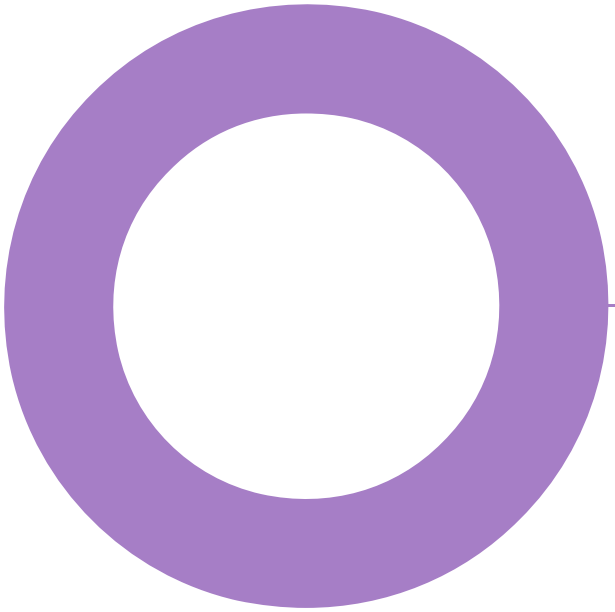
HOARE LEA

Rounds Gardens. Rugby.
St. Modwen Homes.

AIR QUALITY
AIR QUALITY ASSESSMENT

REVISION 01 – 31 JANUARY 2024



Audit sheet.

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Contents.

Executive Summary.

Hoare Lea have been commissioned by St. Modwen Homes to undertake an Air Quality Assessment to support the planning application for the proposed residential development at land north of Rounds Gardens, Rugby CV21 2EZ (the 'Application Site').

The proposals comprise the demolition of the existing pavilion and all other remaining structures and enclosures; and the erection of 134 dwellings, accesses, landscaping, car parking and associated works.

The baseline assessment has shown that the Application Site is located within an Air Quality Management Area (AQMA). There have been no exceedances of the annual mean Air Quality Objective (AQO) by pollutant nitrogen dioxide (NO_2) in 2022, the most recent year of available monitoring data from passive diffusion tube monitoring locations within the vicinity of the Application Site. Furthermore, from a review of Department for Environmental, Food and Rural Affairs (Defra) predicted background concentrations at the Application Site, there is expected to be no exceedance of the annual mean AQOs for pollutants NO_2 and particulate matter (PM_{10} or $PM_{2.5}$) in 2031, the anticipated opening year for the Proposed Development.

The impacts of demolition and construction work on dust soiling and ambient fine particulate matter concentrations have been assessed and appropriate mitigation measures have been recommended. Provided these mitigation measures are implemented and included within a dust management plan, for example through a planning condition, the residual impacts from the construction phase are considered to be not significant.

It has been confirmed by the two appointed project transport consultants, PJA and SLR Consulting, that the trip generation associated with the Proposed Development will exceed the criteria detailed in the Environmental Protection United Kingdom (EPUK) and Institute of Air Quality Management (IAQM) planning guidance for developments within an AQMA and a detailed assessment was required. Accordingly, the impacts on NO_2, PM_{10} and $PM_{2.5}$ concentrations from road emissions generated by operational phase road traffic vehicles associated with the Proposed Development on existing sensitive receptors within the locale of the Application Site was undertaken using ADMS Roads. Subsequently, all predicted concentrations are below their respective AQOs and the impact on pollutant concentrations is predicted to be not significant in line with EPUK and IAQM planning guidance at all existing sensitive receptors. Therefore no additional mitigation is required.

The energy strategy for the primary supply to the Proposed Development has been confirmed by St. Modwen Homes, to be all-electric utilising Air Source Heat Pumps (ASHPs), a zero-combustion technology. However it has also been confirmed that multiple plots as part of the proposals will be served by combustion sources initially. No life safety diesel generators are included as part of the proposals. As no long term combustion sources are proposed for the primary energy supply, no long term local air quality impacts are anticipated and a detailed assessment of impacts of combustion emissions from the energy plant has been screened out of this assessment.

A qualitative Site Suitability Assessment has shown that pollutant concentrations are in compliance with the AQOs and therefore, the Application Site is considered suitable for the proposed residential use without mitigation.

The Proposed Development can be considered air quality neutral, in line with the RBC Air Quality Supplementary Planning Document (SPD), following the implementation of all relevant mitigation measures.

Based on the assessment results, the Application Site is considered suitable for the Proposed Development with the inclusion of relevant mitigation measures, air quality should not be considered as a constraint to the planning consent and the Proposed Development conforms to the principles of the National Planning Policy Framework (NPPF), Rugby Borough Council Local Plan 2011-2031 and the Rugby Borough Council Air Quality SPD.

1. Introduction.

Hoare Lea have been commissioned by St. Modwen Homes to undertake an Air Quality Assessment to support the planning application for the proposed residential development at land north of Rounds Gardens, Rugby CV21 2EZ (the 'Application Site').

1.1 Proposed Development.

The proposals comprise the demolition of the existing pavilion and all other remaining structures and enclosures; and the erection of 134 dwellings, accesses, landscaping, car parking and associated works.

The energy strategy for the primary supply to the Proposed Development has been confirmed by St. Modwen Homes, the project client, to be all-electric utilising Air Source Heat Pumps (ASHPs), a zero-combustion technology. However it has also been confirmed that multiple plots as part of the proposals will be served by combustion sources initially. No life safety diesel generators are included as part of the proposals. As no long term combustion sources are proposed for the primary energy supply, no long term local air quality impacts are anticipated and a detailed assessment of impacts of combustion emissions from the energy plant has been screened out of this assessment.

The proposed ventilation strategy has also been confirmed by St. Modwen Homes to rely on the System 1 ventilation methodology in line with Part F of the Building Regulations (2021)[13].

1.2 Application Site Description and Location.

The Application Site is located within Rugby Borough Council (RBC) administrative area at the approximate National Grid Reference (NGR): X 449860 Y 275720. Princes Street and Edward Street border the Application Site to the east and west respectively. The Application Site is surrounded by residential properties in the eastern, southern and western directions. North of the Application Site is an industrial warehouse occupied by GE Power. The A426 is located approximately 100 m east of the Application Site.

The Application Site is mainly occupied by greenfield land and a single existing building with associated car parking.

Figure 1 illustrates the location of the Application Site.

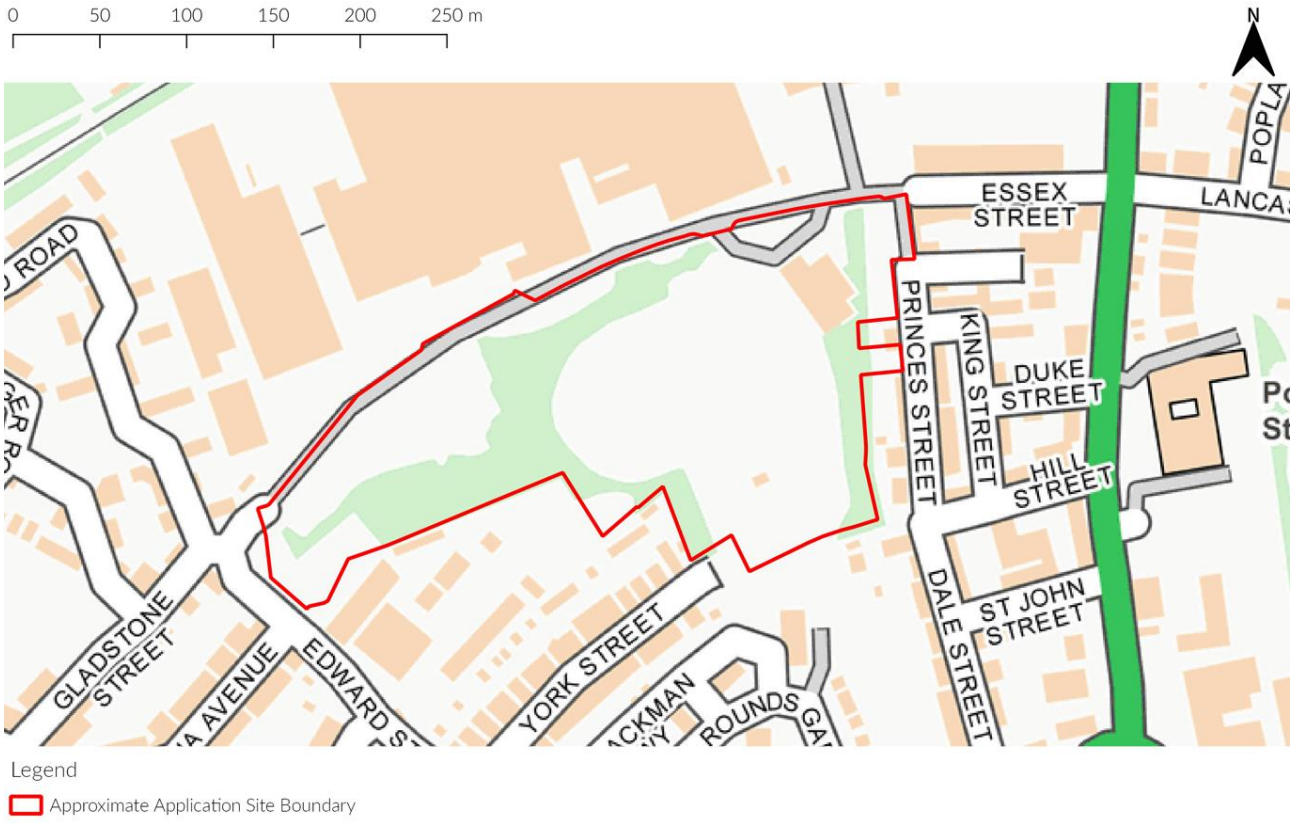


Figure 1: Location of the Application Site. Contains OS Data © Crown Copyright and Database Rights 2023.

1.3 Scope of Assessment.

An email detailing the proposed methodology for the Air Quality Assessment was provided to RBC on the 19th January 2024. At time of writing a response has currently not been received. A copy of the correspondence with RBC has been included in Appendix 1.

A summary of the scope of the assessment includes:

- Review of National and Local Policy;
- Determination of baseline scenario, using RBC monitoring data and Department for Environmental, Food and Rural Affairs (Defra) predicted background concentrations;
- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase;
- Air quality neutral assessment in line with the RBC Supplementary Planning Document (SPD);
- An assessment of the suitability of the Application Site for its proposed residential use; and
- Identification of required mitigation measures.

2. Legislation, Policy and Guidance Documents.

2.1 Air Quality Strategy and Local Air Quality Management.

The Environment Act 1995 (Part IV)[1] requires the Secretary of State to publish an air quality strategy and local authorities to review and assess the quality of air within their boundaries. The latter has become known as Local Air Quality Management (LAQM).

The Air Quality Strategy[2] provides the policy framework for local air quality management and assessment in the UK. It sets out air quality standards and objectives for key air pollutants. These standards and objectives are designed to protect human health and the environment. The Strategy also sets out how the different sectors of industry, transport and local government, can contribute to achieving these Air Quality Objectives (AQOs).

Local authorities are required to identify whether the AQOs have been, or will be, achieved at relevant locations, by the applicable date. If the AQOs are not achieved, the authority must declare an Air Quality Management Area (AQMA) and should prepare an action plan within 12 months. An action plan must identify appropriate measures and policies that can be introduced in order to work towards achieving the AQO(s).

The AQOs set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The AQOs for use by local authorities are prescribed within the Air Quality (England) Regulations 2000[3], and the Air Quality (England) (Amendment) Regulations 2002[4].

The AQOs for Nitrogen Dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) are set out in Table 1. The AQOs for NO_2, PM_{10} and $PM_{2.5}$ were to have been achieved by 2005, 2004 and 2020 respectively and continue to apply in all future years thereafter.

The Environment Act 2021[5] acts as the UK's new framework of environmental protection and came into force on 1st April 2022. With regard to air quality, the Environment Act establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation. This was implemented through the Environmental Improvement Plan[6] which outlines new $PM_{2.5}$ targets for future years. These are a long term target of 10 µg/m^3 by 2040 and an interim target of 12 µg/m^3 by 31st January 2028. These targets are expected to focus on reducing concentrations of, and exposure to, $PM_{2.5}$.

Additionally, a new Air Quality Strategy has been published in April 2023 which sets out a framework which should be followed by local authorities in suport of Defra's long term air quality goals incldiuing new $PM_{2.5}$ targets[7].

Table 1: Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	1-hour Mean	200 µg/m^3 Not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
Fine Particles (PM_{10})	24-hour Mean	50 µg/m^3 Not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m^3
Fine Particles ($PM_{2.5}$) *	Annual Mean	20 µg/m^3
Notes: Measured gravimetrically *The time period in LAQM.TG(22) states "Work towards reducing emissions/concentrations of fine particulate matter ($PM_{2.5}$)"		

The AQOs apply at locations where members of the public are likely to be regularly present and exposed over the averaging period of the AQO. Examples of where the annual mean AQOs should apply are provided in the Local Air Quality Management Technical Guidance (LAQM.TG(22))[8], and include: building façades of residential properties, schools, hospitals. The annual mean AQOs are not relevant for the building façades of offices or other places of work where members of the public do not have regular access, kerbsides or gardens.

The 24-hour mean AQO for PM_{10} is considered to apply at the same locations as the annual mean AQO, as well as in gardens of residential properties and at hotels.

The 1-hour mean AQO for NO_2 also applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations, pavements of busy shopping streets, carparks and bus stations which are not fully enclosed. The 1-hour mean AQO does not apply at kerbside sites where the public do not have regular access.

2.2 EU Limit Values.

The European Union (EU) has also set limit values for NO_2, PM_{10} and $PM_{2.5}$; these are legally binding and have been implemented into English legislation by The Air Quality Standards Regulations 2010[9] and The Air Quality Standards (Amendment) Regulations 2016[10].

