
R8	Moderately Frequent	Close	Moderately Effective

7.6. Amenity Dust Risk

Having determined the residual source emissions (**Section 7.4**) and the pathway effectiveness (**Section 7.5**) these are combined to determine the amenity dust risk in **Table 7.4**, below.

Table 7.4: Amenity Dust Risk by Receptor

Receptor	Residual Source Emissions	Pathway Effectiveness	Amenity Dust Risk
R1	Small	Ineffective	Negligible
R2	Small	Moderately Effective	Negligible
R3	Small	Highly Effective	Low
R4	Small	Highly Effective	Low
R5	Small	Moderately Effective	Negligible
R6	Small	Ineffective	Negligible
R7	Small	Ineffective	Negligible
R8	Small	Moderately Effective	Negligible

7.7. Magnitude of Dust Effect

Having determined the amenity dust risk (**Section 7.5**) and the receptor sensitivity (**Section 7.1**), these are combined to determine the magnitude of dust effect in **Table 7.5**, below.

Table 7.5: Magnitude of Dust Effect by Receptor

Receptor	Receptor Sensitivity	Amenity Dust Risk	Magnitude of Dust Effect
R1	High	Negligible	Negligible
R2	High	Negligible	Negligible
R3	High	Low	Slight Adverse
R4	High	Low	Slight Adverse
R5	High	Negligible	Negligible
R6	High	Negligible	Negligible
R7	High	Negligible	Negligible
R8	Low	Negligible	Negligible

7.8. Mitigation

The magnitude of dust effects has been shown to be negligible at most receptors, with a slight risk of adverse dust effects at Caxton House (R3) and on St Stephen's Road (R4). In order to minimise this risk, a Dust Management Plan (DMP) has been prepared.

The following measures should be included, and should provide an appropriate level of mitigation.

- Much of surface at the site is hard surfaced, and vehicles leaving the site will travel across a clean, hard surface before joining Trout Road;
- Hard surfaces would be regularly swept using road sweeping plant, with water suppression used as necessary;
- Aggregate storage bays will be high sided and enclosed,
- Aggregates will be dampened as necessary during dry weather;
- Drop heights will be minimised;
- A speed limit of 10 mph will limit resuspension of dust;
- Vehicles bringing in or taking out dusty materials will be sheeted; and
- Water suppression will be used as necessary.
- During prolonged periods of dry weather or high winds, additional water suppression will be used to prevent dust emissions from the site.

- Activities with the potential to cause dust emissions will be monitored, and should visible dust be generated, action is to be taken, including the use of water suppression.

7.8.1. Roles and Responsibilities

- Day-to-day operations on site would be the responsibility of the Site Manager.
- All operational staff members and sub-tenants would be responsible for minimising emissions from the site and would be trained in their responsibilities with regards to dust.
- When abnormal dust emissions are observed, staff/tenants would be instructed to report this to the Site Manager without delay.
- It would be the responsibility of the Site Manager to organise action to mitigate emissions of fugitive dust.

7.8.2. Monitoring

- All site personnel will be responsible for reporting dust problems to the Site Manager immediately.
- Daily visual inspection will be carried out by the Site Manager, or an appropriately trained member of staff. The inspection will consist of a walk around potentially dust emitting areas with observations made of any dust emissions detected. Particular attention will be paid to any areas where there is a greater risk of dust emissions, such as the aggregates stockpiles. A record of the inspection will be maintained in a site logbook.
- If significant dust is identified beyond the site boundary, immediate investigation/remedial action will be taken and this will be recorded in the site logbook.
- The Site Manager will review the logbook regularly to ensure that any necessary actions have been implemented, and to identify problem areas where more may need to be done to mitigate against further dust emissions.
- During adverse meteorological conditions, when it is dry and/or windy, additional inspections shall be carried out downwind of any dust generating activities.
- The council shall be informed if dust emissions are likely to have an effect on the local community.

7.8.3. Trigger Levels and Corrective Action

In the event that the following conditions are experienced on site, additional mitigation measures will be employed:

- A complaint regarding dust is made; or
- Observations of dust due to site operations extending beyond the site boundary.

The additional measures will include:

- Immediate identification of the source of the dust;
- Cleaning up any spillages of potentially dusty materials;

- The liberal use of water suppression; and
- Covering or sheeting sources of unacceptable dust emissions (where possible);

If unacceptable dust emissions continue, despite the additional mitigation measures, consideration should be given to modifying site operations and temporarily suspending dust generating operations until the issue can be resolved.

7.8.4. Record Keeping and Auditing

A notice will be displayed at the site entrance displaying:

- The name of the site operator; and
- An emergency contact name and telephone number;
- Complaints made directly to the site will be recorded in the site logbook and the Site Manager informed. The dust emission source will be investigated immediately, and remedial action taken. The Site Manager will determine appropriate actions to prevent further occurrences.
- The Site Manager will try to establish what on-site activity was going on at time the complaint was made and review the meteorological conditions at the time of the complaint. The Site Manager will then determine appropriate actions to prevent further occurrences.
- Records of complaints and investigations will be stored by the Site Manager and made available to the council upon request.

