



Queens Wharf, 47 Queens Road, Reading, RG1
4QE

Air Quality Assessment

On Behalf of Metrix Developments Ltd
December 2023

Document Control Sheet

Project Name: Queens Wharf, 47 Queens Road, Reading, RG1 4QE

Project Ref: 0208

Report Title: Air Quality Assessment

Client	Metrix Developments Ltd
Principal Contact	Steve Saunders
Job Number	0208
Item	Air Quality Assessment
File Location	0208\Report\0208A(AQ)v0.docx

Quality Management

Prepared by	Harley Parfitt	Air Quality Consultant	19/12/2023
Checked by	Harley Parfitt	Air Quality Consultant	19/12/2023
Revision Number	V1		

Revision History	Date of Issue	Reason for revision
V0	03/11/2023	Draft for client comment
V1	19/12/2023	Draft watermark removed (no other changes)

Disclaimer

Greenavon Ltd has used reasonable skill and care in carrying out this assessment, within the terms of the agreed scope of work. The report has been prepared for the sole use of the client and Greenavon Ltd accepts no responsibility for any use of this document by any third party. Greenavon Ltd accepts no responsibility for incorrect or inaccurate data provided by other parties, which are used in this assessment. Unless otherwise agreed, this document and all other intellectual property remains the property of Greenavon Ltd.

Table of Contents

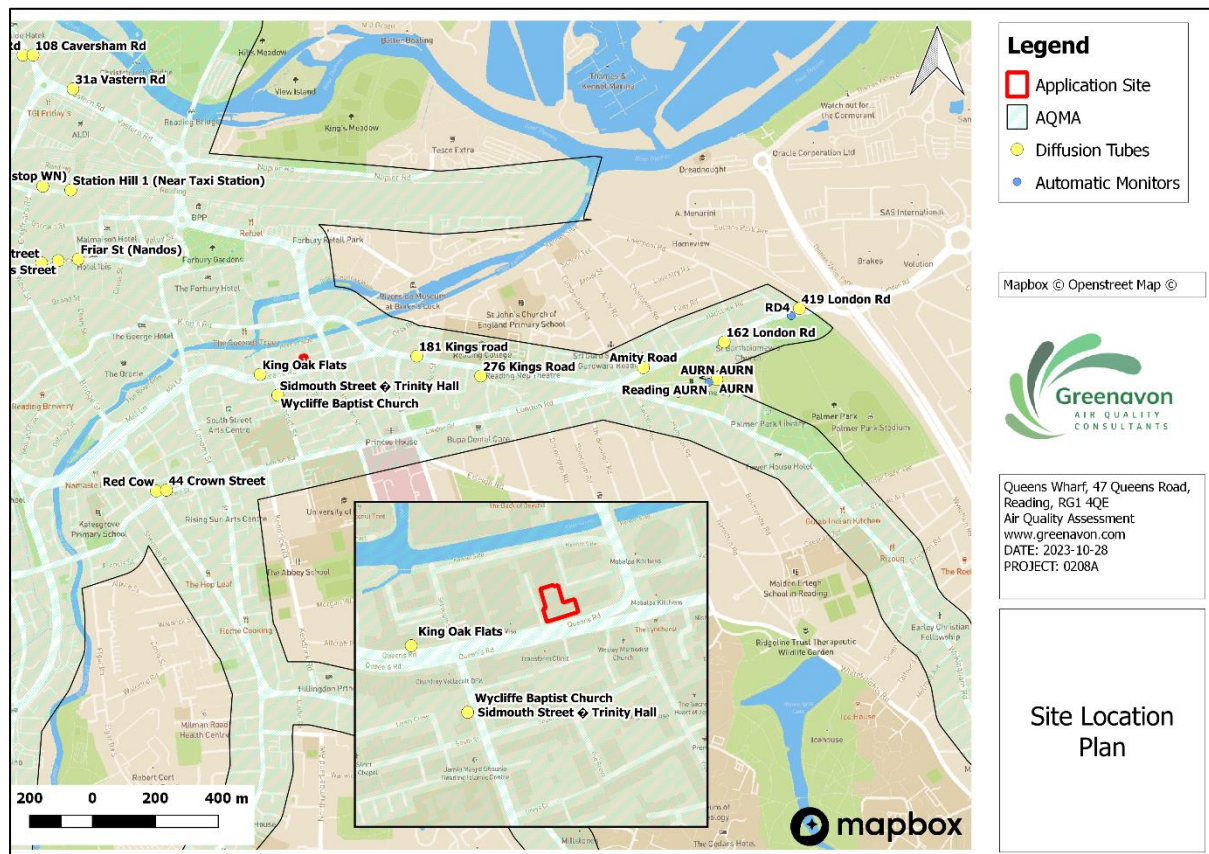
1	Introduction	3
2	Policy Context	4
	Air Quality Standards Regulations and Air Quality Strategy	4
	National Planning Policy Framework	5
	Planning Practice Guidance	6
	Local Planning Policy	7
	Air Quality Guidance.....	7
3	Methodology	9
	Consultation	9
	Baseline Conditions.....	9
	Construction	9
	Construction Phase Dust Risk Assessment	9
	Construction Traffic and Non-Road-Mobile Machinery.....	10
	Operational Phase Assessment.....	11
	Screening Assessment	11
	Roads Impact Assessment.....	11
	Meteorological Inputs and Surface Characteristics.....	11
	Traffic Data and Emissions	12
	Background Concentrations.....	12
	Advanced Input Parameters.....	13
	Receptors	13
	Post-processing and NO _x to NO ₂ conversion	14
	Model Verification	14
	Judgement of Significance	15
	Ecological Receptors.....	15
4	Baseline Conditions	17
	Local Air Quality Management.....	17
	Industrial Sources.....	17
	DEFRA / UK-AIR	17
	Local Authority Monitoring	17
5	Construction Phase Assessment	20
	Dust Risk Assessment.....	20
	Dust Magnitude (Step 2A).....	20
	Sensitivity of the Area (Step 2B)	21