The limit values for NO_2, PM_{10} and $PM_{2.5}$ are the same as the English objectives (given in Table 1), but applied from 2010 for NO_2, 2005 for PM_{10} and 2015 for $PM_{2.5}$. The limit values apply at all locations (apart from where the public does not have access, where health and safety at work provisions apply and on the road carriageway).

2.3 Statutory Nuisance Legislation.

Part III of the Environmental Protection Act (EPA) 1990 (as amended)[11] contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

Fractions of dust greater than 10 μm (i.e. greater than PM_{10}) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK Air Quality Strategy. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

2.4 Clean Air Strategy.

The Clean Air Strategy (CAS)[12], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.5 Building Regulations.

The Building Regulations help to ensure that new buildings, conversions, renovations and extensions (domestic or commercial) will be safe, healthy and high performing. Detailed regulations cover specific topics including structural integrity, fire protection, accessibility, energy performance, acoustic performance, protection against falls, electrical and gas safety. Part F of the Building Regulations (2021)[13] provides guidance for indoor air quality and the pollutant concentrations that must not be exceeded in both buildings for dwellings and non-dwellings.

2.6 Planning Policy.

2.6.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[14] sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

> Paragraph 8: *"Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives): [...]*
>
> *c) an environment objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy. [...]"*

Paragraph 55: *"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*

Paragraph 109: "*The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."*

Paragraph 180*: "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 191: *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."*

Paragraph 192: *"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 194 *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

The NPPF is supported by Planning Practice Guidance (PPG)[15].

The PPG states that:

Paragraph 001 (Reference ID: 32-001-20191101): *"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit or where the need for emissions reductions has been identified."*

Paragraph 002 (Reference ID: 32-002-20191101): *"Plans may need to consider ways in which the development could be made appropriate in locations where air quality is or is likely to be a concern, and not give rise to unacceptable risks from pollution. This could, for example entail identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."*

Paragraph 005 (Reference ID: 32-005-20191101): *"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 conversation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."

The PPG also sets out the information that may be required in an air quality assessment, stating that:

Paragraph 007 (Reference ID: 32-007-20191101): *"Assessments need to be proportional to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific. The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned."*

It also provides guidance on options for mitigating air quality impacts, and makes clear that:

Paragraph 008 (Reference ID: 32-008-20191101): *"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact."*

2.7 Local Policy.

2.7.1 Rugby Borough Council Local Plan 2011-2031

The Rugby Borough Council Local Plan 2011-2031[16] was adopted in June 2019 and sets out the vision and strategy for the RBC area of administration until 2031. This includes nine strategic objectives for the RBC which focus on the key issues and challenges facing the RBC area of administration and a delivery strategy for achieving those objectives. There is a single policy focused specifically on air quality within the Rugby Borough Council Local Plan 2011-2031[16] as shown below:

Policy HS5: Traffic Generation and Air Quality, Noise and Vibration

"Development proposals should promote a shift to the use of sustainable transport modes and low emission vehicles (including electric/hybrid cars) to minimise the impact on air quality, noise and vibration caused by traffic generation. Proposals should be located where the use of public transport, walking and cycling can be optimised. Proposals should take full account of the cumulative impact of all development including that proposed in this Local Plan on traffic generation, air quality, noise and vibration. Development proposals should complement the Air Quality Action Plan.

Development throughout the Borough of more than 1,000 sqm of floorspace or 10 or more dwellings or development within the Air Quality Management Area (see Appendix 8) that would generate any new floorspace must:

1. Achieve or exceed air quality neutral standards; or

2. Address the impacts of poor air quality due to traffic on building occupiers, and public realm or amenity space users by reducing exposure to and mitigating their effects, proportionate to the scale of the development. This can be achieved using design solutions that include:

- *Orientation and layout of buildings, taking into account building occupiers, public realm and amenity space users;*
- *Appropriate abatement technologies; and*
- *Urban greening appropriate for providing air quality benefits.*

3. Where air quality neutral standards are not met, measures to offset any shortfall will be required, according to the following hierarchy:

- *On-site measures; then*
- *Off-site measures; then*
- *Financial contributions.*

4. Address the adverse impacts of noise and vibration on existing and future occupiers and users of the public realm."

2.7.2 Local Air Quality Management in Rugby.

According to the latest RBC Annual Status Report (ASR) 2023[17], a single AQMA has been declared within the RBC area of administration. This AQMA is named as the "Rugby AQMA" which was declared in 2004 for exceedances of the NO_2 annual mean AQO only. The Application Site is located within the "Rugby AQMA". If compliance with the NO_2 annual mean AQO is sustained for two additional years from RBC local monitoring, there will be consideration to revoke the AQMA in its entirety.

According to the RBC ASR 2023[17], the measures within the current AQAP[18], which was produced in 2010, are currently being used to reduce pollutant concentrations of NO_2 only. PM_{10} and $PM_{2.5}$ concentrations have been in compliance with corresponding AQOs for many years and local monitoring of these pollutants has been discontinued since December 2017. However it has been flagged within the RBC ASR 2023[17] that this AQAP is out of date and accordingly an updated AQAP is required. The RBC ASR 2023[17] confirms an updated AQAP is currently in progress. There are 22 measures contained within the current AQAP[18] and several completed measures have been shown below:

- Rugby Western Relief Road (RWRR);
- Warwick Street Gyratory Improvements;
- Variable Message Signing; and
- Planning Development and Planning Applications.

2.8 Assessment Guidance and Standards.

The primary guidance documents consulted in undertaking this assessment are detailed below.

2.8.1 Defra Local Air Quality Management Technical Guidance

Defra's LAQM.TG(22)[8] was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

2.8.2 EPUK and IAQM 'Air Quality Guidance for Planning'

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance (EPUK and IAQM planning guidance)[19] to help ensure that air quality is properly accounted for in the development control process. It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

2.8.3 IAQM 'Construction and Demolition Dust Guidance'

Guidance on the assessment of dust from demolition and construction has been published by the IAQM (IAQM construction guidance)[20]. The guidance provides a methodology to determine the dust emission magnitude and provides a series of matrices to determine the risk magnitude of potential dust sources associated with construction activities. This allows for the identification of appropriate mitigation measures that are defined within further IAQM guidance.

2.8.4 Rugby Borough Council Air Quality Supplementary Planning Document

The Rugby Borough Council Air Quality SPD[21] was adopted in July 2021 and sets out guidance for upcoming developments regarding the requirements of an Air Quality Assessment and mitigation necessary to minimise the negative impacts of a development on air quality. The objectives of the SPD[21] are:

- Improve the consideration of air quality impacts in the planning process, in line with the NPPF, Planning Practice Guidance (PPG) and the Rugby Local Plan;
- To help ensure consistency in the approach to dealing with air quality issues in planning applications across the Borough;
- Explain how and when policy HS5 in particular is applied, and the mitigation requirements to achieve development that is compliant;
- Identify the circumstances where detailed assessments will be required as part of planning applications when establishing baseline conditions when a development is not air quality neutral;

- To provide guidance on measures that can be implemented to mitigate the potentially harmful impacts of new developments on air quality in line with policy HS5;
- To promote the identification of suitable mitigation on development within the AQMA, either as part of planning applications or through pre-application discussions; and
- To provide guidance on the use of planning conditions in relation to policy HS5.

3. Methodology of Assessment.

3.1 Consultation.

The approach to the assessment, as described in section 1.3, was provided to the RBC for review on the 19th of January 2024. At time of writing a response has currently not been received.

3.2 Existing Air Quality in the Study Area.

A baseline air quality review was undertaken to determine the existing air quality in the vicinity of the Application Site.

This desk-top study was undertaken using the following sources:

- Air quality data for RBC, including a review of the RBC air quality reports and local monitoring data[17];
- Background pollution maps from Defra's Local Air Quality Management (LAQM) website[22];
- Pollution Inventory from the Environment Agency (EA)[23];
- The UK Ambient Air Quality Interactive Map[24]; and
- Ordnance Survey (OS) data and Aerial photography from Google Maps.

3.3 Construction Phase Impacts.

3.3.1 Construction Dust Assessment

The assessment of construction dust impacts has been undertaken in line with the methodology outlined in the IAQM construction guidance[20]. Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The risk of dust emissions has been assessed for each activity with respect to:

- Potential loss of amenity due to dust soiling;
- The risk of health effects due to a significant increase in exposure to PM_{10}; and
- The risk of ecological impacts due to a significant increase in exposure to PM_{10}.

The first stage of the assessment involves screening to determine whether there are any sensitive receptors within the threshold distances defined by the IAQM construction guidance[20]. A detailed assessment of the impact of dust from construction sites will be required where:

- A 'human receptor' is located within 250 m of the boundary of the Application Site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the Application Site entrance; and
- An 'ecological receptor' is located within 50 m of the boundary of the Application Site or within 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the Application Site entrance.

The magnitude of dust emission for each activity is determined on the basis of the guidance, indicative thresholds, information available relating to the project and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the mitigation requirements.

Descriptors for magnitude of impact and impact significance used in this assessment of construction phase dust are given in the guidance available online[20].

3.3.2 Construction Emissions Assessment

3.3.2.1 Construction Traffic Emissions Screening

The screening assessment has been undertaken with reference to the following EPUK and IAQM planning guidance[19] indicative criteria:

- a change of Light Duty Vehicle (LDV) flows of more than 100 AADT (within an AQMA); and/or
- a change of Heavy Duty Vehicle (HDV) flows of more than 25 AADT (within an AQMA).

3.3.2.2 NRMM Emissions Screening

Non-Road Mobile Machinery (NRMM) refers to mobile machines, transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads. NRMM emissions have been screened following IAQM construction guidance[20].

3.4 Operational Phase Impacts.

3.4.1 Road Traffic Impacts

A detailed assessment of the impacts from vehicles generated by the Proposed Development on existing sensitive receptors within the locale of the Application Site has been modelled using ADMS roads (version 5.0.1.3). The model has been extensively validated and is widely used by regulators, government departments, consultancies and industry. The latest emission factors have been used from EFT v12.0 to calculate the road traffic emissions. Full details on the air quality modelling methodology are provided in Appendix 2.

Defra background concentrations and emission factors have been used for the baseline year of 2022 and kept constant in the future year of 2031 as a precautionary approach. Emissions are expected to reduce in the future, but there are inherent uncertainties when predicting future emissions, therefore keeping the background concentrations and emission factors constant at the baseline year (2022) is considered a reasonable worst-case. The model has been run using meteorological data from Church Lawford in the verification year of 2022

The NO_X to NO_2 calculator v8.1 has been used to convert the total NO_X concentrations to NO_2 concentrations.

Traffic data has been provided by the two appointed project transport consultants, PJA and SLR Consulting. Annual Average Daily Traffic (AADT) flows split by LDVs and HDVs.

The following scenarios have been modelled:

- Base 2022 – baseline traffic flows for model verification;
- Do Minimum (DM) – baseline traffic flows for the opening year without the Proposed Development (DM 2031 – with 2022 emissions factors and 2022 background concentrations); and
- Do Something (DS) – baseline traffic flows for the opening year with the Proposed Development (DS 2031 with 2022 emissions factors and 2022 background concentrations).

3.4.1.1 Existing Sensitive Receptors.

Concentrations of the pollutants NO_2, PM_{10} and $PM_{2.5}$ have been predicted at 20 existing sensitive receptors in the DM 2031 and DS 2031 scenarios. The location of the modelled existing sensitive receptors is provided in Table 2 and are displayed in Figure 2.

Table 2: Existing Sensitive Receptors Identified.

Receptor ID	Heights (m)	Location	OS Grid Reference (m)		Receptor Type	Long Term or Short Term
			X	Y		
R1	1.5	52 Edward Street	449625	275609	Residential	Long Term
R2	1.5	30 Edward Street	449763	275504	Residential	Long Term
R3	1.5	63 Edward Street	449864	275371	Residential	Long Term
R4	1.5	10 Princes Street	450027	275701	Residential	Long Term
R5	1.5	99 Oliver Street	450065	275495	Residential	Long Term
R6	1.5	25 Newbold Road	450125	275638	Residential	Long Term
R7	1.5	Rugby Food Bank	450151	275599	Commercial	Short Term
R8	1.5	9 Park Walk	450132	275817	Residential	Long Term
R9	1.5	64 Newbold Road	450159	275908	Residential	Long Term
R10	1.5	Benfield Surgery	450095	275222	Residential	Long Term
R11	1.5	Cotterhill GP	450103	275101	Residential	Long Term
R12	1.5	Rugby Montessori Nursery School	449908	275077	Residential	Long Term
R13	1.5	14 Oliver Street	449801	275204	Residential	Long Term
R14	1.5	90 Lawford Road	449756	275146	Residential	Long Term
R15	1.5	The Church of Jesus Christ of Latter-day Saints	449999	275436	Church	Short Term
R16	1.5	57 Lawford Road	449759	275118	Residential	Long Term
R17	1.5	250 Lawford Road	449264	275358	Residential	Long Term
R18	1.5	320 Lawford Road	449081	275472	Residential	Long Term
R19	1.5	20 King Street	450067	275722	Residential	Long Term
R20	1.5	1 Duke Street	450122	275710	Residential	Long Term

The existing sensitive receptors identified in Table 2 are considered to be the worst-case locations in terms of sensitivity to air quality pollutants. It should be noted that this is not an exhaustive list and there may be other locations within the vicinity of the Application Site which may experience air quality impacts as a result of traffic generated by the Proposed Development that have not been individually assessed. The existing sensitive receptors assessed are located along roads where trip generation is expected to be greatest in order to predict the greatest impacts from the Proposed Development and at the most sensitive locations.