7.8.5. Communications

- Following investigation of the complaint, feedback will be provided to the complainant outlining the findings of the investigation, and the remedial actions taken, as well as apologising and explaining the commitment to prevent further occurrences. A record of the feedback given will be retained in the site logbook.

7.8.6. DMP Audit

The Site Manager will review the DMP once a year, in light of any complaints or issues that have been identified during the previous year. The following issues will be considered during the review:

- Effectiveness of mitigation measures employed;
- Additional mitigation measures implemented within the previous 12 months;
- Complaints received in relation to dust impacts at offsite receptors;
- Review of any dust events recorded within the previous 12 months;
- Review of the effectiveness of the visual monitoring scheme; and
- Review of the effectiveness of personnel training on dust awareness.

Should any control measures be shown to be failing, or should a need for further control measures be identified, new controls will be agreed and implemented in an updated DMP.

7.9. Significance

Assuming that the measures proposed in the above Dust Management Plan are incorporated, it would be considered that any residual impacts arising from dust as a consequence of the operation of the proposed development would be considered not significant.

8. CONCLUSIONS & SUMMARY

An air quality assessment has been undertaken in accordance with the Department of Environment, Food and Rural Affairs' (Defra) current *Technical Guidance on Local Air Quality Management (LAQM) (TG16)* and addresses the effects of air pollutant emissions associated with the development of the site. In addition, a risk-based assessment of the likely impact of dust on the air quality of the local environment has been conducted in accordance with the Institute of Air Quality Management's 2016 edition of the *Guidance on the Assessment of Mineral Dust Impacts for Planning.*

The purpose of the assessment is to determine whether reason (b) of Planning Enforcement Notice HS/ENF/019144 is justified, specifically in relation to the assertion that *"The unauthorised use of the land would cause unacceptable adverse impacts arising from dust and deteriorating air quality resulting in significant harm to the living conditions and wellbeing of neighbouring residents in this Air Quality Management Area".*

Baseline pollutant concentrations on site have been investigated using both existing monitoring data and through predictions using the ADMS-Roads Detailed Dispersion Model methodology. At present, concentrations of all pollutants are below the Air Quality Objectives.

In order to assess the impact of the proposed development on local air quality, the IAQM/EPUK Guidance *Land-Use Planning & Development Control: Planning for Air Quality* has been utilised. The assessment has shown that due to limited traffic generation, the impact of new vehicle emissions from the proposed development is considered to be *"negligible*".

With regards to the impacts of dust on air quality, it is considered that the continued use of the site has the possibility to give rise to "slight adverse" impacts at two of the eight receptors modelled. However, with a risk-appropriate Dust Management Plan, residual effects will not be considered significant.

Since it has been shown that the proposed development meets the guidance contained within *Technical Guidance on Local Air Quality Management (LAQM) (TG16),* IAQM/EPUK's *Land-Use Planning & Development Control: Planning for Air Quality* and IAQM's *Guidance on the Assessment of Mineral Dust Impacts for Planning*, it is considered that the proposed development adheres to the principles of the National Planning Policy Framework since the new development will not be *"put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution".* Since it has been shown that in terms of air quality, the proposals adhere to local and national planning policy, it is considered that the air pollution should not be a constraint on the proposed development.

Appendix 1
Glossary of Terms

Appendix 1: Glossary of Terms

National Air Quality Standard/National Air Quality Objective (NAQO): The concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The standards are based on an assessment of the effects of each pollutant on human health including the effects on sensitive subgroups.

Annual mean: The average of the concentrations measured for each pollutant for one year. In the case of the Air Quality Objectives, this is for a calendar year.

Air Quality Management Area (AQMA): An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.

Concentration: The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, microgrammes per cubic metre, µg/m^3) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).

Exceedance: A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.

Nitrogen Oxides: Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released into the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO_2), which is harmful to health. NO_2 and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).

Particulate Matter: Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM_{10} (less than 10 microns in diameter), but the finer fractions such as $PM_{2.5}$ (less than 2.5 microns in diameter) is becoming of increasing interest in terms of health effects.

µg/m^3 microgrammes per cubic metre of air: A measure of concentration in terms of mass per unit volume. A concentration of 1 µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix 2
Air Quality Model

Appendix 2: Air Quality Model

ADMS-Roads

In the UK, the Department for Environment, Food & Rural Affairs (Defra) provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). Defra regularly updates its Technical Guidance, with the latest LAQM Technical Guidance TG16 published in 2016.

The methodology in TG16 directs air quality professionals to a number of tools published by Defra to predict and manage air quality. One of the main tools for modelling air pollutants is ADMS-Roads, which is a refined air dispersion model produced by Cambridge Environmental Research Consultants. ADMS-Roads has been specifically developed for use with UK roads and as such is considered to be one of the most appropriate tools for use in UK air quality modelling and therefore is widely used in the UK.