Risk (Step2C)	23
Site Specific Mitigation	23
Residual Effects	25
6 Operational Phase Assessment	26
Impact Assessment	26
ADMS Roads Assessment: Exposure	26
Mitigation	27
7 Discussion	28
8 Conclusion	29
Table 2.1: Air Quality Standards for England	4
Table 2.2: Modelled Receptors	13
Table 3.2: APEC Criteria	15
Table 4.1: UK-AIR predicted background concentrations for the application site	17
Table 4.2: Annual Mean Concentrations of NO ₂ , PM ₁₀ and PM _{2.5}	18
Table 5.1: Dust Emission Magnitude Examples and Project Specific Judgement	20
Table 5.2: Approximate Number of Highly Sensitive Receptors in proximity to the application site	22
Table 5.3: Sensitivity of the Area to Dust	23
Table 5.4: Summary of Dust Impact Risk by Construction Stage based on the IAQM's dust guidance	23
Table 5.5: Highly Recommended and Desirable Mitigation Measures for Sites with a Low Risk of Dust Impacts	23
Table 6.1: Predicted Annual Mean Concentrations of NO ₂ , PM ₁₀ and PM _{2.5}	26
Figure 1:1: Site Location Plan	3
Figure 2:1: Modelled Roads and Receptors	14
Figure 5:1: Wind-Rose for Farnborough Airport (2022)	22
Figure 6:1 Annual Mean NO ₂ Concentrations (2025)	27
Figure A:1: Road Link Schematic	31

1 Introduction

- 1.1 Greenavon Ltd was commissioned by Metrix Developments Ltd to undertake an Air Quality Assessment for a proposed residential development at Queens Wharf, 47 Queens Road, Reading, RG1 4QE. The application site is located within the administrative boundary of Reading Borough Council (RBC). A Site Location Plan is included in Figure 1.1, below.
- 1.2 The proposal is for the change of use and refurbishment of the ground floor of the existing building to create eight residential apartments. There is currently residential use on all upper floors.
- 1.3 Land use surrounding the site is mixed with both commercial uses and residential uses found in proximity.
- 1.4 The application site is located within the RBC town centre Air Quality Management Area (AQMA). The AQMA was declared due to elevated concentrations of nitrogen dioxide (NO₂).
- 1.5 The main source of local air pollution in the vicinity of the application site are vehicles travelling on the local road network, particularly the A329 Queen's Road.
- 1.6 This report assesses the proposed development's impact on, and sensitivity to, local air quality during the construction and operational phases, recommending mitigation where necessary.

Figure 1.1: Site Location Plan



2 Policy Context

Air Quality Standards Regulations and Air Quality Strategy

- 2.1 The Air Quality Standards Regulations 2010¹ and subsequent amendments, regulate the concentrations of major pollutants in outdoor air in the UK, including particulate matter (PM₁₀ & PM_{2.5}), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), carbon monoxide (CO) and lead (Pb). These regulations seek to minimise the public's exposure to air pollution by requiring ambient concentrations to be within legally binding limit values, as well as target values.
- 2.2 The air quality standards (AQS) of relevance to this assessment are summarised in Table 2.1 below.

Table 2.1: Air Quality Standards for England

Pollutant	Averaging Period	Objective (µg.m ⁻³)	Date to be achieved by
Nitrogen dioxide (NO₂)	1-hour mean not to be exceeded more than 18 times per year.	200	1 January 2005
	Annual Mean	40	1 January 2005
Particulate Matter (PM₁₀)	24-Hour Mean not to be exceeded more than 35 times per year	50	1 January 2005
	Annual Mean	40	1 January 2005
Particulate Matter (PM_{2.5})	Annual Mean	20	1 January 2020

- 2.3 The Environment Act 1995 requires the Government and devolved administrations to produce a National Air Quality Strategy for the UK. The last major update to the National Air Quality Strategy (NAQS) was published in 2007², with minor updates occurring in 2011 and in 2023. Under the Environment Act 2021³, the Secretary of State must review the NAQS every five years. The most recent review in April 2023, included a PM_{2.5} annual mean target of 10 µg.m⁻³, to be achieved by 2040.
- 2.4 Part IV of the Environment Act 1995 and Part II of the Environment (Northern Ireland) Order 2002 sets out that it is the responsibility of every local authority to review the air quality within its area and designate AQMAs where air quality limit values are not being achieved. An Air Quality Action Plan (AQAP) setting out the measures to reduce pollution in that area must then be put in place.
- 2.5 RBC have adopted an AQAP⁴ which contains measures to improve air quality across the Borough. The AQAP states that RBC may seek Section 106 planning obligations from development to secure site specific and off-site mitigation.