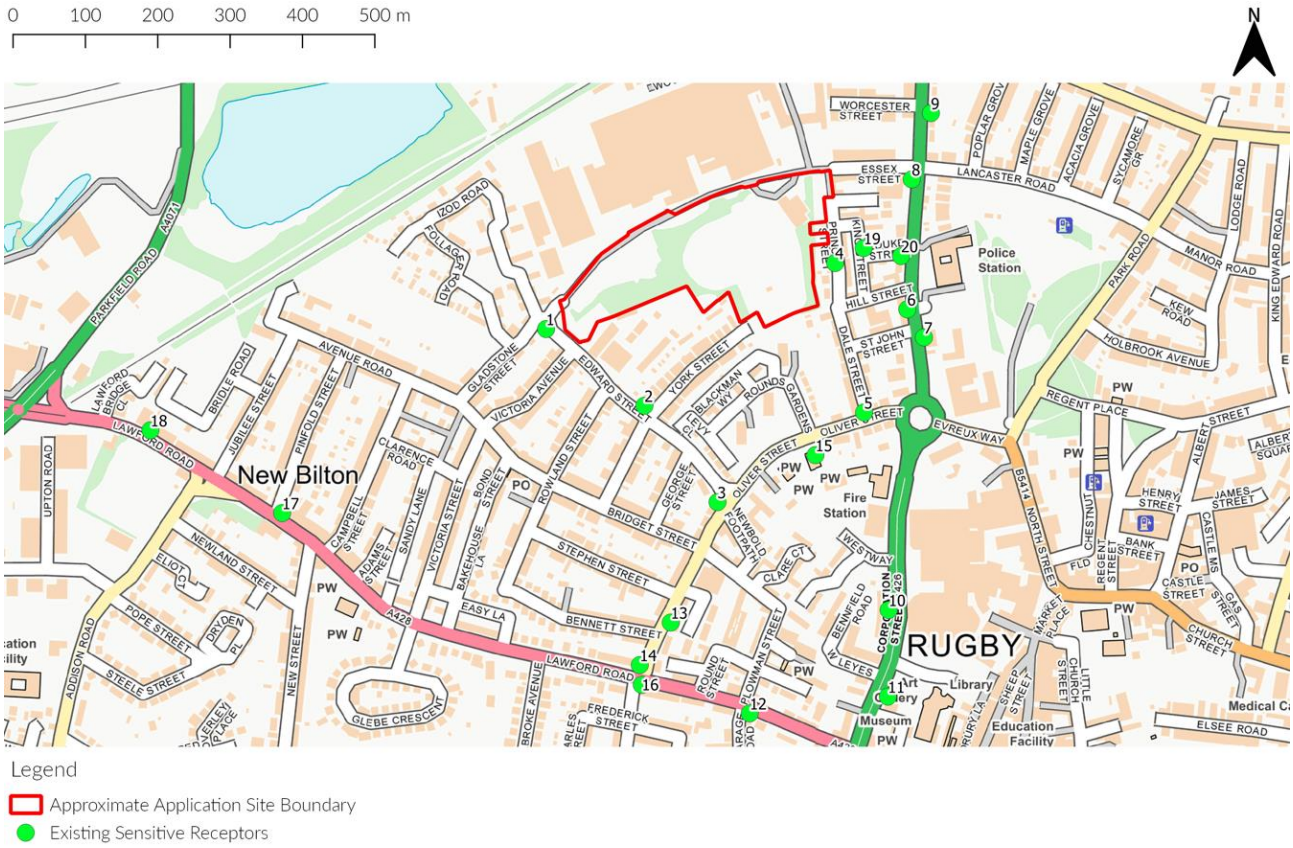


Figure 2: Existing Sensitive Receptors in the vicinity of the Application Site. Contains OS Data © Crown Copyright and Database Rights 2023.

3.4.2 Site Suitability Assessment

A qualitative Site Suitability Assessment has been undertaken to consider the exposure of future occupants of the Proposed Development to existing air quality.

The assessment of Site Suitability has been assessed qualitatively using monitoring data from the RBC Annual Status Report (ASR) 2023[17] in addition to Defra predicted background concentrations[22].

3.4.3 Rugby Borough Council Air Quality Supplementary Planning Document

According to the Rugby Borough Council Air Quality SPD[21] all new development within the RBC administrative area should comply with recommended minimum standards that applies to all new development within the RBC area of administration as shown in Table 3. The Proposed Development falls within scheme type *"Development above 10 units or 1000 square metres (regardless of whether or not it is inside or outside the AQMA)"*

Table 3: Rugby Borough Council Air Quality Supplementary Planning Document Criteria

Scheme Type	Does HS5 apply or not?	Type of Mitigation	Notes
Development below 10 units or 1000 square metres floorspace which is outside the AQMA (regardless of whether or not it generates new floorspace)	Policy HS5 does not apply	No mitigation required*	There are some types of development, such as Biomass boilers, that will require air quality considerations as part of SDC 1. These types of development are explained within section 7.

Scheme Type	Does HS5 apply or not?	Type of Mitigation	Notes
Development below 10 units or 1000 square metres which generates new floorspace and is inside the AQMA	Policy HS5 applies	Type 1 Mitigation	Extensions to existing dwellings may not require mitigation if no new boilers are included as part of the scheme as a whole. Annexes to dwellings which require their own heating would require mitigation. Changes of use/new uses from an empty shell would require mitigation if new/upgraded heating is included as part of scheme. Extensions to existing uses would require mitigation if new/upgraded heating is required due to the increase in floorspace
Development below 10 units or 1000 square metres which does not generate new floorspace inside the AQMA	Policy HS5 does not apply	No mitigation required	
Development above 10 units or 1000 square metres (regardless of whether or not it is inside or outside the AQMA)	Policy HS5 applies	Type 1 and Type 2 mitigation required. If NRMM used as part of scheme, Table 4 applies	
*A standard informative encouraging the take up of ultra low emission boilers and other associated measures will be added to planning permissions.			

3.4.3.1 Air Quality Neutral Assessment

In line with the requirements of the RBC Air Quality SPD[21] to conduct an air quality neutral assessment, the road traffic emissions associated with the Proposed Development for its first five operational years are to be calculated based on the following assumptions:

- Identifying the additional trips generated by the proposal (from the Transport Assessment);
- The emissions calculated for the pollutants of concern (NO_x and PM_{10}) [from the Emissions Factor Toolkit];
- The air quality damage costs calculation for the specific pollutant emissions (from Defra Interdepartmental Group on Costs and Benefits (IGCB)); and
- The result is totalled for a five-year period to enable mitigation implementation.

3.5 Assessment of Significance.

3.5.1 Construction Dust

The IAQM construction guidance[20] states that the primary aim of the construction phase risk assessment is to identify site specific mitigation that, once implemented, should ensure that there will be no significant effect. Therefore, the assessment has been used to determine an appropriate level of mitigation for the construction phase.

The determination of which mitigation measures are recommended include elements of professional judgement and the professional experience of the consultants preparing this report is set out in Appendix 3.

3.5.2 Operational Impacts

The air quality impacts at individual existing sensitive receptors have been described by determining the percentage change in concentrations relative to the Air Quality Assessment Level (AQAL) and comparing this with the total average concentration (Road traffic + Background), as set out in Table 4.

Table 4: EPUK and IAQM Impact Descriptors for Individual Existing Sensitive Receptors.

Long term average concentration at receptor in assessment year	% Change in concentration 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% of more of AQAL	Moderate	Substantial	Substantial	Substantial

The criteria shown in Table 4 has been taken from the EPUK and IAQM planning guidance[19] with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM planning guidance[19].

Where significant impacts are predicted, mitigation measures are recommended to reduce the impact.

The determination of the significance of impacts includes elements of professional judgement and the professional experience of the consultants preparing the report is set out in Appendix 3.

The overall significance of the air quality impacts is judged as either significant or not significant taking account of:

- The existing and future air quality in the absence of the Proposed 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.

These factors were considered, and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

3.5.3 24-Hour Mean Impacts Calculation

In line with the requirements from LAQM.TG(22)[8], the annual mean PM_{10} concentrations can be used to estimate the number of annual 24-hour mean exceedances following the modelling of road traffic emissions. This methodology is only feasible if the PM_{10} concentrations is greater than an annual mean threshold of 14.8 µg/m^3. LAQM.TG(22)[8] provides the following relationship to estimate exceedances of the PM_{10} 24-hour mean AQO:

"No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean^3 + (206/annual mean)"

3.5.4 Site Suitability Assessment

To determine the significance of predicted air quality impacts based upon a Site Suitability Assessment, the EPUK and IAQM planning guidance[19] states:

"*Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means.*"

4. Baseline Environment.

This section sets out the available information on air quality in the vicinity of the Application Site.

4.1 Local Air Quality Management Review and Assessment.

As previously mentioned, the latest RBC ASR 2023[17] has confirmed that a single AQMA has been declared within the RBC area of administration. This AQMA is designated the "Rugby AQMA" which was declared in 2004 for exceedances of the NO_2 annual mean AQO only. The Application Site is located within the "Rugby AQMA".

A review of the RBC ASR 2023[17] has indicated that in 2022, the most recent year of available monitoring data, a single exceedance of the NO_2 annual mean AQO was recorded at passive diffusion tube monitoring locations within the RBC area of administration. Pollutant concentrations of NO_2 have generally declined from 2015 to 2022 from RBC monitoring data. Furthermore, based on the monitoring data recorded in 2022 no exceedance of the 60 $\mu g/m^3$ threshold has been recorded making it unlikely that the NO_2 1-hour mean AQO has been exceeded within the RBC area of administration.

It should be noted that the pollutant concentrations recorded in 2020 and 2021 from the most recent RBC (ASR) 2022[17] are lower than previous years as a direct result of reduced traffic levels during the COVID-19 pandemic. As such the pollutant concentrations recorded in 2020 and 2021 are not considered to be representative of 'normal' air quality conditions but have been presented for information purposes only. However, 2022 monitoring data has been presented and discussed as this is the latest year of available representative monitoring data.

4.2 Local Air Quality Monitoring.

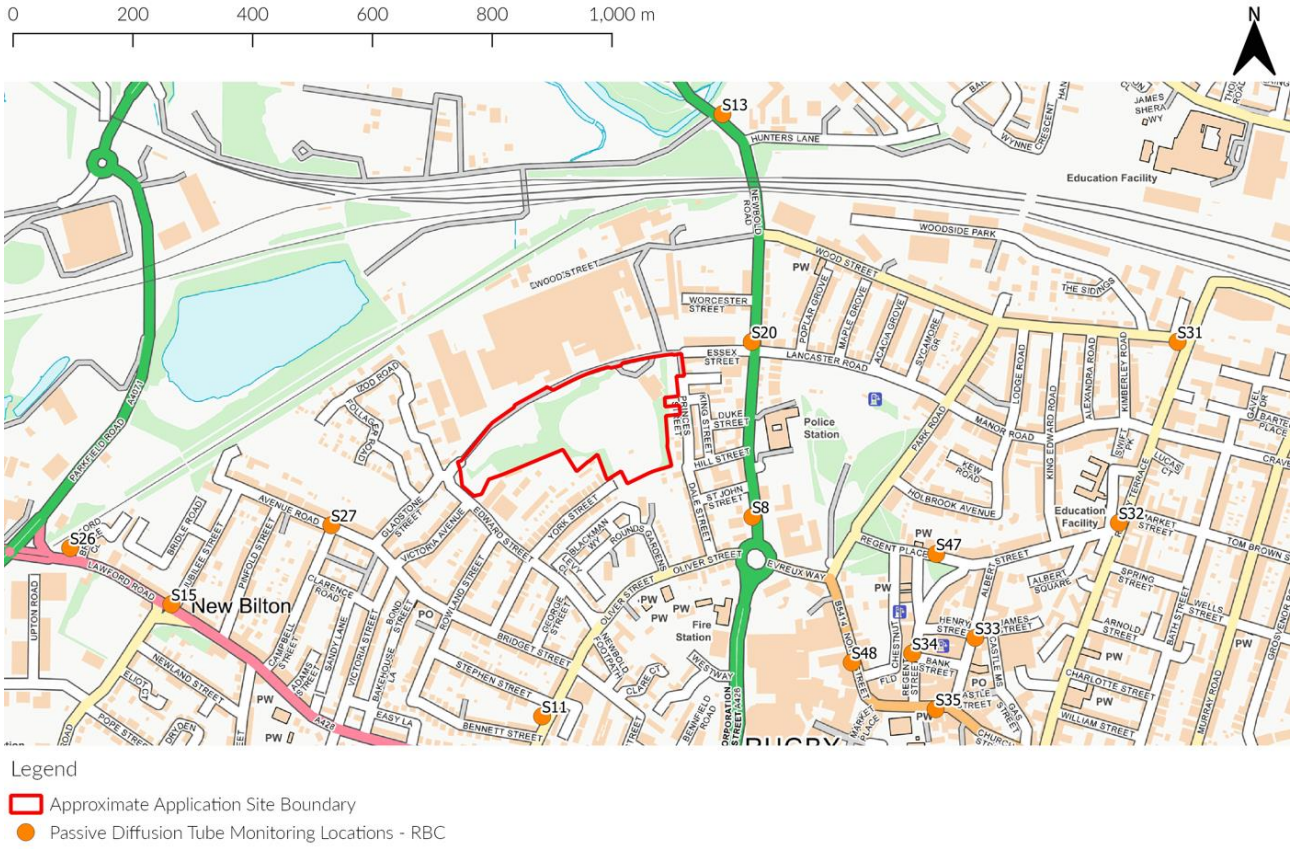
There are no automatic monitoring stations currently operated by RBC according to the RBC ASR 2023[17] and accordingly no monitoring of PM concentrations are undertaken within the RBC area of administration.