ADMS-Roads is an air dispersion modelling suite that predicts the air quality impacts of nitrogen dioxide, particulate matter and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roads and junctions.

The methodology utilised by ADMS-Roads is significantly more advanced than that of most other air dispersion models, such as CALINE, which Breeze Roads is based upon, which is the other commonly used detailed air dispersion model in the UK. ADMS-Roads incorporates the latest understanding of the boundary layer structure and goes beyond the simplistic Pasquill-Gifford stability categories method used in other dispersion models and utilises the Monin-Obukhov length for greater accuracy. The model also uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

Unlike the 'DMRB Screening Method', ADMS-Roads can take into account annualised meteorological data; it can take into account source, receiver and terrain heights; canyon effects can be modelled, and the model can calculate hourly concentrations.

TG16 provides detailed guidance on the modelling of air pollutants and in particular highlights a procedure to validate models. The procedure discusses the comparison of modelled results against measured levels, either from diffusion tubes (for NO_2) or continuous monitors (for NO_2 or PM_{10}).

Model verification and subsequent adjustment for oxides of nitrogen is undertaken based upon NO_X as most models (including ADMS-Roads) predict NO_2 based upon its relationship to NO_x. Consequently, the verification process requires conversion to NO_x of any measurements of NO_2 in order to compare against modelled levels of NO_x.

Defra has published in 2009 a methodology to calculate NO_x from NO_2 and as part of its LAQM toolkit[1]. The calculation method allows local authorities and air quality consultants to derive NO_2 and NO_x wherever NO_x is predicted by modelling emissions from roads. The calculation method incorporates the impact of expected changes in the fraction of NO_x emitted as NO_2 (f – NO_2) and changes in regional concentrations of NO_x, NO_2 and O_3.

[1] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Background concentrations for various pollutants are published and updated regularly by Defra, so it is possible to calculate the contribution of NO_x from road traffic at a particular location. If the ratio of the monitored road traffic contribution to the modelled road traffic contribution of NO_x is calculated, this factor can be applied to the component derived from road traffic emissions for any predictions of NO_x in the area. Therefore, it is possible to validate the model such that predictions should be within 10% of air quality measurements.

Appendix 3
Modelling Procedure and Input Data

Appendix 3: Modelling Procedure and Input Data

The following Appendix summarises the input data and assumptions used in the modelling of air pollutants.

Appendix 3.1 - Traffic Data

Traffic flows in the vicinity of the site have been attained from the Department for Transport's traffic database for the year 2022, as well as from the London Atmospheric Emissions Inventory for 2013. High traffic growth factors have been applied to this data to predict traffic flows for the year 2022. Traffic flows for Tavistock Road and Trout Road were taken from the Air Quality Assessment for Tavistock Gardens supplied by JMP (Report No. 001, Job No. NW91113).

Since lower traffic speeds increase emissions from vehicles, it is necessary to take into account the reduction in traffic speeds around junctions. TG16 suggests that *"there is no simple factor that can be applied to the average speed to calculate a speed applicable to congested periods"* and that one should exercise professional judgement when taking into account congestion and decreasing speeds around junctions. However, in the absence of any more detailed site-specific information, TG16 does suggest that that *"For a busy junction, assume that traffic approaching the junction slows to an average of 20kph …(for) approach distances of approximately 25m"*. This is the approach adopted at this site.

All road links within 200 m of a receptor have been included in the model. Road widths have been modelled in accordance with OS mapping data. However, based on observations, road widths are adjusted to take into account any restrictions to flow, such as parked cars.

Since road-traffic emissions on roads with significant gradients (>2.5%) can increase significantly, especially in relation to HGVs, significant gradients are taken into account in the modelling. At this site, road gradients were not considered to be significant.

The wake effects of traffic induced turbulence have been included in the modelling as standard. This takes into account the fact that increased traffic volumes and speeds produce more turbulence, which has effects on dispersion.

Input road links, traffic flows, the percentage of Heavy Goods Vehicles (HGVs) and traffic speeds are shown below.

Model Input Data

Road	AADT 2019 (% HGV)	AADT 2022 (% HGV)	AADT 2022 with Development (% HGV)	Speed km/h
Fairfield Rd 1	2539 (4)	2655 (4)	2711 (2.6)	20
Fairfield Rd 2	2539 (4)	2655 (4)	2711 (2.6)	32
Fairfield Rd 3	2539 (4)	2655 (4)	2711 (2.6)	20
High St 1	17826 (4.4)	18641 (4.4)	18697 (4.2)	20
High St 2	17826 (4.4)	18641 (4.4)	18697 (4.2)	48