¹ Air Quality Standards Regulations 2010 (as amended) S.I 2008/30.

² Defra (2007) The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland.

³ Environment Act 2021 SI No. 1274 (C. 72).

⁴ RBC (2016) Air Quality Action Plan Update

National Planning Policy Framework

- 2.6 The revised National Planning Policy Framework (NPPF)⁵, updated in September 2023, sets out the Government's planning policies for England and how these are expected to be applied. A key aim of the NPPF is to promote sustainable development and regarding conserving the natural environment, paragraph 174 states:

“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”.*

- 2.7 Paragraph 186 relates to compliance with legal limit values and how planning decisions should be consistent with local air quality policy and action plans. It states:

“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”.

- 2.8 Paragraph 185 relates to the appropriate siting of development and the assessment of cumulative effects, it states:

“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.”

- 2.9 Whilst principally relating to sustainable transport, Paragraph 105 is indirectly related to air quality and states:

“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

⁵ Ministry of Housing, Communities & Local Government (2023) National Planning Policy Framework

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.

Planning Practice Guidance

2.10 Planning Practice Guidance (PPG)⁶ provides advice on how the planning process can take account of the impact of new development on air quality. It sets out what should be included in an air quality assessment and provides detail of when air quality is likely to be relevant to a planning decision:

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

When deciding the relevance of air quality, the PPG suggests this as important.

- *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*
- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*

⁶ Department for Communities and Local Government (2019) Planning Practice Guidance Air Quality

- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value”.*

Local Planning Policy

- 2.11 The Reading Borough Local Plan⁷ was adopted on 4th November 2019. This document sets out the planning policies for development in Reading, up to 2036, and is the principal document used when deciding planning applications.
- 2.12 The Local Plan contains policy of relevance to air quality, including *Policy EN15:Air Quality*, which states:

“Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

i. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:

- *Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would worsen air quality;*
- *Whether the development is within, or accessed via, an Air Quality Management Area; and*
- *Whether it can be demonstrated that a local worsening in air quality that would not detrimentally affect human health or the environment would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.*

ii. Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused.

iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring.”

Air Quality Guidance

- 2.13 This assessment has been undertaken with reference to the following national and local guidance:
- Defra, Local Air Quality Management Technical Guidance (LAQM.TG (22)) (2022)⁸;

⁷ RBC (2019) Reading Borough Local Plan. Available at: <https://www.reading.gov.uk/planning-and-building-control/planning-policy/new-local-plan/>

⁸ Defra. 2022. Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management, Technical Guidance LAQM. TG(22).

- Institute of Air Quality Management (IAQM) and Environmental Protection UK, *Land-Use Planning and Development Control: Planning for Air Quality* (2017)⁹;
- IAQM, A guide to the assessment of air quality impacts on designated nature conservation sites¹⁰; and
- IAQM, Guidance on the assessment of dust from demolition and construction (2023)¹¹

⁹ EPUK & IAQM. (2017). Land-Use Planning & Development Control: Planning for Air Quality.

¹⁰ EPUK & IAQM. (2020). A guide to the assessment of air quality impacts on designated nature conservation sites.

¹¹ IAQM. (2023). Guidance on the assessment of dust from demolition and construction.

3 Methodology

Consultation

- 3.1 The proposed scope of assessment was discussed with RBC's Senior Environmental Health Officer, by email, in October 2023. It was agreed that dispersion modelling would be required due to the site's proximity to a major road junction.

Baseline Conditions

- 3.2 The purpose of the baseline assessment is to gather information on existing air quality in the vicinity of the site to better understand how air quality might constrain, or be impacted by, a proposal.
- 3.3 A review of baseline conditions has been undertaken using data provided by Defra's UK AIR information resource¹², review and assessment reports provided by RBC¹³ and other sources. Defra's Pollutant Release and Transfer Register¹⁴ was also reviewed to identify any major industrial or waste management sources in the vicinity.

Construction

- 3.4 The construction phase of the proposed development will result in emissions of dust, fine particulates and other pollutants associated with construction traffic and non-road mobile machinery (NRMM).

Construction Phase Dust Risk Assessment

- 3.5 There are many activities on a construction site that can generate dust emissions including demolition, cutting, the storage of friable materials, piling, concrete batching, crushing, and screening of wastes, loading and tipping and dry sweeping, amongst others.
- 3.6 IAQM guidance recommends that an assessment of construction dust risk would likely be required where there is:

"a 'human receptor' within:

250 m of the boundary of the site; or 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).

an 'ecological receptor' within:

50 m of the boundary of the site; or 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s)."