A review of the most recent monitoring data available indicated that there are 14 passive diffusion tube monitoring locations within the vicinity of the Application Site. Table 5 details the monitoring results for all passive diffusion tube monitoring locations for the most recent years available and the passive diffusion tube monitoring locations are illustrated in Figure 3.

Table 5: Passive Diffusion Tube Monitoring Location Results

Site ID	Site Type	Site Name	Distance (km) from Application Site (approx.)	Annual Mean NO_2 Concentration ($\mu g/m^3$)							
				2015	2016	2017	2018	2019	2020	2021	2022
S20	Roadside	Essex St / Newbold Rd	0.1	30.9	32.4	26.7	27.8	26.0	19.5	20.2	17.6
S8	Kerbside	Newbold Rd opp Benn Hall	0.2	38.2	33.6	29.3	30.0	28.0	26.9	24.3	25.9
S27	Roadside	Leam Rd Ryton lampost	0.2	-	27.5	21.3	18.2	21.2	14.4	14.9	13.3
S13	Roadside	Avon Mill Lampost	0.4	38.3	39.5	36.5	34.8	33.5	26.7	26.5	26.6
S11	Roadside	15 Oliver St drainpipe house	0.4	25.6	24.3	21.8	21.8	22.6	16.2	17.4	16.3
S48	Roadside	North St Natwest	0.4	34.5	37.5	34.3	31.0	34.1	23.1	22.3	24.5
S15	Kerbside	Lawford Road / Jubile St	0.5	30.9	28.3	25.6	26.9	25.1	22.1	20.7	26.7
S47	Kerbside	Regent Place Quakers	0.5	33.9	35.2	30.8	32.6	29.5	20.2	22.6	23.0
S34	Roadside	Oxfam Regent St	0.5	33.9	27.8	25.5	24.8	23.1	15.2	17.1	17.1
S35	Roadside	Papa Johns Church St	0.6	34.8	32.3	28.4	31.7	31.0	19.9	22.0	23.7

Site ID	Site Type	Site Name	Distance (km) from Application Site (approx.)	Annual Mean NO_2 Concentration (µg/m^3)							
				2015	2016	2017	2018	2019	2020	2021	2022
S33	Roadside	Alma Lodge Albert St	0.6	25.6	25.4	21.6	22.4	22.2	15.7	16.6	16.4
S26	Roadside	Lawport Rd Flats	0.7	20.3	22.4	18.3	19.1	18.7	14.5	14.9	14.6
S32	Roadside	Station Barr Railway Terr	0.8	32.6	30.4	28.2	29.3	27.4	21.1	21.2	20.9
S31	Roadside	Wood Street opp Myson House	0.8	32.1	29.7	26.1	27.3	24.7	21.3	20.8	21.1



Legend

Approximate Application Site Boundary

Passive Diffusion Tube Monitoring Locations - RBC

Figure 3: Passive Diffusion Tube Monitoring Locations within the vicinity of the Application Site. Contains OS Data © Crown Copyright and Database Rights 2023.

As shown in Table 5 above there were no recorded exceedances of the NO_2 annual mean AQO in 2022, the most recent year of available monitoring data. The highest recorded annual mean concentration of NO_2 in 2022 was recorded at Site ID: S15 as 26.7 µg/m^3 which is 66.8% of the NO_2 annual mean AQO. No exceedances of the NO_2 annual mean AQO have been recorded from 2015 to 2022.

Furthermore, as outlined in Defra LAQM.TG(22)[8], an NO_2 annual mean concentration of 60 µg/m^3 or above is often used to indicate a possible exceedance of the NO_2 1-hour mean AQO. There has been no recorded exceedance of the 60 µg/m^3 threshold from monitored annual mean NO_2 concentrations at any of the passive diffusion tube monitoring locations within the vicinity of the Application Site between 2015 to 2022. As such, an exceedance of the NO_2 1-hour mean AQO is unlikely at the Application Site.

4.3 Industrial Pollution.

A desk-based review of potential industrial sources using the EA Pollution Inventory[23] identified a single significant industrial source of air pollution within 2 km of the Application Site that could affect the Application Site with regard to air quality. Relevant information for the industrial source is presented in Table 6 and the location of the industrial source with respect to the Application Site is shown in Figure 4.

Table 6: Information on Source of Industrial Air Pollution within 2 km of the Application Site Boundary

Source Name	Source Type	Air Pollutant Release
Cemex UK Cement Limited	Industrial	Nitrogen oxides (NO_x and NO_2) as NO_2

As the industrial source of air pollution contains an environmental permit from the EA, significant air quality impacts are not expected at the Application Site.

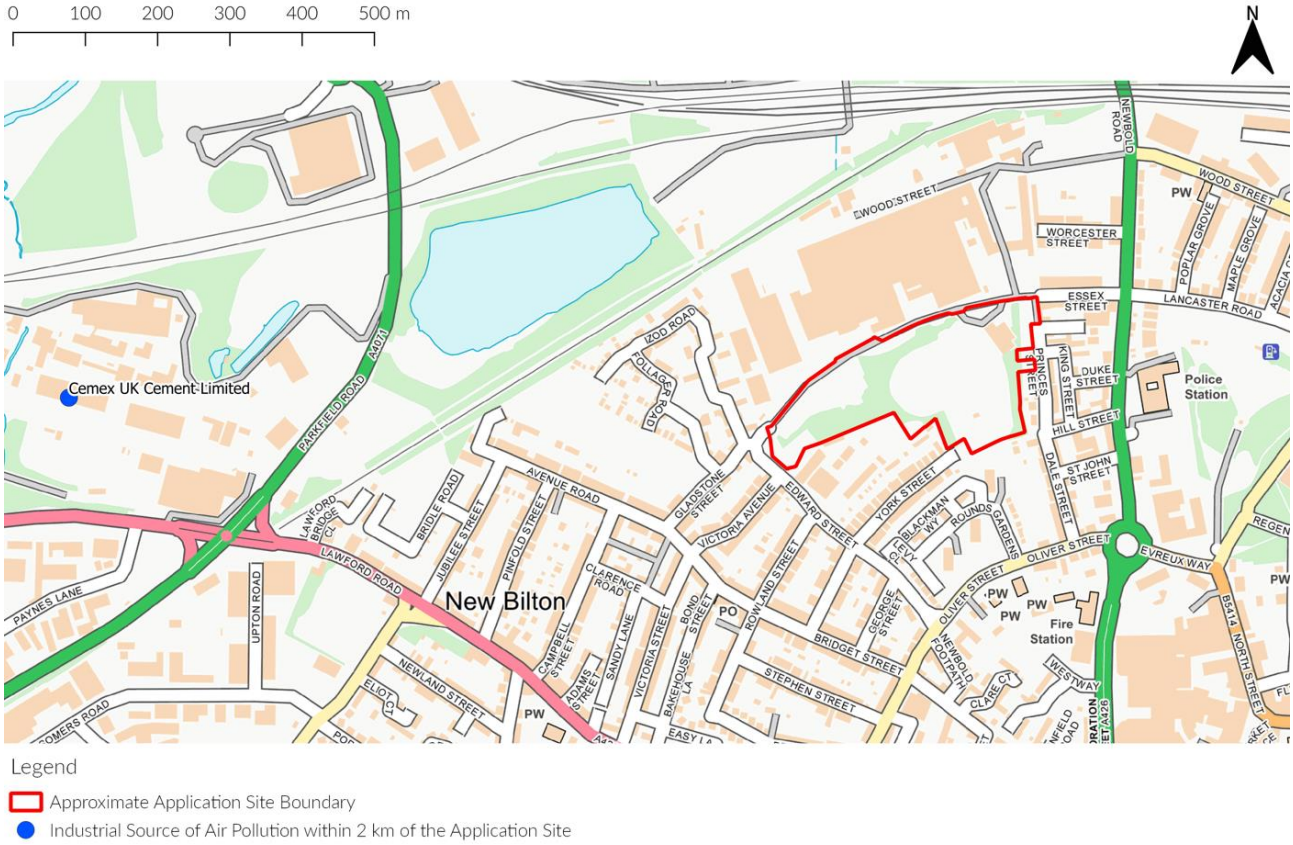


Figure 4: Sources of Industrial Air Pollution within 2 km of the Application Site. Contains OS Data © Crown Copyright and Database Rights 2023.

4.4 Defra Predicted Background Concentrations.

The Defra predicted background concentrations have been obtained from the national maps published by Defra[22]. These estimated concentrations are produced on a 1 km by 1 km grid basis for the whole of the UK. The Application Site falls into grid square X 449500 Y 275500 and the Defra predicted background concentrations for this grid square for NO_2, PM_{10} and $PM_{2.5}$ are provided in Table 7 for 2022, the most recent year with available monitoring data, for 2024, the current year and for 2030, the latest available year with Defra predicted background concentrations[22] to represent the Proposed Development opening year of 2031.

Table 7: Defra Predicted Background Concentrations for Grid Square X 449500 Y 275500

Year	Defra Predicted Background Concentration (µg/m^3)		
	NO_2	PM_{10}	$PM_{2.5}$
2022	11.2	14.2	9.1
2024	10.5	13.9	8.9
2030	9.1	13.6	8.7

As shown in Table 7, Defra predicted background concentrations[22] are below the relevant annual mean AQOs for pollutants NO_2, PM_{10} and $PM_{2.5}$ in 2022, 2024 and 2030.

4.5 Summary of Background Data.

The baseline assessment has shown that the Application Site is located within the Rugby AQMA.

No monitoring of PM_{10} or $PM_{2.5}$ is undertaken within the RBC area of administration.

A review of local monitoring data from passive diffusion tube monitoring locations within the vicinity of the Application Site indicates no likely exceedances of the AQOs for NO_2 will occur based on 2022 data, the most recent year of available monitoring data.

There are no industrial or waste management sources of air pollution within 2 km of the Application Site that could impact local air quality in the vicinity of the Application Site based on a review of the EA Pollution Inventory[23].

Defra predicted background concentrations[22] are predicted to be below the annual mean AQOs for all considered pollutants at the Application Site in 2022, 2024 or 2030, the latest available year with Defra predicted background concentrations[22].

5. Construction Phase Assessment.

The potential for air quality impacts during the construction of the Proposed Development are assessed in this section.

5.1 Construction Phase Dust Assessment.

The risk of dust impacts is based on the potential dust emissions magnitude and the sensitivity of the area. These two factors are then combined to determine the risk of dust impacts with no mitigation applied. In the absence of any site-specific information, a higher risk category has been applied to represent a worst-case scenario.

5.1.1 Assessment Screening

There are 'human receptors' within 250 m of the Application Site but no designated habitat sites within 50 m of the Application Site boundary or within 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the Application Site entrance.

The closest ecological receptor to the Application Site is Newbold Quarry Park, classified as a Local Nature Reserve (LNR), located 1.0 km to the north west.

Therefore, an assessment of construction dust at human receptors is required, but an assessment of construction at ecological receptors can be screened out from this assessment.

5.1.2 Potential Dust Emission Magnitude

The potential magnitude of dust emissions from demolition, earthworks, construction and trackout have been assessed, as identified in Table 8.

Table 8: Predicted Magnitude of Dust Emissions

Activity	Magnitude	Justification
Demolition	Small	The Application Site currently includes a single existing building which will be demolished prior to the construction of the Proposed Development. Based on estimates of the demolition area of the existing building using QGIS and estimating a height of the existing building to be approximately 5 m using Google Earth it is likely that the demolition volume will be less than 12,000 m^3. The original construction material of the existing building appears to be a mixture of brick and concrete which are both potentially dusty construction material. The approximate height of the existing building is less than 6 m above ground level ensuring demolition activities will occur greater than 6 m above ground level. Therefore, in line with IAQM construction guidance[20], the magnitude of dust emissions from demolition is anticipated to be small.
Earthworks	Medium	The Application Site currently comprises mostly greenfield land in addition to a single existing building. However the Proposed Development will require extensive landscaping as part of the proposals and earthworks across the entirety of the Application Site will be required. The total Application Site area, as a worst case, has been confirmed by St. Modwen Homes, the client, to be 12.62 acres (51,071 m^2) which is between the 18,000 m^2 – 110,000 m^2 threshold for a medium dust emission magnitude classification. The soil type at the Application Site has been classed as "loamy and clayey" which is a potentially dusty soil type using the application Soilscape[25]. Therefore, in line with IAQM construction guidance[20], the magnitude of dust emissions from earthworks is anticipated to be medium.
Construction	Medium	The proposals are for the construction of 134 houses ranging from two to 4 bedrooms. The exact construction volumes for the Proposed Development are not currently available but based on the proposals the total volume is estimated to be between 12,000 m^3 to 75,000 m^3. It is expected that concrete and brick will be used as a construction material which has a high potential for dust generation. Therefore, in line with IAQM construction guidance[20], the magnitude of dust emissions from construction is anticipated to be medium.

Activity	Magnitude	Justification
Trackout	Large	Outward movements of HDVs associated with the construction phase of the Proposed Development have not been confirmed at time of writing. As the Application Site is predominantly greenfield land, the unpaved road length will be greater than 100 m after analysis using QGIS. The soil type at the Application Site has been previously classed as "loamy and clayey" using the application Soilscape[25] which is a potentially dusty soil type. Therefore, in line with IAQM construction guidance[20], the magnitude of dust emissions from construction is anticipated to be large as a worst case.

5.1.3 Sensitivity of the Study Area

The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site-specific factors, such as whether there are natural shelters, such as trees or other vegetation, to reduce the risk of wind-blown dust.

The IAQM distance bands for sensitivity are illustrated relative to the Application Site in Figure 5.