Road	AADT 2019 (% HGV)	AADT 2022 (% HGV)	AADT 2022 with Development (% HGV)	Speed km/h
High St 3	17826 (4.4)	18641 (4.4)	18697 (4.2)	32
Trout Rd 1	2557 (4)	2674 (4)	2730 (2.6)	20
Trout Rd 2	2557 (4)	2674 (4)	2730 (2.6)	48
Trout Rd 3	2557 (4)	2674 (4)	2730 (2.6)	32
Trout Rd 4	2557 (4)	2674 (4)	2730 (2.6)	48
Trout Rd 5	2557 (4)	2674 (4)	2730 (2.6)	20
Tavistock Rd 1	2557 (4)	2674 (4)	2730 (2.6)	20
Tavistock Rd 2	2557 (4)	2674 (4)	2730 (2.6)	48

Appendix 3.2 - Meteorological Data

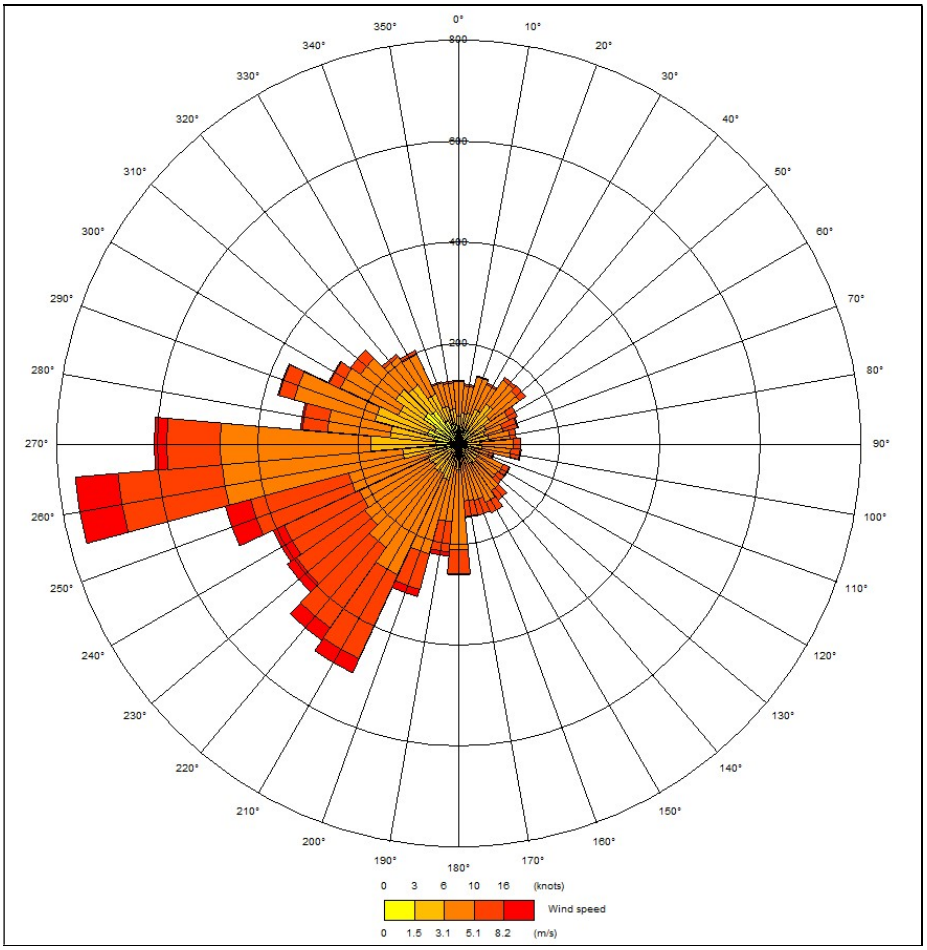
TG16 suggests that a single year's meteorological data will be sufficient to predict air pollution concentrations.

Meteorological data was obtained from London Heathrow Airport for 2019 operated by the Met Office (Surface Station Number 3772 – ICAO airport code EGLL – 24m above sea level). It is considered that this weather station is likely to be representative of conditions within the area local to the development site.

Data was collected in accordance with internationally accepted weather observation techniques, specifically the METAR weather format, which is an internationally recognised standardised weather format commonly used in the aviation industry. The meteorological data consists of hourly sequential data of wind speed, wind direction, surface temperature, precipitation rate and cloud cover data. In line with the standards, all data is passed through numerous quality control checks. At this site, the data was over 99% complete, with very little missing data.

The Meteorological data was used for both model verification and future year scenarios. The figure below shows the wind rose data used in the modelling.

Wind Rose – London Heathrow Airport



Appendix 3.3 - Emission Factors

The model utilises emission factors contained within EFT v10.1, published in August 2020. This represents the most up to date emissions factors available. The Emissions Factors Toolkit (EFT) is published by Defra and the Devolved Administrations to assist local authorities in carrying out Review and Assessment of local air quality as part of their duties under the Environmental Act 1995. It can be used by anyone to predict pollution concentrations at a given point, in conjunction with a detailed dispersion model.