¹² Defra (2020) Background Mapping data for local authorities – 2018 [Accessed online: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>]

¹³ RBC (2023) 2022 Air Quality Annual Status Report

¹⁴ Defra. UK Pollutant Release and Transfer Register (PRTR) data sets. [Accessed online: <https://prtr.defra.gov.uk/pollutant-releases>]

- 3.7 As the proposed development is in proximity to commercial and residential uses, a construction dust risk assessment has been undertaken.
- 3.8 A review of the Multi Agency Geographic Information for the Countryside (MAGIC) website¹⁵ could not identify any statutory ecological receptors near the site. As such, the potential for significant impacts on ecological receptors can be screened out based on distance alone.
- 3.9 A construction dust risk assessment involves several steps, which are summarised below:
- **Step 1 (Screening):** distance-based criteria are used to screen the requirement for a detailed dust risk assessment. If sensitive receptors are located within the screening distance, a full risk assessment including steps 2-4 should be undertaken.
 - **Step 2:** The dust risk of each phase of the construction works (demolition, earthworks, construction and trackout) is assessed.
 - **Step 2A (Dust Emission Magnitude):** the potential dust emission magnitude for each phase is defined as either 'Small', 'Medium' or 'Large', taking account of the scale and nature of the works.
 - **Step 2B (Sensitivity of Area):** the sensitivity of the area to dust impacts is identified as either 'Low', 'Medium' or 'High', for each construction phase.
 - **Step 2C (Assignment of Risk):** The phase specific magnitude is combined with the phase specific sensitivity to provide a phase specific risk profile (Low Risk, Medium Risk or High Risk) for dust soiling, human health effects and ecological impacts.
 - **Step 3 (Mitigation):** Site specific mitigation for each of the four construction phases is then identified, based on the outputs of Step 2.
 - **Step 4 (Judgement of Significance):** Professional judgment is then used to examine whether any significant residual risk/ effects are likely.
- 3.10 The above steps are designed to provide a framework for the assessment of construction risk; however, best practice IAQM guidance explicitly states that "professional judgement" should be used when assessing dust risk as the guidance cannot cover the full range of projects likely to be subject to dust assessment.
- 3.11 IAQM guidance, however, cautions that all judgements must be fully auditable and where justification cannot be given, a precautionary approach should be taken where the highest level of mitigation is recommended.

Construction Traffic and Non-Road-Mobile Machinery

- 3.12 LAQM.TG (22) outlines that impacts associated with exhaust emissions from on-site plant (NRMM) are unlikely to have a significant impact on air quality in most cases, where there are suitable controls and site management. Furthermore, because of the

¹⁵ Natural England and MAGIC partnership organisations. Multi Agency Geographic Information for the Countryside. <http://www.magic.gov.uk/>

scale of the works, the quantity of emissions would unlikely result in significant peaks in air pollution. As such, the assessment of NRMM and construction traffic has been scoped out of the assessment.

Operational Phase Assessment

Screening Assessment

- 3.13 Minor development, on their own, are highly unlikely to cause significant increases in local air pollution concentrations. Environmental Protection UK (EPUK) & IAQM guidance, therefore, advocates a two-stage screening approach. EPUK & IAQM guidance states that the impact of a proposal on air quality cannot be screened out, based on size alone, if there are:
- 10 or more residential units or a site area of more than 0.5ha; or
 - 1,000 m² of floor space for all other uses or a site area greater than 1ha.
- 3.14 Coupled with any of the following:
- the development has more than 10 parking spaces;
 - the development will have a centralised energy facility; or
 - other centralised combustion process.
- 3.15 At the second screening stage, EPUK & IAQM guidance provides indicative criteria which can be used to screen out the potential for significant impacts caused by a proposed development.

Roads Impact Assessment

- 3.16 ADMS-Roads (Version.5.0.1.3) is a commercially available dispersion model, developed by CERC, that is routinely used for local air quality management by both the private and public sectors, across the UK. ADMS-Roads can provide predictions of pollutant concentrations, at key receptor locations or across a wider area, by using traffic flows and associated emission factors, in combination with meteorological data and approximations of the surface characteristics.
- 3.17 ADMS-Roads was used to assess the proposed development's sensitivity to local air quality, focusing on the pollutants of NO₂, PM₁₀ and PM_{2.5}.

Meteorological Inputs and Surface Characteristics

- 3.18 Hourly sequential meteorological data, for 2022, from Farnborough Airport meteorological station was used in the assessment. The meteorological station is considered a suitable source of weather data as it is close to the study area and the terrain is not significantly different to the model domain. Furthermore, the verification study shows that the model performs well with this input, demonstrating its suitability for making predictions in Reading.
- 3.19 Data capture for wind speed and wind direction was sufficient (>95%) for the assessment.
- 3.20 The surface roughness of the model domain was assigned a value of 0.75m, which is between the proposed lengths for "Cities" and "Open Suburbia". The roughness of the

meteorological site was chosen to be 0.1m, reflective of a location outside of the urban built-up area.

- 3.21 Cities tend to have higher levels of atmospheric mixing resulting from the presence of buildings and the urban heat island effect and the atmosphere is, therefore, more unstable. The stability of the atmosphere in ADMS-Roads was represented by the Monin-Obukhov parameter, and a figure of 30m was chosen to reflect the urban nature of the model domain.