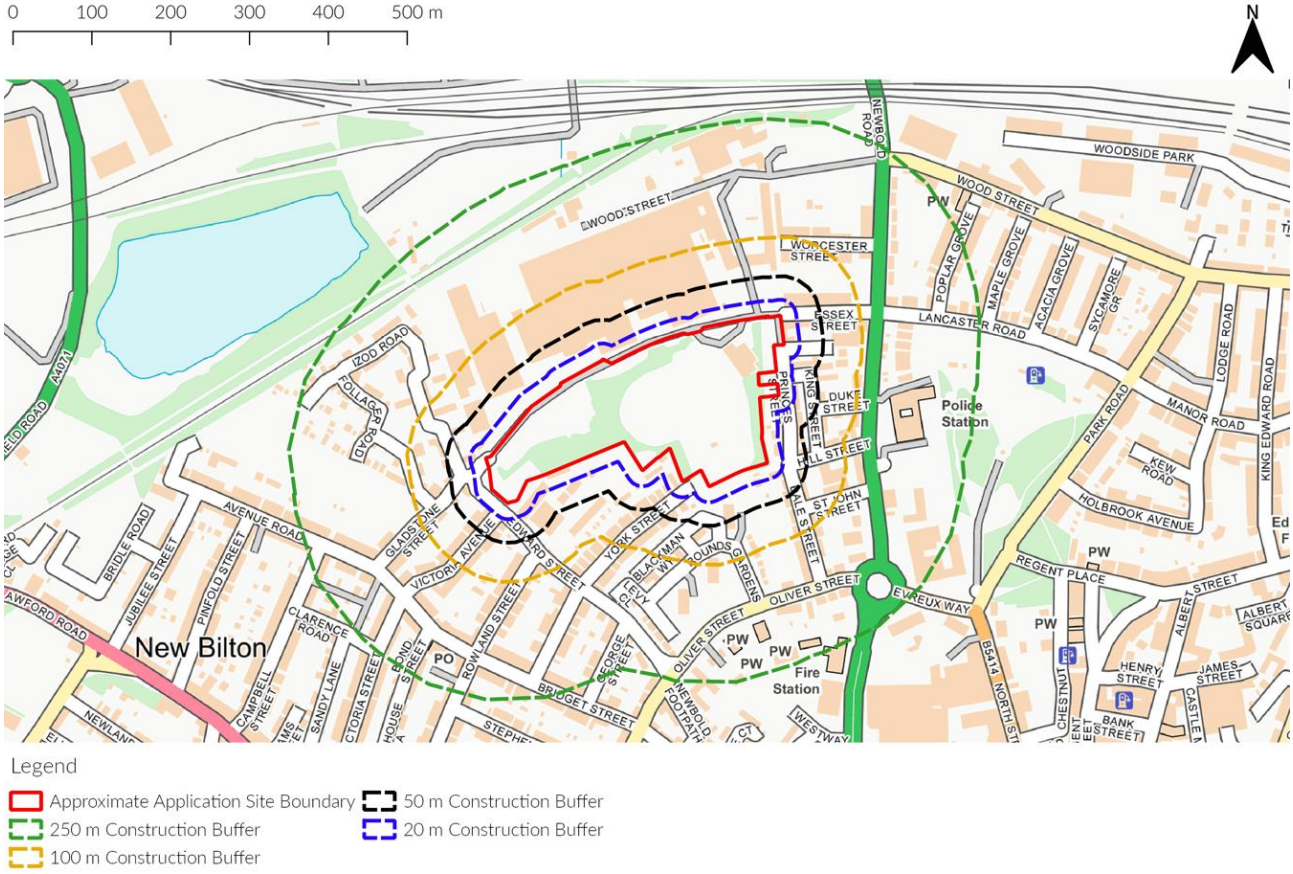


Figure 5: IAQM Demolition and Construction Dust Distance Band Criteria from the Application Site Boundary. Contains OS Data © Crown Copyright and Database Rights 2023.

The sensitivity of the area and the factors considered are detailed in Table 9.

Table 9: Sensitivity of the Area

Sensitivity Type	Factors	Sensitivity of Area	
		On – Site Activity	Trackout
Dust Soiling	There are between 10-100 high sensitivity receptors (residential dwellings and car parking spaces) and between 10-100 medium sensitivity receptors (1-10 industrial and commercial properties) within 20 m of the Application Site boundary. Therefore, the sensitivity of the area surrounding the Application Site has been classified as high sensitivity with regards to dust soiling for on-site activity. For trackout, there are between 10-100 residential apartments and car parking spaces classed as high sensitivity receptors within 20 m of multiple potential routes likely to be used by construction traffic up to 200 m from the Application Site. Therefore, the sensitivity of the area surrounding the Application Site has been classified as medium with respect to dust soiling for trackout.	High	High

Sensitivity Type	Factors	Sensitivity of Area	
		On – Site Activity	Trackout
Human Health	The Defra predicted background PM_{10} concentration for the 1 km by 1 km grid square in which the Application Site is located is below the annual mean PM_{10} concentration of 24 µg/m^3 in the years 2022, 2024 and 2030 (the latest available year with Defra predicted background concentrations[22]) as provided in Table 7. There are between 10-100 existing residential properties, classed as high sensitivity receptors, and between 1-10 existing commercial properties, classed as medium sensitivity receptors within 20 m of the Application Site boundary. Therefore, the sensitivity of the area surrounding the Application Site has been classified as low sensitivity with regards to human health impacts for on-site activity. For trackout there are between 10-100 residential apartments and car parking spaces classed as high sensitivity receptors within 20 m of multiple potential routes likely to be used by construction traffic up to 200 m from the Application Site where people could be exposed to PM_{10} for eight hours or more in one day. Therefore, the sensitivity of the area surrounding the Application Site has been classified as low with respect to human health for trackout.	Low	Low

5.1.4 Risk of Dust Impacts

The outcomes of the assessments of potential magnitude of dust emissions and the sensitivity of the area are combined to determine the risk of impact. This risk is then used to inform the selection of appropriate mitigation. Table 10 details the risk of dust impacts for demolition, earthworks, construction and trackout activities.

Table 10: Summary of Potential Unmitigated Dust Risks

Potential Impact	Sensitivity	Demolition	Earthworks	Construction	Trackout
Magnitude		Small	Medium	Medium	Large
Dust Soiling Impacts	High	Medium Risk	Medium Risk	Medium Risk	High Risk
Human Health Impacts	Low	Negligible	Low Risk	Low Risk	Low Risk

5.2 Construction Phase – Vehicular Pollutants.

The Application Site is located within the Rugby AQMA and therefore the lower screening criteria (i.e. 100 LDV and 25 HDV) would apply.

Information on traffic movements anticipated during construction works was unavailable for the completion of the Air Quality Assessment. However, the development quantum is not anticipated to result in a significant increase in movements above the criteria outlined in the EPUK and IAQM planning guidance[19]. The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criteria presented within EPUK and IAQM planning guidance[19], additional road vehicle trips during the construction phase of the Proposed Development "*can be considered to have insignificant effects*" on air quality.

5.3 Construction Phase – Non-road Mobile Machinery.

Pollutants emitted by NRMM that may have the most significant potential effects on local air quality are particulate matter (PM_{10} and $PM_{2.5}$), and NO_x/NO_2. Typically, NRMM is associated with construction sites and,

therefore there is a potential for NRMM emissions to adversely affect local air quality as a result of the Proposed Development.

Furthermore, the IAQM construction guidance[20] states that "*Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed*."

6. Operational Phase Assessment.

The potential for air quality impacts during the operation of the Proposed Development are assessed in this section.

6.1 Road Traffic Emissions Impact Assessment.

Pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at 20 existing sensitive receptors. Annual mean, 1-hour mean and 24-hour mean concentrations will be evaluated at all of the existing sensitive receptor locations except at two existing sensitive receptors, R7 and R15, where only the 1-hour mean and 24-hour mean AQOs apply. Concentrations for the DS 2031 and DM 2031 scenarios have been provided from Table 11 to Table 13 for annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations. To ensure an up to date and robust assessment, Defra predicted background concentrations[22] and emission factors from 2022 have been used.

The significance of the impacts on pollutant concentrations within the vicinity of the Application Site at existing sensitive receptors from the increase in operational phase traffic associated with the Proposed Development has been determined in accordance with EPUK and IAQM planning guidance[19].

6.1.1 NO_2.

6.1.1.1 Annual Mean Concentrations.

Annual mean NO_2 concentrations were predicted for the DM 2031 and DS 2031 scenarios. The modelled concentrations for annual mean NO_2 are displayed in Table 11. The predictions have been assessed against the annual mean NO_2 AQO of 40 µg/m^3 and the impact has been determined in accordance with EPUK and IAQM planning guidance[19].

Table 11: Predicted Annual Mean Concentrations of NO_2 at Existing Sensitive Receptors in 2031.

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R1	1.5	11.98	12.09	0.11	0.3	Negligible
R2	1.5	12.40	12.57	0.17	0.4	Negligible
R3	1.5	15.99	16.28	0.29	0.7	Negligible
R4	1.5	17.22	17.64	0.42	1.1	Negligible
R5	1.5	24.09	24.47	0.38	0.9	Negligible
R6	1.5	25.01	25.26	0.25	0.6	Negligible
R8	1.5	26.77	27.06	0.29	0.7	Negligible
R9	1.5	31.19	31.56	0.37	0.9	Negligible
R10	1.5	22.62	22.64	0.02	0.0	Negligible
R11	1.5	24.51	24.59	0.08	0.2	Negligible
R12	1.5	14.52	14.76	0.24	0.6	Negligible
R13	1.5	16.54	16.85	0.31	0.8	Negligible
R14	1.5	18.77	19.26	0.49	1.2	Negligible
R16	1.5	15.23	15.51	0.28	0.7	Negligible
R17	1.5	18.07	18.59	0.52	1.3	Negligible
R18	1.5	16.78	17.20	0.42	1.1	Negligible

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R19	1.5	18.15	18.45	0.30	0.8	Negligible
R20	1.5	25.30	25.62	0.32	0.8	Negligible

As indicated in Table 11 the annual mean NO_2 AQO of 40 µg/m^3 is not predicted to be exceeded at any existing sensitive receptors considered in both the DM 2031 and DS 2031 scenario (i.e. both without and with traffic associated with the Proposed Development). For the DS 2031 scenario, the maximum NO_2 concentration is expected to occur at existing receptor R9 with an annual mean of 31.56 µg/m^3 for the DS 2031 scenario, which is not in exceedance of the NO_2 annual mean AQO.

The largest air quality impact from NO_2 emissions is predicted at R17, with an increase of 0.52 µg/m^3, or 1.30% of the AQAL. The concentration at this existing sensitive receptor in the DS 2031 scenario is 18.59 µg/m^3, or 46.5% of the AQAL. In line with the EPUK and IAQM criteria[19] the overall impact is expected to be "Negligible".

6.1.1.2 1-Hour Mean Impacts.

In the absence of hourly data in line with LAQM.TG(22)[8], an annual mean NO_2 concentration of 60 µg/m^3 can be used as an indication of whether an exceedance of the 1-hour mean NO_2 AQO is likely. The NO_2 predicted concentrations at all existing sensitive receptors included within this assessment in both the DM 2031 and DS 2031 scenarios are below the indicative 60 µg/m^3 threshold and as such, it is unlikely that there will be any exceedances of the 1-hour mean NO_2 AQO. Therefore, existing sensitive receptors where the 1-hour mean NO_2 concentration exclusively applies have been omitted from Table 11.

6.1.2 PM_{10}.

6.1.2.1 Annual Mean Impacts.

Annual mean PM_{10} concentrations were predicted for the anticipated opening year of the Proposed Development of 2024 for both the DM 2031 and DS 2031 scenarios. The modelled concentrations for annual mean PM_{10} are displayed in Table 12 below. The predictions have been assessed against the annual mean PM_{10} AQO of 40 µg/m^3 and the magnitude of impact has been determined in accordance with EPUK and IAQM planning guidance[19].

Table 12: Predicted Annual Mean Concentrations of PM_{10} at Existing Sensitive Receptors in 2031.

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R1	1.5	14.31	14.34	0.02	0.1	Negligible
R2	1.5	14.40	14.44	0.04	0.1	Negligible
R3	1.5	15.23	15.30	0.08	0.2	Negligible
R4	1.5	17.30	17.39	0.09	0.2	Negligible
R5	1.5	18.94	19.05	0.11	0.3	Negligible
R6	1.5	19.20	19.27	0.06	0.2	Negligible
R8	1.5	19.68	19.75	0.07	0.2	Negligible
R9	1.5	20.84	20.94	0.10	0.3	Negligible
R10	1.5	18.36	18.38	0.02	0.0	Negligible

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R11	1.5	18.90	18.93	0.03	0.1	Negligible
R12	1.5	14.86	14.91	0.05	0.1	Negligible
R13	1.5	15.36	15.44	0.08	0.2	Negligible
R14	1.5	15.77	15.88	0.11	0.3	Negligible
R16	1.5	15.01	15.07	0.06	0.2	Negligible
R17	1.5	15.65	15.76	0.11	0.3	Negligible
R18	1.5	15.37	15.46	0.09	0.2	Negligible
R19	1.5	17.51	17.57	0.06	0.2	Negligible
R20	1.5	19.27	19.35	0.08	0.2	Negligible

As indicated in Table 12 predicted annual mean PM_{10} concentrations did not exceed the annual mean AQO at any of the existing sensitive receptors considered in the DM 2031 and DS 2031 scenario. A maximum PM_{10} concentration of 20.94 µg/m^3 is predicted to occur at existing receptor R9 in the DS 2031 scenario, which is below the annual mean AQO.

The greatest change in PM_{10} concentration is predicted at existing sensitive receptors R5, R14 and R17 as 0.11 µg/m^3, which is 0.3% of the AQAL. As such, in line with the EPUK and IAQM criteria the overall impact is expected to be "Negligible".

6.1.2.2 24-Hour Mean Impacts.