The EFT provides emission rates for 2018 through to 2030 and takes into consideration data from the National Atmospheric Emissions Inventory (NAEI) such as fleet composition based on European emission standards from pre-Euro I to Euro 6/VI (including Euro 6 subcategories) and scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting. The EFT allows users to calculate road vehicle pollutant emission rates for NO_x, PM_{10}, $PM_{2.5}$ and CO_2 for a specified year, road type, vehicle speed and vehicle fleet composition. EFT v10.1 uses the latest COPERT 5.3 NO_x and PM emissions factors, updated from COPERT 5.0. The EFT is updated regularly to reflect changes in vehicle fleet composition and emissions factors.

It should be noted that the fleet projections in EFT v10.1 are based on fleet growth assumptions which were current prior to the Covid-19 pandemic and subsequent restrictions and lockdowns. Outputs from the EFT do not reflect short or longer-term impacts on emissions resulting from behavioural change during the national or local lockdowns. Consequently, it is probable that emission factors from EFT v10.1 represents a worst-case scenario when considering future pollutant concentrations.

Appendix 3.4 – Street Canyons

ADMS-Roads is designed to be used to model concentrations at different locations assuming that there are no obstacles to air flow. Dispersion modelling in urban areas is difficult due to the presence of buildings, trees, walls, etc. that modify the wind flow and alter the dispersion of traffic emissions. This is especially the case in so called 'street canyons', where buildings, or other obstacles, can trap pollutants and restrict dispersion. ADMS-Roads includes additional modules to account for the restricted dispersion.

Although street canyons have been defined as narrow streets where the height of buildings on both sides of the road are greater than the road width, there are numerous examples whereby broader streets may be considered as street canyons. It also does not require buildings on both sides of a road to restrict dispersion. A wall or a bank with trees will also affect dispersion, as will overhanging trees.

Background concentrations influence pollutant levels within street canyons when the air mass at rooftop level moves into the canyon, leading to increased ventilation and flushing of the polluted air from the traffic. Similarly, gaps between buildings allow increased wind flows to enter the canyon and can re-circulate pollutants away from the junctions but causing increased concentrations further away. The opposite effect may occur if the gap is at a junction, where road traffic emissions are carried into the canyon, resulting in higher concentrations.

The concentrations depend of the wind direction with respect to the orientation of the street canyon; when the wind is perpendicular to the road higher concentrations occur on the leeward side. Wind blowing along a road will reduce concentrations as it ventilates the canyon. In reality, street canyons in are generally not regular in shape, the buildings on opposite sides of the road are of different heights, the width varies along the street and there are gaps between buildings.

LAQM.TG.16 states *"Where a street can be partially classified as a street canyon, for example, where there are gaps in between buildings, monitoring in such locations may indicated elevated concentrations. It is therefore recommended that local authorities consider these links as street canyons; otherwise predicted concentrations are likely to be under-estimated"* (paragraph 7.413).

At this site, street canyon effects were not considered to be significant.

Appendix 3.5 - Advanced Modelling Parameters

The following modelling parameters have been used in the ADMS-Roads Model:

Parameter	Value	Justification
Latitude	51.51°	Latitude of site
Surface Roughness Note 1	1 m	Recommended for city/wooded areas
Minimum Monin-Obukhov Length	100 m	Recommended for large conurbations >1,000,000
Surface Albedo	0.23	The default for non-snow-covered ground
Priestley-Taylor Parameter	1.0	Model default

Note 1: A surface roughness of 0.1 has been applied to the meteorological measurement site, as it is considered to be a less built up area than the proposed development site.