Traffic Data and Emissions

- 3.22 24-hour average annual daily traffic (AADT) for use in the assessment were taken from the Department for Transport (DFT) Road Traffic Statistics website¹⁶. TEMPro growth factors were used to factor the baseline data from 2022 to the proposed development's opening year (2025), accounting for additional traffic associated with other committed development in the local area. A TEMPro growth factor (2022-2025) was supplied by Lime Transport Ltd, the Transport Consultants for the project.
- 3.23 The traffic data used in this assessment is replicated in Appendix A. Modelled speeds were based on the road's speed limit and were reduced by 10 km/h at junctions, in accordance with the method outlined in LAQM.TG (22).
- 3.24 The following transport scenarios were modelled:
- Model Verification (2022)
 - Baseline (2022)
 - With Development (2025)
- 3.25 Emission factors for NO_x, PM₁₀ and PM_{2.5} were derived from Defra's Emission Factor Toolkit (EFT V.11)¹⁷. The EFT predicts that emissions from road transport will reduce in the future, due to the replacement of the UK fleet with newer vehicles. Whilst there is evidence to suggest that Defra's predictions are now accurate¹⁸, there are several other uncertainties and limitations associated with air quality modelling assessments and the emission factor year is a convenient means by which these additional uncertainties can be accounted for. As such, for the future year scenario (2025), it was assumed that there would be no improvement in the UK vehicle fleet beyond 2022. This is considered a conservative approach.

Background Concentrations

- 3.26 ADMS-Roads provides estimates of the contribution of a road (or an industrial source) to local pollutant concentrations. In order to derive an estimate of the total concentration, to compare against air quality objectives, it is necessary to add the modelled contribution to background concentrations.
- 3.27 When carrying out air quality modelling, it is important that the estimates of background pollution represent all sources that are not being explicitly modelled and that they do not include the contribution from the source that is being modelled, to avoid double counting.

¹⁶ DFT (2023) Road Traffic Statistics: <https://roadtraffic.dft.gov.uk/>

¹⁷ Defra (2021) Emissions Factors Toolkit (v.11): <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/>

¹⁸ Air Quality Consultants (2020) Defra's Emission Factor Toolkit Now Matching Measurements

3.28 Background concentrations for use in this assessment were derived from the UK-AIR estimates, with concentrations at discrete locations representative of the estimates from that grid square, for the assessment scenario year. The nearby urban background monitoring site (AURN) was not chosen as the source of background data as concentrations of NO₂ in 2022 were greater than at some nearby roadside locations (e.g., King Oak Flats).

3.29 UK-AIR background concentrations are also predicted to improve in the future and as such, as another means to account for inherent uncertainty, it has been assumed that there will be no future improvement in background concentrations beyond 2022.

Advanced Input Parameters

3.30 Where there is a continuous line of buildings along both sides of a road, a “street canyon” can be created. Street canyons can result in increased pollutant concentrations due to the recirculation and reduced dispersion of emissions.

3.31 Whilst the application site is in a busy built-up area, it is not located on a road with archetypal canyon effects given the large width between the two building facades, on either side. Furthermore, the model was predicting well without the incorporation of model effects, and as such, no canyons were modelled in the assessment.

Receptors

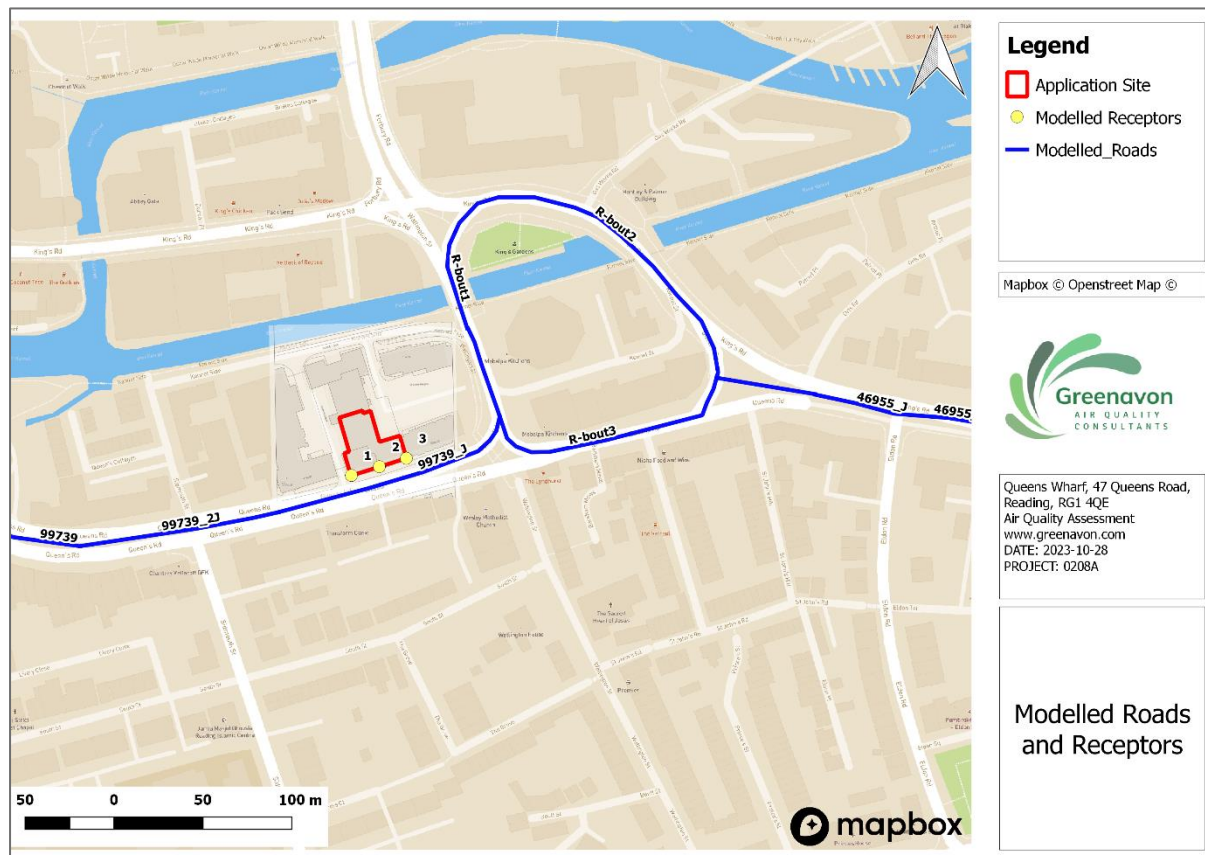
3.32 Table 2.2 and Figure 2.1, below sets out details of the receptors explicitly modelled in the assessment. These receptors were chosen as they represent the application site’s southern façade, facing the A329 Queen’s Road. The receptors were modelled at “breathing height”, which is, by convention, 1.5m above ground or floor height.