For the 24-hour mean PM_{10} AQO to be exceeded, there needs to be more than 35 hourly exceedances of the 50 µg/m^3 threshold. In line with the methodology from LAQM.TG(22)[8], the modelled annual mean PM_{10} concentrations presented in Table 12 can be used to estimate the number of annual 24-hour mean exceedances using the equation presented in Section 3.5.3.

The number of 24-hour PM_{10} exceedances predicted at all existing sensitive receptors included within this assessment in both the DM 2031 and DS 2031 scenarios is below 35. Therefore in accordance with LAQM.TG(22)[8], exceedances of the 24-hour mean PM_{10} AQO can be considered unlikely and are therefore not significant. Accordingly, existing sensitive receptors where the 24-hour mean PM_{10} concentration exclusively applies have been omitted from Table 12.

6.1.3 $PM_{2.5}$

6.1.3.1 Annual Mean Impacts.

Annual mean $PM_{2.5}$ concentrations were predicted for the DM 2031 and DS 2031 scenarios. The modelled concentrations for annual mean $PM_{2.5}$ are displayed in Table 13 below. The predictions have been assessed against the annual mean $PM_{2.5}$ AQO of 20 µg/m^3 and the magnitude of impact has been determined in accordance with EPUK and IAQM planning guidance[19].

Table 13: Predicted Annual Mean Concentrations of $PM_{2.5}$ at Existing Sensitive Receptors in 2031.

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R1	1.5	9.18	9.19	0.01	0.1	Negligible

Existing Receptor	Height (m)	Conc. in DM scenario (µg/m^3)	Conc. in DS scenario (µg/m^3)	Difference in conc. (µg/m^3)	Difference expressed as % AQAL	Impact descriptor
R2	1.5	9.23	9.25	0.02	0.1	Negligible
R3	1.5	9.67	9.71	0.04	0.2	Negligible
R4	1.5	10.42	10.47	0.05	0.2	Negligible
R5	1.5	11.30	11.36	0.06	0.3	Negligible
R6	1.5	11.44	11.47	0.03	0.2	Negligible
R7	1.5	12.64	12.70	0.06	0.3	Negligible
R8	1.5	11.69	11.73	0.04	0.2	Negligible
R9	1.5	12.32	12.37	0.05	0.3	Negligible
R10	1.5	10.99	11.00	0.01	0.0	Negligible
R11	1.5	11.28	11.29	0.02	0.1	Negligible
R12	1.5	9.47	9.50	0.03	0.1	Negligible
R13	1.5	9.74	9.79	0.04	0.2	Negligible
R14	1.5	9.96	10.02	0.06	0.3	Negligible
R15	1.5	9.42	9.43	0.02	0.1	Negligible
R16	1.5	9.55	9.58	0.03	0.2	Negligible
R17	1.5	9.90	9.96	0.06	0.3	Negligible
R18	1.5	9.75	9.79	0.05	0.2	Negligible
R19	1.5	10.53	10.56	0.03	0.2	Negligible
R20	1.5	11.47	11.52	0.04	0.2	Negligible

As indicated in Table 13, the predicted annual mean $PM_{2.5}$ concentrations do not exceed the annual mean $PM_{2.5}$ AQO at any of the existing sensitive receptors considered in the DM 2031 and DS 2031 scenarios.

The maximum concentration of 12.37 µg/m^3 is predicted to occur at existing sensitive receptors R9 in the DS 2031 scenario which is below the annual mean AQO.

The greatest change in $PM_{2.5}$ concentration is predicted at existing sensitive receptors R5, R14 and R17 as 0.06 µg/m^3, which is 0.3% of the AQAL. As such, in line with the EPUK and IAQM criteria the overall impact is expected to be "Negligible".

6.1.4 Significance of Air Quality Impacts from the Road Traffic Emissions Impact Assessment.

Overall, the magnitude of impact following the EPUK and IAQM planning guidance[19] can be considered "Negligible" at all existing sensitive receptors. As such, the overall significance of operational phase road traffic emission impacts from the Proposed Development on annual mean, 1-hour mean and 24-hour mean NO_2, PM_{10} and $PM_{2.5}$ concentrations was determined not to be significant in line with EPUK and IAQM planning guidance[19] at all existing sensitive receptors.

The following factors have been considered when providing justification:

– The magnitude of the impact of a change in concentration of pollutants NO_2, PM_{10} and $PM_{2.5}$ as a result of road traffic emissions associated with the Proposed Development is predicted to be "Negligible". As such the

overall significance of operational phase road traffic emission impacts from pollutants NO_2, PM_{10} and $PM_{2.5}$ has been deemed to be not significant in line with EPUK and IAQM planning guidance[19];

- Worst case emission factors from 2022 have been used in the assessment;
- Worst case Defra predicted background concentrations[22] from 2022 have been used in the assessment;

As no exceedances of the considered AQOs are predicted, mitigation measures are not required for the operational phase of the Proposed Development. As such, the overall effect is considered to be 'not significant'.

6.2 Site Suitability Assessment.

This section presents a review of RBC monitoring data and Defra predicted background concentrations[22] in the vicinity of the Application Site, for the purpose of identifying the suitability of the Application Site for the proposed residential use from a review of annual mean, 24-hour mean and 1-hour mean pollutant concentrations of pollutants NO_2, PM_{10} and $PM_{2.5}$, in line with Defra LAQM.TG(22)[8] to identify any requirements for potential mitigation to be embedded into the Proposed Developments design.

As shown in Table 5 there has been no exceedance of the NO_2 annual mean AQO at any of the closest and most representative passive diffusion tube monitoring locations (Site ID: S8, S11, S20 and S27), due to their roadside placement on minor roads, within the vicinity of the Application Site based on 2022 monitoring data and accordingly no exceedance of the NO_2 annual mean AQO is expected at the Application Site.

An annual mean concentration of 60 $\mu g/m^3$ or above is often used to indicate a possible exceedance of the 1-hour mean NO_2 AQO. There has been no recorded exceedance of 60 $\mu g/m^3$ from monitored annual mean NO_2 concentrations at any of the passive diffusion tube monitoring locations within the vicinity of the Application Site from the most recent five years of representative monitoring data. Furthermore, Defra predicted background concentrations[22] for NO_2 at the Application Site are below the 60 $\mu g/m^3$ threshold in 2030, the latest year with available Defra predicted background concentrations[22]. As such, an exceedance of the NO_2 1-hour mean AQO is unlikely.

As shown in Table 7 the Defra predicted background mapped concentrations for pollutants NO_2, PM_{10} and $PM_{2.5}$ at the Application Site are below the respective annual mean AQOs in 2022, 2024 and 2030.

The methodology outlined in Defra LAQM.TG(22)[8] has indicated that no exceedances of the PM_{10} 24-hour mean AQO are anticipated in 2022, 2024 or 2030.

Therefore, NO_2, PM_{10} and $PM_{2.5}$ concentrations in the vicinity of the Application Site are considered to be below their respective annual mean (in line with Part F of the Building Regulations (2021)[13]), 1-hour mean and 24-hour mean AQOs and the Application Site is considered suitable for the proposed residential use without the need for additional mitigation measures.

6.2.1 Significance of Air Quality Impacts from the Site Suitability Assessment

To determine the significance of predicted air quality impacts based upon a Site Suitability assessment, such as that undertaken as part of this assessment, the EPUK and IAQM planning guidance[19] states:

"*Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means.*"

- With regards to the Proposed Development, the unmitigated impact significance associated with the Proposed Development has been predicted in accordance with the stated assessment methodology. The Proposed Development will not introduce any new receptor into an area of exceedance of the respective 1-hour mean, 24-hour mean or annual mean AQOs for all pollutants based upon a review of local monitoring data[17] and Defra predicted background concentrations[22] within the vicinity of the Application Site.

As no exceedances of the considered AQOs are predicted, mitigation measures are not required for the operational phase of the Proposed Development. As such, the overall effect is considered to be 'not significant'.

6.3 Rugby Borough Council Air Quality Supplementary Planning Document

6.3.1 Air Quality Neutral

In accordance with the requirements of the RBC Air Quality SPD[21] to conduct an air quality neutral assessment, the road traffic emissions associated with the Proposed Development for its first five operational years have been calculated based on the following site-specific assumptions:

- Vehicle emissions have been calculated using Defra's latest Emission Factor Toolkit (EFT v12.0);
- 2022 emission factors have been used;
- Edward Street has been classified as an Urban (Not London) road link
- All vehicles generated by the Proposed Development are LDVs;
- The average speed of vehicles is 30 kph; and
- The average length of each trip generated by the Proposed Development is 10 km.

A total of 4.53 tonnes of NO_x and 0.33 tonnes of $PM_{2.5}$ for the five year period between 2031 and 2035 is expected to be released as a result of the Proposed Development. In accordance with the RBC Air Quality SPD[21], the Proposed Development is not air quality neutral. Air quality mitigation measures are therefore required in order to offset these pollutant emissions.

In line with RBC's Air Quality SPD[21], it has been confirmed by PJA that multiple mitigation measures (Type 1 and Type 2) are intended to be put in place during the operational phase of the Proposed Development, in line with the provided travel plan, to assist with achieving air quality neutral status as shown below:

- Site layout and Design;
- Measures to reduce the need to travel;
- Walking Initiatives;
- Cycling Initiatives;
- Public Transport Initiatives;
- Car Sharing Initiatives;
- Marketing and Promotion of the Travel Plan measures; and
- Smartphone Apps.

As negligible air quality impacts are predicted at all nearby existing sensitive receptors, and the NPPF[14] states that mitigation measures should be proportional to the level of impact, the mitigation measures outlined above are considered sufficient to offset the increase in pollutant emissions associated with the Proposed Development going ahead.

Therefore, the Proposed Development can be considered air quality neutral following the application of relevant mitigation measures.

7. Mitigation.

7.1 Construction Phase.

To mitigate the potential impacts during the construction phase it is recommended that mitigation measures as detailed in the IAQM construction guidance are implemented. These mitigation measures have been carefully selected for the Proposed Development and are based upon the dust risk categories outlined in Table 10 of this report.

It is recommended that RBC approve a Dust Management Plan (DMP) prior to works commencing on site, and that this is implemented using an appropriately worded planning condition. Table 14 below details the measures that should be incorporated in the DMP. For general mitigation measures, which excludes those specifically targeted towards demolition, earthworks, construction and trackout (which are given towards the end of the table), high risk measures have been applied as these represent the highest risk category determined in Table 10. This approach is consistent with the IAQM construction guidance[20].

Table 14: Mitigation Measures

Issue	Mitigation Measure
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
Dust Management Plan	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the Local Authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling check of surfaces such as street furniture, cars, window sills within 100 m of the site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Issue	Mitigation Measure
	Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible, commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences.
Preparing and maintaining the site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicles/machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the Local Authority, where applicable).
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing)
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management	Avoid bonfires and burning of waste materials.
Demolition	Soft strip inside building before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
	Ensure effective water suppression is used during demolition activities. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is

Issue	Mitigation Measure
	needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.
	Bag and remove any biological debris or damp down such material before demolition.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once.
Construction	Avoid scrabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
	For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in continuous use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	Access gates to be located at least 10 m from receptors where possible.

Potential dust effects during the construction phase are considered to be temporary and short term in nature. The impacts are determined to be temporary as they will only potentially occur throughout the construction phase and short-term because these will only arise at particular times when certain activities and meteorological conditions combine to create the predicted level of magnitude.

However, with the application of the above dust control and mitigation measures, it is considered that impacts at all receptors will be 'not significant' in accordance with the IAQM construction guidance[20].

7.1.1 Construction Phase Road Traffic Emissions

Potential air quality impacts associated with construction phase road traffic emissions, principally HDV movements, have been screened out for further assessment with associated impacts on air quality predicted to result in an 'insignificant' effect. Therefore, mitigation measures are not considered to be required.

7.1.2 Construction Phase NRMM Emissions

In accordance with Part 4 of the IAQM construction guidance, all NRMM would need to adhere to the emissions standards for NO_2 and PM_{10} set out for NRMM. It is therefore considered the likely effects of construction plant on local air quality would be insignificant.

7.2 Operational Phase.

7.2.1 Road Traffic Emissions

In line with EPUK and IAQM planning guidance[19], the dispersion modelling of the impacts of additional road traffic associated with the Proposed Development shows there is no significant impact on local air quality where there is relevant exposure and therefore mitigation measures are not required.

7.2.2 Site Suitability Assessment

A review of RBC monitoring data in consideration of the Application Site, and mapped concentrations by Defra in the locale of the Application Site, indicates no likely exceedance of the annual mean AQOs for pollutants NO_2, PM_{10} and $PM_{2.5}$, 1-hour mean AQO for NO_2 or 24-hour mean AQO for PM_{10}.

As no exceedances of any considered AQOs are predicted, this follows the 1st hierarchy principle of the EPUK and IAQM planning guidance[19] to *'prevent and avoid'* exposure'. Therefore, no embedded mitigation into the Proposed Development design is required and natural ventilation is possible from an air quality perspective.

7.3 Rugby Borough Council Air Quality Supplementary Planning Document

7.3.1 Air Quality Neutral

The Rugby Borough Council Air Quality Supplementary Planning Document[21] defines multiple mitigation measures for Proposed Developments exceeding the criteria stated within the document[21].

It has been confirmed by PJA that multiple mitigation measures (Type 1 and Type 2) are intended to be put in place during the operational phase of the Proposed Development, in line with the provided travel plan and Rugby Borough Council Air Quality Supplementary Planning Document[21], to assist with achieving air quality neutral status as shown below:

- Site layout and Design;
- Measures to reduce the need to travel;
- Walking Initiatives;
- Cycling Initiatives;
- Public Transport Initiatives;
- Car Sharing Initiatives;
- Marketing and Promotion of the Travel Plan measures; and
- Smartphone Apps.