Appendix 3.6 - Background Concentration of Air Pollutants

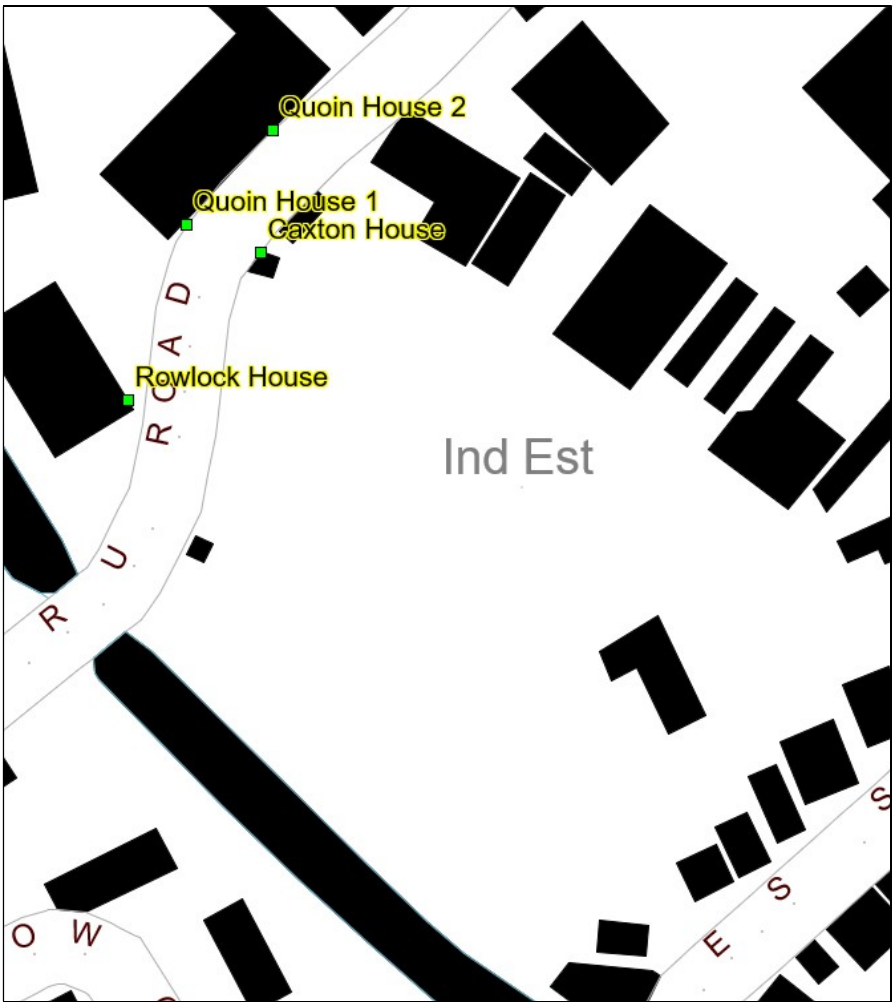
Background concentrations of air pollutants for the modelling were obtained from the UK National Air Quality Information Archive, in accordance with Local Air Quality Management Technical Guidance TG16. Background concentrations of 23.03 µg/m^3, 16.69 µg/m^3 and 11.14 µg/m^3 of NO_2, PM_{10} and $PM_{2.5}$ respectively were determined for the 1 km^2 grid square centred at 505500 180500. In order to avoid 'double counting', major road sources within the grid square identified were removed from the total background as they have been explicitly modelled as part of the assessment.

The above background concentrations have been used in all modelling scenarios (current and future) in order to show a worst-case scenario, i.e., future concentrations assuming that background levels stay constant and do not decrease as expected.

Appendix 3.7 - Receptor Locations

The site plan below shows the locations of the sample sensitive receptor locations used within the modelling of road traffic impacts. Receptors used in the dust risk assessment are shown in **Section 7.3**.

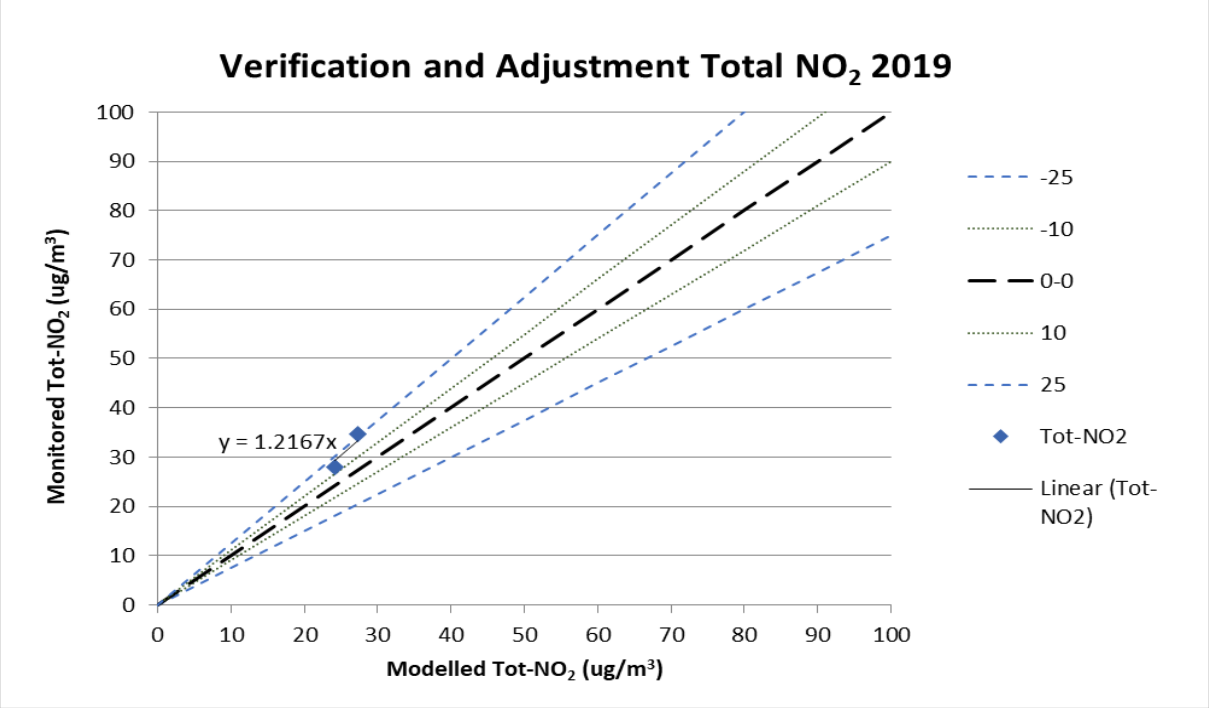
It is good practice to include receptors in the model that represent those locations where concentrations are likely to highest. Consequently, the receptors include those locations closest to the kerbside, nearest to junctions or locations where traffic is stationary, slowed or congested and where appropriate include receptors on both sides of a road to take into account the fact the wind directions are predominately in one direction and the greatest annual mean impacts are generally downwind.