Table 3.1: Modelled Receptors

ID	Description	X	Y	Heights (m)
R1	Proposed development’s southern façade	472149.8	173246.8	1.5
R2	Proposed development’s southern façade	472165.6	173251.7	1.5
R3	Proposed development’s southern façade	472180.7	173256.4	1.5

3.33 A contour showing the dispersion of NO₂ across the application site at 1.5m height, in the proposed development’s opening year has also been produced. The results were output to an 80m-by-90m grid, originating at 472120, 173210, with a receptor resolution of 2m.

Figure 3:1: Modelled Roads and Receptors



Post-processing and NO_x to NO₂ conversion

3.34 The modelled contribution of NO_x has been converted to NO₂ using the LAQM NO_x to NO₂ calculator (Version 8.1)¹⁹, in combination with background predictions from the UK AIR resource.

Model Verification

- 3.35 It is recommended that the model results are compared with measured data to determine whether the model inputs need adjusting to reflect local air quality more accurately. This process is known as verification.
- 3.36 LAQM.TG (22) recommends that model predictions should be adjusted to within 25% (preferably 10%) of monitored concentrations, or when systematically under or over predicting. Model verification was undertaken in line with the method set out in LAQM.TG (22). Appendix B contains full details of the model verification process.
- 3.37 The model was found to be performing well without adjustment, with all predictions within 25% of monitored concentrations and no systematic under or over-predicting.
- 3.38 Nonetheless, a factor of 0.95 was derived to adjust modelled NO_x contributions to best match monitored concentrations. Modelled contributions of PM₁₀ and PM_{2.5} were

¹⁹ Defra (2020) NO_x to NO₂ calculator (Version 8.1)

adjusted by a factor of 1.80, derived from PM₁₀ monitoring undertaken at the AURN and RD4 monitors.

Judgement of Significance

- 3.39 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as 'significant' or 'not significant'. In this assessment, impacts on air quality were screened using EPUK & IAQM criteria and no detailed impact assessment was undertaken.
- 3.40 In the absence of any formal local criteria to determine the significance of exposure to air pollution levels, London Council's Air Pollution Exposure Criteria (APEC)²⁰ were used to determine the significance of the proposed development's exposure. The criteria are reproduced in Table 3.2 below.

Table 3.2: APEC Criteria

	Applicable Range NO ₂ Annual Mean	Applicable Range PM ₁₀	Recommendation
APEC – A	> 5% below national objective	Annual Mean: > 5% below national objective 24 hr: > 1-day less than national objective	No air quality grounds for refusal; however, mitigation of any emissions should be considered.
APEC – B	Between 5% below or above national objective	Annual Mean: Between 5% above or below national objective 24 hr: Between 1-day above or below national objective.	May not be sufficient air quality grounds for refusal, however appropriate mitigation must be considered e.g., Maximise distance from pollutant source, proven ventilation systems, parking considerations, winter gardens, internal layout considered, and internal pollutant emissions minimised.
APEC – C	> 5% above national objective	Annual Mean: > 5% above national objective 24 hr: > 1-day more than national objective.	Refusal on air quality grounds should be anticipated, unless the Local Authority has a specific policy enabling such land use and ensure best endeavours to reduce exposure are incorporated. Worker exposure in commercial/industrial land uses should be considered further. Mitigation measures must be presented with air quality assessment, detailing anticipated outcomes of mitigation measures.

- 3.41 The criteria above are useful to evaluate the likely exposure of a proposal to air pollution. However, professional judgment must be used to determine the overall effect, considering the area of high exposure, as well as the validity of the assumptions made during the assessment process, amongst other factors.

Ecological Receptors

²⁰ London Council (2007) London Councils Air Quality and Planning Guidance

- 3.42 Air quality assessments must also consider the impact of operational emissions on designated ecological sites, considering the sensitivity of the receptor and the predicted change in pollution concentrations. As there are no designated sites in proximity, a detailed assessment of operational impacts on statutory ecological sites has been scoped out.

4 Baseline Conditions

- 4.1 A baseline assessment has been undertaken to provide a summary of the existing air quality environment in the local area.