8. Summary and Conclusions.

This report details the potential air quality impacts associated with the construction and operation of a proposed residential development at land north of Rounds Gardens, Rugby CV21 2EZ (the 'Application Site').

The findings of the assessment are as follows:

- The baseline assessment has shown that Application Site is located within an AQMA. Local monitoring data within the RBC area of administration from passive diffusion tube monitoring locations within the vicinity of the Application Site in addition to Defra predicted background concentrations has indicated that no exceedances of the respective AQOs for pollutants NO_2, PM_{10} and $PM_{2.5}$ is expected based on available monitoring data from 2015 to 2022;
- A qualitative assessment of the potential dust impacts during the construction of the Proposed Development has been undertaken. Through good practice and implementation of appropriate mitigation measures, it is expected that the release of dust would be effectively controlled and mitigated, with resulting impacts considered to be 'not significant'. All dust impacts are considered to be temporary and short-term in nature;
- The energy strategy for the primary supply to the Proposed Development has been confirmed to be all-electric utilising ASHPs with no life safety diesel generators to be included. However it has been confirmed that multiple plots as part of the Proposed Development will temporarily rely on combustion sources in the initial stages. As no long term combustion sources are proposed for the primary energy supply, no long term local air quality impacts are anticipated and a detailed assessment of impacts of combustion emissions from the energy plant were screened out of this assessment;
- The predicted air quality impacts from vehicle trip generation associated with the Proposed Development on existing sensitive receptors has been assessed using ADMS Roads. The results of the modelling indicate that the impacts on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all nearby existing sensitive receptors will be negligible. In line with EPUK and IAQM planning guidance[19], there are no significant impacts and additional mitigation will not be required;
- A qualitative Site Suitability Assessment has been undertaken to assess the suitability of the Application Site for the proposed residential use, in line with Defra LAQM.TG(22)[8] and based on local monitoring data and Defra predicted background concentrations[22]. From the assessment results, no exceedance of the respective annual mean, 24-hour mean or 1-hour mean AQOs for pollutants NO_2, PM_{10} and $PM_{2.5}$ are anticipated at the Application Site and no further mitigation measures will be required; and
- The Proposed Development can be considered air quality neutral, in line with the Rugby Borough Council Air Quality SPD[21], upon the implementation of all relevant mitigation measures listed in Section 7.3.

Based on the information above, it is considered that air quality should not be viewed as a constraint to planning and the Proposed Development conforms to the principles of the NPPF[14], Rugby Borough Council Local Plan 2011-2031[16] and the Rugby Borough Council Air Quality SPD[21].

9. Glossary of Terms.

AADT	Annual Average Daily Traffic
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQDMP	Air Quality Dust Management Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
ASHP	Air Source Heat Pump
ASR	Annual Status Report
CEMP	Construction Environmental Management Plan
CHP	Combined Heat and Power
Defra	Department for Environment, Food and Rural Affairs
DM	Do Minimum
DMP	Dust Management Plan
DS	Do Something
EA	Environment Agency
EPA	Environment Protection Act
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicles (> 3.5 tonnes gross vehicle weight)
IAQM	Institute of Air Quality Management
IGCB	Interdepartmental Group on Costs and Benefits
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (≤3.5 tonnes gross vehicle weight)
LNR	Local Nature Reserve
µg/m^3	Micrograms per cubic metre
NGR	National Grid Reference
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides (taken to be NO_2 + NO)
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
OS	Ordinance Survey
PM_{10}	Particulate matter with an aerodynamic diameter less than 10 micrometres
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than 2.5 micrometres
PPG	Planning Practice Guidance
RBC	Rugby Borough Council
RMSE	Root Mean Square Error
RWRR	Rugby Western Relief Road
SPD	Supplementary Planning Document
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site

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Appendix 1 - EHO Consultation.

Hello [redacted]

Hoare Lea have been instructed to undertake an Air Quality Assessment to support the planning application for the construction and operation of the proposed residential development at land north of Rounds Gardens, Rugby CV21 2EZ.

I have set out our proposed assessment approach below and would invite any comments or local air quality considerations you may have. The site is located at the below location (red outline):

The proposals comprise the demolition of the existing pavilion and all other remaining structures and enclosures; and the erection of new dwellinghouses, accesses, landscaping, car parking and associated works.

Hoare Lea propose to undertake the assessment using the following methodology:

- A baseline assessment of air quality will be undertaken using Rugby Borough Council (RBC) data, taken from the most recently available Annual Status Report/s.
- Monitoring data for 2020 and 2021 will not be included as part of our assessment, owing to the effects of the COVID-19 pandemic. Monitoring data from 2015-2019 and 2022 will be used to establish the baseline.
- A review of the Rugby Borough Council Local Plan 2011-2031 will be carried out.
- A review of relevant supplementary planning guidance including the Rugby Borough Council Air Quality Supplementary Planning Document.
- DEFRA's background pollution maps will be used to establish background concentrations in the area.
- An assessment of the construction impacts on air quality and dust using the IAQM methodology, in compliance with 'The Control of Dust and Emissions During Construction and Demolition'.
- Any construction or operational phase mitigation will be recommended as necessary in line with IAQM guidance.
- The energy strategy for the primary supply to the Proposed Development is to be all-electric utilising Air Source Heat Pumps (ASHPs), a zero emission technology. However it has also been confirmed that multiple

plots as part of the proposals will be served by combustion sources in the short term. No life safety diesel generators are included as part of the proposals. As no long term combustion sources are proposed for the primary energy supply, no long term local air quality impacts are anticipated and a detailed assessment of impacts of combustion emissions from the energy plant has been screened out of this assessment.

- Initial road traffic data associated with the Proposed Development has been provided by PJA, the appointed Transport Consultants for the project. It is expected that the annual average daily traffic (AADT) increase associated with the Proposed Development will be above the EPUK and IAQM criteria, indicating potential for air quality impacts and therefore a detailed assessment will be required to assess the impacts of additional road traffic on existing sensitive receptors. As such, the impacts of road traffic emissions associated with the operation of the Proposed Development on sensitive existing receptors will be modelled using ADMS-Roads.
- Concentrations of NO_2, PM_{10} and $PM_{2.5}$ will be predicted at existing receptors in the vicinity of the Application Site.
- We are proposing to verify the dispersion model using data from existing monitoring locations in Rugby. The following passive diffusion tube monitoring locations have been identified as potential sites to be used for verification purposes using 2022 data, if possible:
    - S20
    - S11
    - S26
- The source of the emission factors used will be EFT V12.0.
- We are proposing to use 2022 meteorological data from the Church Lawford meteorological station.
- An assessment of Site Suitability will be undertaken qualitatively with a desk-based review of the existing baseline air quality undertaken to inform the exposure of future users of the development. Local air quality monitoring and DEFRA's background pollution maps will be used to understand concentrations at the Application Site.

I would also be grateful if you could please confirm your acceptance of the proposed methodology and provide me with any comments you may have. However, if you would like to discuss further, please do not hesitate to contact me on the number below.

Please let me know if there are any additional guidance documents that aren't publicly available that you would like us to consider.

In the meantime, if you have any questions, do not hesitate to contact me.

Kind regards,

Bhajan Chatha
Air Quality Consultant

Appendix 2 – Model Input Parameters

Model Input Parameters.

Table 15: Model Input Parameters Summary.

Parameter	Description	Input Variable
Surface Roughness	Surface roughness of the modelling domain as a function of land use	A roughness length z_0 of 0.5 m was used within the assessment area of this dispersion modelling study. This value is for 'Parkland, open suburbia' and therefore considered appropriate for the surface roughness of the dispersion modelling assessment area.
Road Source Emissions	Source of the emission factors used	EFT v.12.0
Emission Year	Modelling year used to factor the traffic emissions	2022 for the verification year and future years.
NO_X to NO_2 Conversion	Conversion from NO_X concentrations to NO_2 concentrations	NO_X to NO_2 calculator v8.1. General inputs – 2022, for verification and all future years, Rugby Borough Council, All other urban traffic.
Elevation of Road	Height of the road link above ground level	0 m
Road Type	Road type within the EFT emission database	Urban (Not London). Urban has been used as it is considered most representative of the nearest existing sensitive receptors.
Road Width	Width of the road link	Road width obtained from Google Street View.
Road Speed	Road speed in km/h	Road Links speeds provided by PJA and SLR Consulting, the two appointed project transport consultants with the inclusion of speed reductions in line with LAQM.TG(22)[8].
Meteorology	Representative hourly sequential meteorological data	Church Lawford 2022, Data capture – 100%.
Background	Background pollutant concentration considered during the modelling	Defra 2018 background maps 1 km x 1 km grid squares for the verification year (2022) at each existing receptor for NO_2, PM_{10} and $PM_{2.5}$ concentrations.
Output	Output as gridded or specified points	At specified points as detailed in Table 2 in Appendix 2.
Pollutant Output	Pollutants modelled and averaging time	NO_2, PM_{10} and $PM_{2.5}$ annual mean concentrations.

Traffic Data.

Annual Average Daily Traffic (AADT) flows and % HDV for each road link was provided by PJA and SLR Consulting, the two appointed project transport consultants for the Proposed Development, with speeds at junctions and roundabouts reduced in line with LAQM.TG(22)[8]. The traffic data used in this air quality assessment are shown in Table 16 and Table 17. Figure 6 illustrates the geometry of these roads.

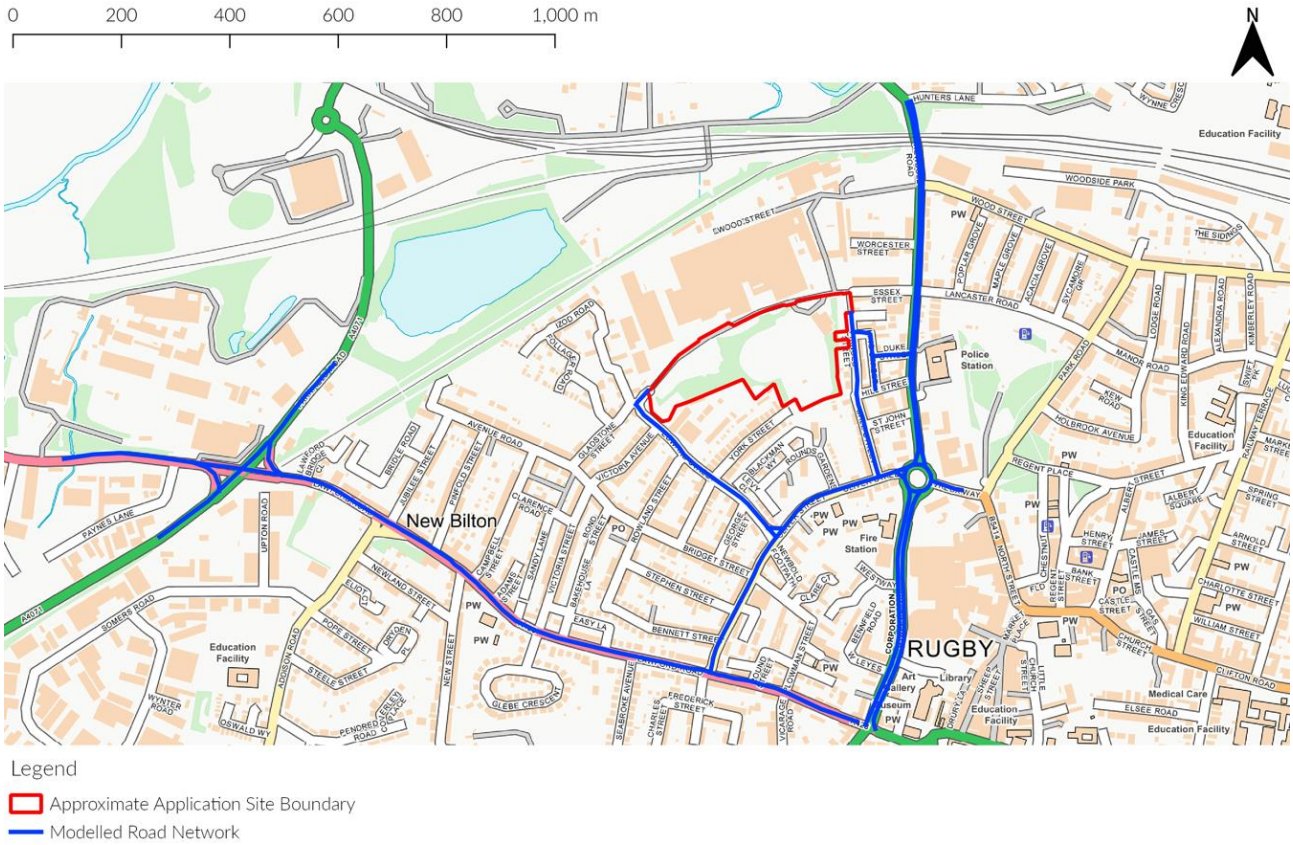

Figure 6: Modelled Road Network. Contains Ordinance Survey Data © Crown Copyright and Database Rights 2023.

The tables below illustrate the roads that have been included in both the verification and future year assessments.

Table 16: Summary of Traffic Data used in the DM and DS models.

Road Link	Road Name	2022 Baseline Scenario (AADT)		Speed (kph)
		LDV	HDV	
1	Dale St	148	0	15
2	Princes St	79	0	13
3	King Street	79	0	14
4	Duke St	476	0	11
5	Oliver St	10753	535	28
6	Edward St	746	24	22
7	Corporation St	21995	676	24
8	Lawford Rd	7483	196	16
9	Newbold Rd	21286	620	28
10	A4071	17294	691	36

Table 17: Summary of Traffic Data used in the Assessment.