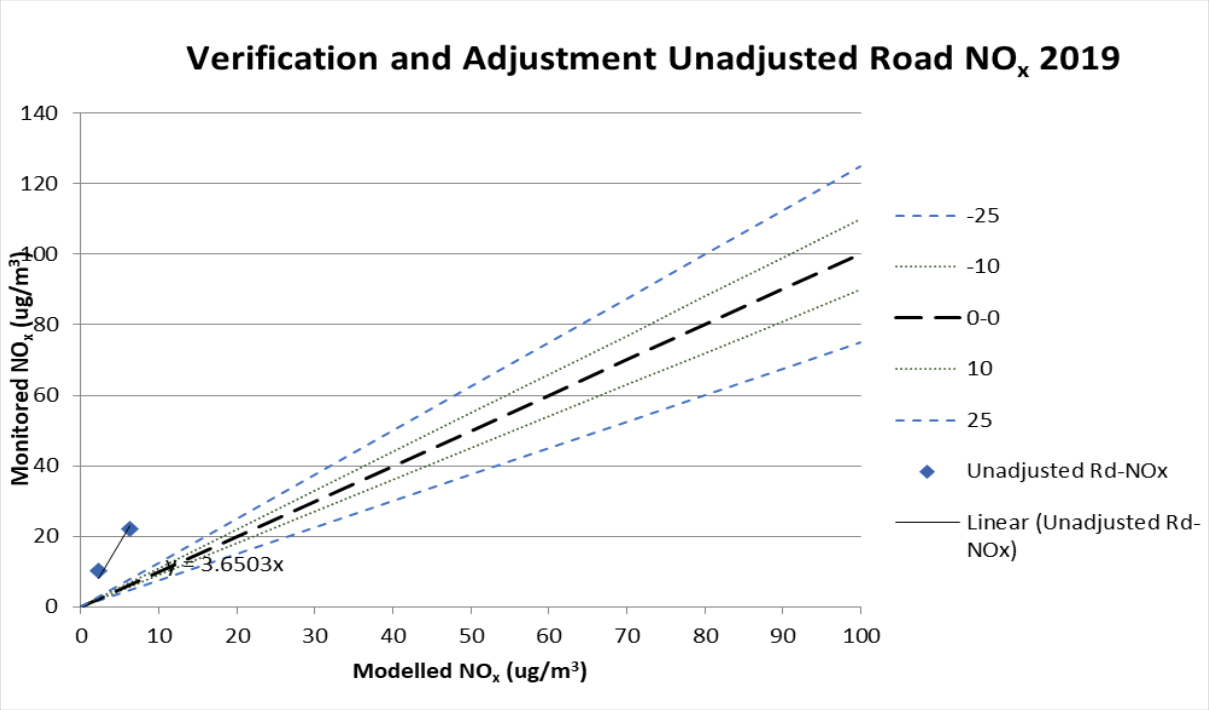


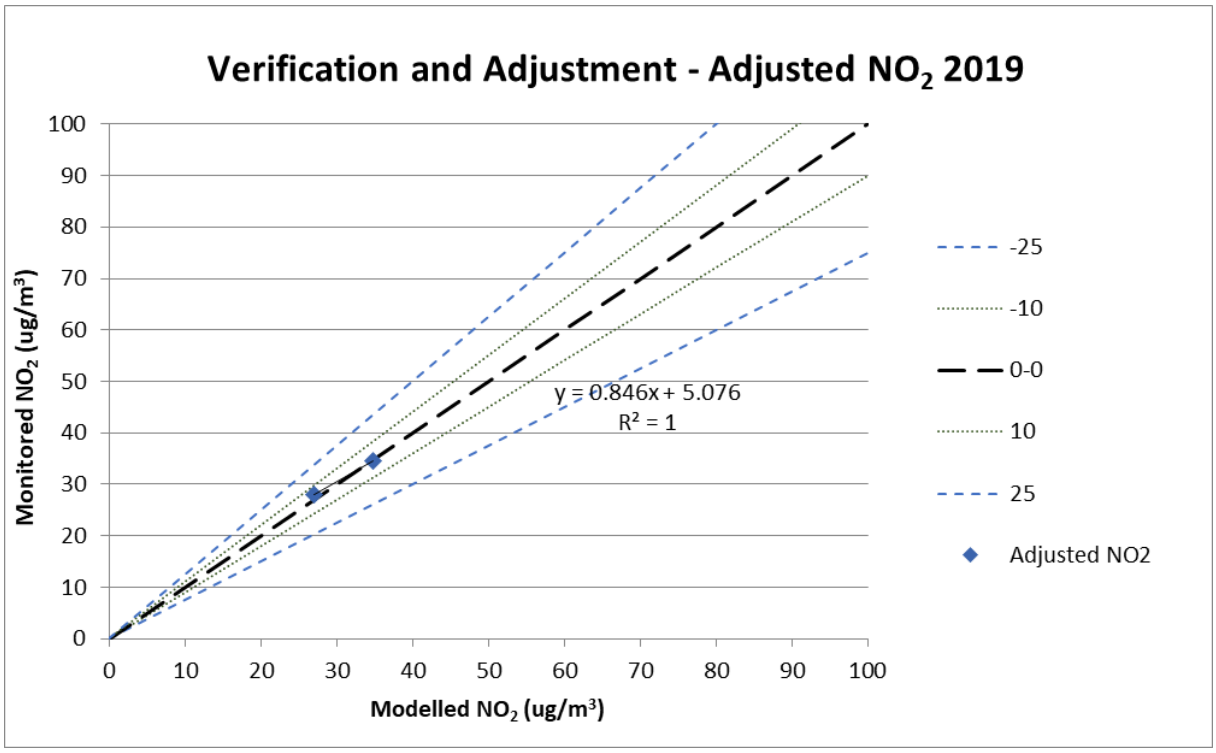
Appendix 3.8 - Verification and Adjustment