Local Air Quality Management

- 4.2 RBC has declared one town centre AQMA due to exceedances of the annual mean AQS for NO₂. The application site is located within this AQMA.

Industrial Sources

- 4.3 A review of The UK Pollutant Release and Transfer Register²¹ identified no industrial or waste facilities in proximity that have the potential to significantly impact the proposed development.
- 4.4 The closest installation, an installation for the disposal of non-hazardous waste, is located over 1.9km to the north-east.

DEFRA / UK-AIR

- 4.5 Defra provides predictions of annual mean concentrations of background NO₂, PM₁₀ and PM_{2.5}, at 1km² resolution across the UK. A summary of the predictions for the grid square (472500, 173500) containing the application site for the years 2018-2025 are set out in Table 4.1 below.

Table 4.1: UK-AIR predicted background concentrations for the application site

Pollutant	Annual Mean Concentration (µg.m ⁻³)							
	2018	2019	2020	2021	2022	2023	2024	2025
NO ₂	24.8	23.8	22.7	22.1	21.6	21.2	20.7	20.2
PM ₁₀	17.6	17.2	16.8	16.6	16.4	16.2	16.0	15.9
PM _{2.5}	12.2	12.0	11.7	11.5	11.4	11.2	11.1	10.9

- 4.6 The data in Table 4.1 show that background annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be well below their respective AQS across the application site, between 2018 and 2025.

Local Authority Monitoring

- 4.7 RBC manages a network of non-automatic monitors (diffusion tubes) and automatic monitors in its administrative boundary, monitoring NO₂, PM₁₀ and PM_{2.5}. RBC's latest available monitoring data is published in the 2023 Air Quality Annual Status Report (ASR)¹³, which includes data from 2022.

²¹ Defra (2021) UK Pollutant Release and Transfer Register. Available at: <https://prtr.defra.gov.uk/pollutant-releases>

- 4.8 Defra also carries out additional air quality monitoring across the UK. Data from the Automatic Urban and Rural Network (AURN) and the UK Urban NO₂ network can also provide relevant monitoring data, for the establishment of baseline conditions. There is an AURN monitor in the vicinity of the application site.
- 4.9 Table 4.2 below summarises the most recent available monitoring data located within 1.3km of the application site.

Table 4.2: Annual Mean Concentrations of NO₂, PM₁₀ and PM_{2.5}

Site ID	Type	Distance to Site (m)	Annual Mean Concentrations (µg.m ⁻³)							
			2015	2016	2017	2018	2019	2020	2021	2022
NO ₂										
King Oak Flats	Urban Centre	135	33	33	31	32.1	27.9	20.1	24.1	22.5
181 Kings r Road	Roadside	334	-	-	-	-	34.9	27.9	35.2	32.7
276 Kings Road	Roadside	536	33	32	32	29.5	26.5	18.7	21.4	22.0
44 Crown Street	Roadside	583	36	37	35	34.0	29.4	22.3	26.8	24.2
Red Cow	Roadside	614	38	38	35	37.6	31.4	24.5	28.7	26.9
Amity Road	Roadside	1056					29.1	21.1	24.1	22.6
AURN	Urban Background	1261	22	34	29	26	22	15	20	23
162 London Rd	Roadside	1308	48	42	43	40	38	-	-	-
RD4	Roadside R	1530		32	28	30	27	18	21	21
419 London Rd	Roadside	1558	43	42	44	39.4	34.8	25.5	27.3	27.4
PM ₁₀										
AURN	Urban Background	1261	12	13	12	13	13	15	15	16
RD4	Roadside	1530		19(19)	18	17	17	19	17	18
PM _{2.5}										
AURN	Urban Background	1261	7	9	10	7	8	8	8	8
Bold denotes exceedance of the annual mean AQS.										

- 4.10 Annual mean concentrations of NO₂ in the vicinity of the application site between 2019 and 2022 were all below the 40 µg.m⁻³ AQS; however, two locations (162 London Road and 419 London Road) recorded exceedances of the annual mean 40 µg.m⁻³ AQS between 2015 and 2019.
- 4.11 The closest monitor to the site, King Oak Flats, between 2015 and 2022, recorded annual mean NO₂ concentrations at least 17.5% below 40 µg.m⁻³ AQS.
- 4.12 There is strong evidence of a downward trend in NO₂ concentrations in the local area.

4.13 Annual mean concentrations of $PM_{2.5}$ and PM_{10} were consistently below their respective annual mean concentrations between 2015 and 2022.

5 Construction Phase Assessment

Dust Risk Assessment

- 5.1 There are many activities on a construction site that can generate dust emissions including demolition, cutting, the storage of friable materials, piling, concrete batching, the crushing and screening of wastes, loading and tipping and dry sweeping, amongst others. The time of year in which these activities occur can also influence the dust emission magnitude, with drier conditions often favouring dust release.

Dust Magnitude (Step 2A)

- 5.2 The dust emission magnitude for demolition, earthworks, construction and Trackout were categorized ('Small', 'Medium', or 'Large') using professional judgment in combination with the proposed plans. Table 5.1 below sets out the IAQM's dust emission magnitude criteria/ examples as well as the defined project level magnitude for each phase.