Road Link	Road Name	2031 Do Minimum Scenario (AADT)		2031 Do Something Scenario (AADT)		Speed (kph)
		LDV	HDV	LDV	HDV	
1	Dale St	135	12	111	6	12
2	Princes St	130	2	673	0	15
3	King Street	130	2	295	0	12
4	Duke St	489	14	586	20	10
5	Oliver St	9184	418	9962	402	30
6	Edward St	874	18	1142	23	22
7	Corporation St	25336	822	25796	778	22
8	Lawford Rd	8735	206	9322	241	22
9	Newbold Rd	29911	1157	30667	1183	29
10	A4071	17324	931	18145	958	35

Emissions.

Emissions were calculated using the most recent version of the Emissions Factor Toolkit (EFT) v.12.0 to calculate a combined emission rate for each of the road links in the modelled network. Emissions are expected to reduce in the future but there are inherent uncertainties when predicting future emissions further into the future and consequently 2022 emissions have been utilised for this assessment to represent a worst-case scenario.

Meteorological Data.

The model has been run using the full year of meteorological data corresponding to the most recent set of representative NO_2 monitoring data (2022) that has not been affected by the COVID-19 pandemic. The meteorological data has been taken from the meteorological station located at Church Lawford.

Background Concentrations.

NO_2, PM_{10} and $PM_{2.5}$ concentrations were taken from Defra predicted background concentrations[22] for the appropriate 1 km by 1 km grid squares have been used for all model results processing.

Defra predicted background concentrations[22] for NO_2, PM_{10} and $PM_{2.5}$ used for all existing sensitive receptors are provided in Table 18 below.

Table 18: Defra Predicted Background Concentrations used in Verification.

Grid Square	Year	Receptors	Defra Predicted Background Concentration (µg/m^3)		
			NO_2	PM_{10}	$PM_{2.5}$
449500 275500	2022	R1, R2, R3, R12, R13, R14, R15, R16, R17, R18	11.2	14.2	9.1
450500 275500	2022	R4, R5, R6, R7, R8, R9, R10, R11, R19, R20	15.6	16.9	10.2

Verification.

The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations. The verification process has been undertaken in line with

LAQM.TG(22)[8] and helps to identify differences between modelled and measured concentrations, which can arise for a number of reasons including uncertainties associated with traffic data, background pollutant concentrations, meteorological data, emission rates, and model input parameters, such as roughness length. The verification methodology is described in subsequent sections.

Monitoring Data.

Two passive diffusion tube monitoring locations (Site ID: S11 and S26) from RBC's administrative area have been used to verify the model due to each of these monitoring locations based classed as roadside and adjacent to roads intended to be used by operational phase road traffic as a result of the Proposed Development. Site ID: S8 and S15 have been discounted based on their kerbside classification. Site ID: 27 was also discounted based on its locations on a back road where the likelihood of obtaining a usable traffic count was not feasible and therefore was not suitable for verification.

The locations of the monitoring sites have been taken from the RBC ASR 2023[17] and monitoring data for the year 2022, the most recent year of available data, has been used for all monitoring sites.

NO_2.

Most NO_2 is produced in the atmosphere by reaction of nitric oxide (NO_X) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_X = NO + NO_2).

The model output of road-NO_X has been compared with the 'measured' road-NO_X, calculated from the measured annual mean NO_2 concentrations and the background concentrations using the NO_X from NO_2 calculator v8.1 published by Defra.

The slope of the best-fit line between the 'measured' road-NO_X contribution and the model derived road-NO_X contribution, forced through zero, has been used to determine a primary adjustment factor. This factor has then been applied to the modelled road-NO_X concentration for each existing receptor to provide adjusted modelled road-NO_X concentrations. The NO_X to NO_2 calculator has then been used to determine total NO_2 concentrations from the adjusted modelled road-NO_X concentrations and the background NO_2 concentrations.

The following adjustment factor has been applied to all modelled nitrogen dioxide data:

Primary verification factor: 1.11

The results imply that the model has under-predicted the road-NO_X contribution. This is a common experience with this and most other models.

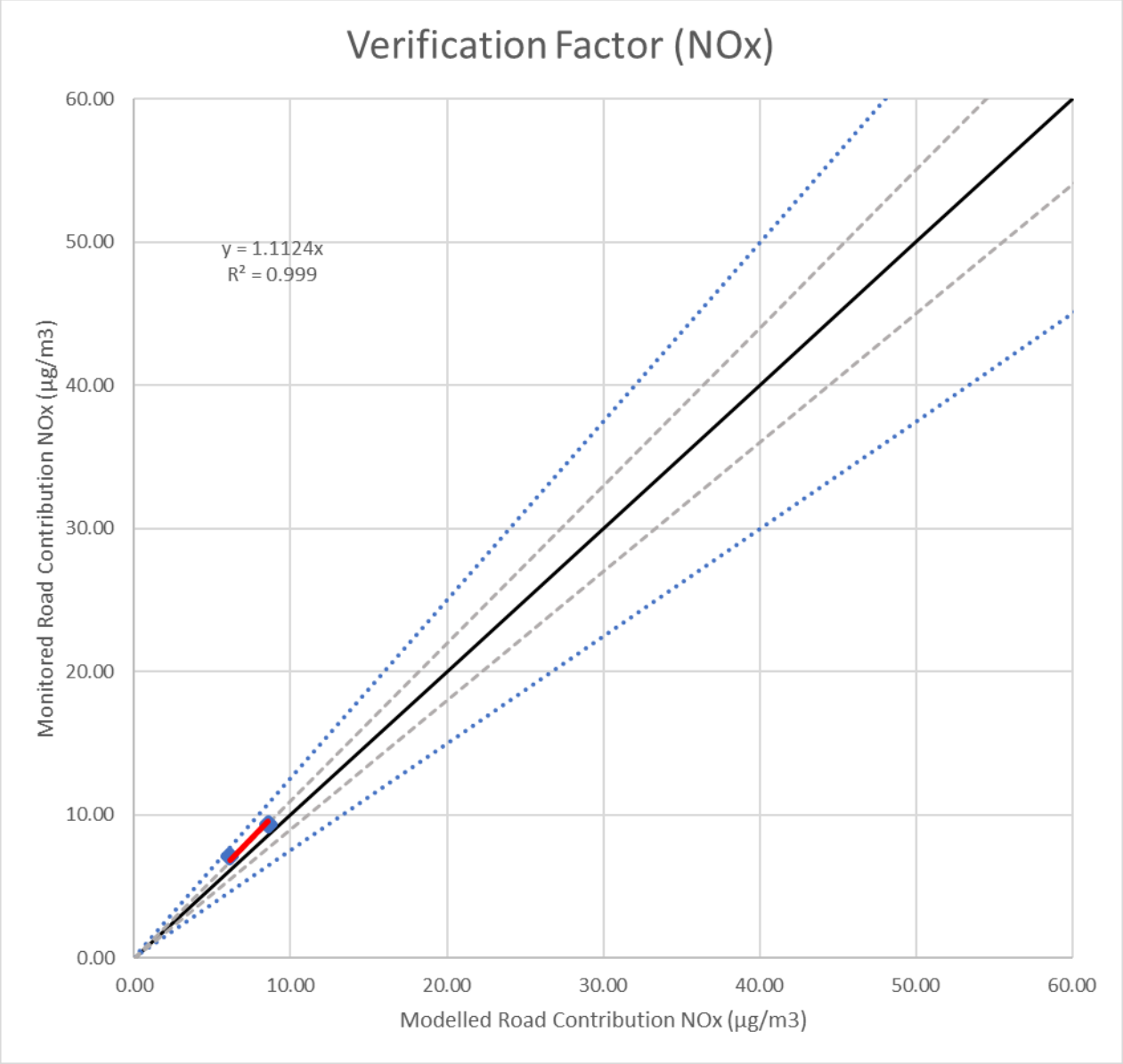

Figure 7 Comparison of Measured Road NO_X to Unadjusted Modelled Road NO_X Concentrations.

Table 19 provides the inputs for the comparison of the adjusted modelled NO_2 and monitored NO_2, which are used to calculate the adjustment factor.

Table 19 Comparison of Modelled and Monitored NO_2 Concentrations.

Monitoring Location	Monitored Total NO_2 Concentration ($\mu g/m^3$)	Monitored NO_X Road Contribution ($\mu g/m^3$)	Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
S11	16.30	9.31	8.56	9.53	14.27	-12.46
S26	14.60	7.12	6.13	6.82	12.88	-11.77

Monitoring Location	Monitored Total NO_2 Concentration ($\mu g/m^3$)	Monitored NO_X Road Contribution ($\mu g/m^3$)	Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
Adjustment Factor				1.11		

Site ID: S20 has been discounted from the verification process due to the adjusted modelled total NO_2 concentration overpredicting by 12.76%. The inclusion of Site ID: S20 within the verification results in a underprediction in NO_x concentrations. between the monitored NO_x Road contribution and modelled Road NO_x contribution within the 2022 baseline modelling scenario (i.e. an underprediction at nearby receptors within the DM 2031 and DS 2031 scenarios) and accordingly was removed from the verification process.

Table 20 provides the inputs for the comparison for Site ID: S20 for information purposes only.

Table 20: Comparison of Modelled and Monitored NO_2 Concentrations for Site ID: S20.

Monitoring Location	Monitored Total NO_2 Concentration ($\mu g/m^3$)	Monitored NO_X Road Contribution ($\mu g/m^3$)	Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled NO_X Road Contribution ($\mu g/m^3$)	Adjusted Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
S20	17.60	3.66	12.26	13.63	19.85	12.76

Statistical Analysis of Model Performance.

LAQM.TG(22)[8] recommends three statistical procedures that should be applied to evaluate model performance and assess the overall uncertainty. These are:

- Root mean square error (RMSE) defines the average error or uncertainty of the model. Ideally a RMSE within 10% of the air quality objective which is being assessed would be derived (for the annual mean NO_2 objective the ideal RMSE would be < 4 $\mu g/m^3$). Where the RMSE is greater than 25% of the objective being assessed (i.e. 10 $\mu g/m^3$ for the annual mean NO_2 AQO) it is advised to revisit the model parameters and verification;
- Fractional bias identifies whether the model has a tendency to under-predict (positive value) or over-predict (negative value). The ideal value is zero but may range from +2 to -2; and
- Correlation coefficient provides a measure of the linear relationship between modelled and measured data. Values range between zero (no relationship) and 1 (perfect relationship).

The values for each of these methods are provided in Table 21.

Table 21: Statistical Analysis of Model Verification.

Method	Value	Acceptable for Verification Methodology
RMSE	1.88	Yes
Fractional Bias	0.13	Yes
Correlation Coefficient	1.00	Yes

PM_{10} and $PM_{2.5}$.

There are no PM_{10} or $PM_{2.5}$ monitors within the study area; therefore, the model outputs of road-PM have been adjusted by applying the primary adjustment factor calculated for road NO_X in line with LAQM.TG(22)[8].

Appendix 3 - Professional Experience.

Christelle Escoffier (Hoare Lea) MsEng. Msc. PhD MIES MIAQM

Christelle Escoffier is a Senior Associate and Technical Lead for Air Quality Group with Hoare Lea. She is a Full Member of the Institution of Environmental Sciences and the Institute of Air Quality Management. She graduated with a Master's in Science Diploma from Paris VI University, France and holds a Doctor of Philosophy degree in Physical Oceanography, Meteorology and Environment, from the same University.

In her twenty-two years of professional experience, she has managed and delivered air quality services for a wide range of industries in the United Kingdom (UK), the United States of America (USA) and the Middle East. Her portfolio of experience comprehends projects for diverse sectors from road transport, planning and development, wastewater and waste, oil and gas to power (energy centres, landfill gas plant, power reserve facilities, gas-fired and oil-fired combustion turbine stations). Christelle has in-depth knowledge of atmospheric dispersion models. She has delivered dispersion modelling training courses to government agencies, academic, industrial and commercial professionals worldwide since 2005.

Oliver Parsons (Hoare Lea), BSc (Hons), MSc, AMIEnvSc, AMIAQM

Oliver is a Senior Air Quality Consultant with Hoare Lea. He is an Associate Member of the Institution of Environmental Sciences and an Associate Member of the Institute of Air Quality Management. He has worked on projects across multiple sectors including residential, commercial and industrial sectors.

He has completed two EIA within the past year at Hoare Lea, SSEN (film studio) and SBQ (mixed use residential). He has experience across different aspects of the air quality assessment processes including monitoring, detailed dispersion modelling of roads, standalone air quality assessments and environmental impact assessments.

Rachael Harrison (Hoare Lea) BSc(Hons) AMIEnvSc, AMIAQM

Rachael is a Senior Air Quality Consultant with Hoare Lea. She is an Associate Member of both the Institution of Environmental Sciences and Institute of Air Quality Management. Rachael has experience in managing Air Quality and Odour Assessments for a wide range of UK and international clients covering sectors including; residential, commercial, energy and industrial operations. With experience in quantitative and qualitative atmospheric assessments, complex dispersion modelling, air pollutant monitoring surveys for rail, road transport and energy projects. Rachael's interest's lie in the health implications attributed to poor air quality.

Bhajan Chatha (Hoare Lea), MEng (Hons), AMIEnvSc, AMIAQM

Bhajan is an Air Quality Consultant with Hoare Lea. He is a MEng Chemical Engineering Graduate from the University of Aberdeen. During his MEng, Bhajan developed his understanding of air pollution, environmental impacts and toxicology throughout multiple modules. He also studied air pollutants, air pollution control equipment, air pollution monitoring and dispersion modelling during his degree. Within air quality, Bhajan's interests lie in air pollution control equipment and human health impacts.

Bhajan has worked on projects across multiple sectors including residential, commercial and industrial sectors. He has experience preparing air quality screening reports, environmental impact assessments, and indoor air quality plans.

HOARE LEA

CHRISTELLE ESCOFFIER
SENIOR ASSOCIATE

+44 2085 859587
christelleescoffier@hoarelea.com

HOARELEA.COM

Western Transit Shed
12-13 Stable Street
London
N1C 4AB
England