Verification of the air pollutant model was carried out in accordance with LAQM Technical Guidance TG16 using the data from the diffusion tube located in the vicinity of the site for 2019. The exercise required the modelling of the diffusion tube location for 2019 and comparing the modelled results with the monitoring results. The verification data is summarised below and shows that pollutant concentrations where underpredicted using the model; therefore, an adjustment factor of 3.6503 was applied to the model contribution of NO_x.

	Modelled Rds NO_x	Modelled Tot-NO_2	Monitored Tot-NO_2	%Diff Mod/Mon Tot-NO_2	Modelled Rd-NO_x	Monitored Rd-NO_x	NO_x ADJ Corr1	Adj Mod Rd-NO_x	Adj Mod Tot-NO_2	Monitored Tot-NO_2	%Diff Mod/Mon Adj Tot-NO_2
HILL13	2.24	24.13	27.9	-13.51	2.24	10.13	4.52	8.18	26.98	27.90	-3.30
HILL19	6.27	27.38	34.6	-20.87	6.27	22.19	3.54	22.89	34.9	34.60	0.87


Verification and Adjustment Total NO2 2019
Monitored Tot-NO2 (ug/m3)
Modelled Tot-NO2 (ug/m3)
y = 1.2167x
-25
-10
0-0
10
25
Tot-NO2
Linear (Tot-NO2)


Verification and Adjustment Unadjusted Road NOx 2019
Monitored NOx (ug/m3)
Modelled NOx (ug/m3)
y = 3.6503x
-25
-10
0-0
10
25
Unadjusted Rd-NOx
Linear (Unadjusted Rd-NOx)


Verification and Adjustment - Adjusted NO2 2019
Monitored NO2 (ug/m3)
Modelled NO2 (ug/m3)
y = 0.846x + 5.076
R² = 1
-25
-10
0-0
10
25
Adjusted NO2

Appendix 3.9 - Model Uncertainty

TG16 recommends the use of statistical parameters to assess uncertainty in the verified model. The table below describes the three parameters it recommends and the corresponding value for the verified model at this site.

Parameter	Value	Description
Correlation Coefficient	1.0	Used to measure the linear relationship between predicted an observed data. The ideal value (an absolute relationship) is 1.
Root Mean Square Coefficient	0.7	RMSE defines the average error/uncertainty of the model verification and is in the same units as the model outputs (µg/m^3). Values should be <10µg/m^3 or ideally <4µg/m^3 where concentrations are near the AQO. The ideal value is 0µg/m^3.
Fractional Bias	0.01	Identifies if the model shows a systematic tendency to over/under predict concentrations. The ideal value is 0 and range between +/- 2. Negative values suggest an over prediction whilst positive values suggest under prediction.

TG16 notes that the Correlation Coefficient is a less reliable indicator when validating with a small dataset; therefore, for sites such as this validated with smaller datasets, the Root Mean Square Coefficient is the main parameter used. The table above notes that the Root Mean Square Coefficient is 0.7, i.e. less than 4 and therefore the model can be used with a high level of confidence. The Fractional Bias is just greater than 0, indicating that on average, the validated model is likely to underpredict by a very small margin, but overall should be highly accurate.

Appendix 3.10 - PM_{10} Exceedances

The number of exceedances of 50 µg/m^3 as a 24-hour mean PM_{10} concentration has been calculated from the modelled total annual mean concentration following the relationship advised by Defra:

$A = -18.5 + 0.00145 B^3 + 206/B$

where A is the number of exceedances of 50 µg/m^3 as a 24-hour mean PM_{10} concentration and B is the annual mean PM_{10} concentration.