Table 5.1: Dust Emission Magnitude Examples and Project Specific Judgement

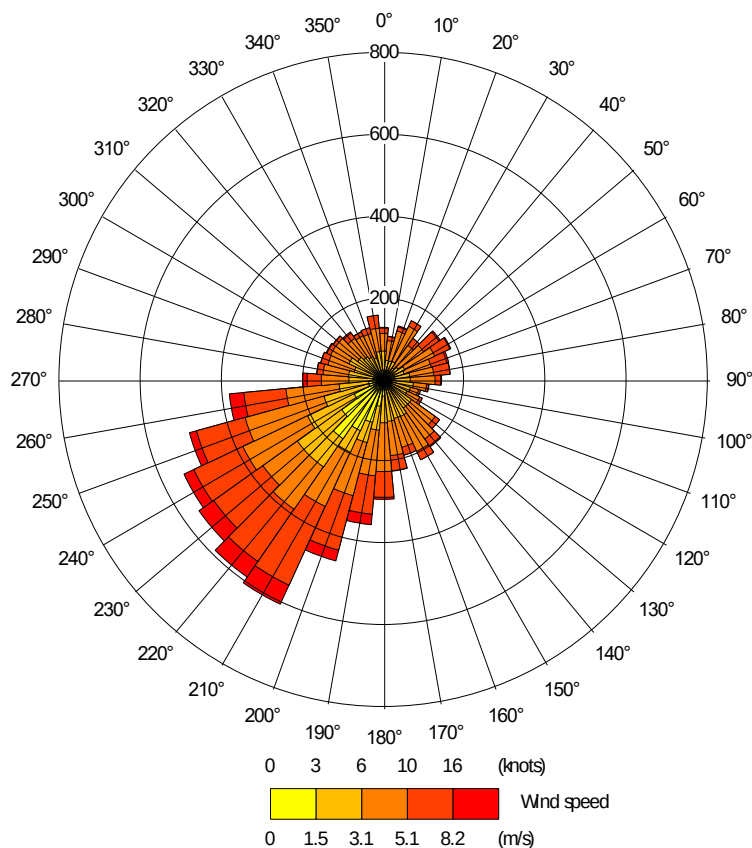
Activity	Dust Emission Magnitude	IAQM and GLA Example Dust Emission Magnitude Criteria	Project specific dust Emission Magnitude
Demolition	Large	Total building volume >75,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level.	NA: It is understood no demolition is proposed.
	Medium	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material, demolition activities 6-12 m above ground level.	
	Small	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months.	
Earthworks	Large	Total site area >110,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.	NA: it is understood the construction phase consists of internal renovations and refurbishments.
	Medium	Total site area 18,000 m ² – 110,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height.	

	Small	Total site area <18,000 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height.	
Construction	Large	Total building volume >75,000 m ³ , on site concrete batching, sandblasting.	Small: The construction phase consists of internal renovations.
	Medium	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.	
	Small	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).	
Trackout	Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;	Small: the application site is an urban area, with paved access to the site. As such, this will minimise the potential for dust entrainment.
	Medium	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m	
	Small	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m	

Sensitivity of the Area (Step 2B)

- 5.3 The sensitivity of the area to dust soiling, human health impacts and ecological impacts is a function of the inherent sensitivity of individual receptors, the local background concentrations of PM₁₀, as well as site specific factors such as the prevailing wind.
- 5.4 Figure 5.1 displays the modelled wind rose for the Farnborough Airport Meteorological station for 2019. It shows that, during this period, the prevailing wind was from the southwest. Grantley Heights, a residential accommodation, is located downwind of the site.

Figure 5.1: Wind-Rose for Farnborough Airport (2022)



- 5.5 High sensitivity receptors include residential dwellings, schools, hospitals and other places where vulnerable members of the community may spend significant periods of time (e.g. care homes and nurseries). However, places such as car showrooms and museums may also be considered of high sensitivity due to the potential for dusts to diminish the value of the property or to significantly impact the enjoyment of a space. Medium sensitivity receptors include areas where people would not reasonably be expected to be present for extended periods of time (e.g., places of work or parks).
- 5.6 The approximate number of high and medium sensitivity receptors located within 100m of the proposed development are set out in Table 5.2.

Table 5.2: Approximate Number of Highly Sensitive Receptors in proximity to the application site.

Distance	Number of Receptors sensitive to dust	Details
<20m	10-100	Residential receptors in Queen's Wharf and Gravity Co-Living Royal Heights.
<50m	100+	Residential receptors in Queen's Wharf and Gravity Co-Living Royal Heights.
<100m	100+	Residential dwellings in wider area.

- 5.7 The sensitivity of the area to earthworks, construction and trackout, for dust soiling, human health impacts and ecological impacts is set out in Table 5.3 below.

Table 5.3: Sensitivity of the Area to Dust

Impact	Sensitivity				Justification
	Demolition	Earthworks	Construction	Trackout	
Dust Soiling	High	High	High	High	There are more than 10 highly sensitive uses within 20m.
Human Health Impacts	Low	Low	Low	Low	Background concentrations of PM ₁₀ in the vicinity are below 24µg.m ⁻³ and there are fewer than 100 receptors within 20m of the site/ roads used by construction vehicles.
Ecological Impacts	Negligible	Negligible	Negligible	Negligible	There are no statutory ecological receptors within 350m of the site.

Risk (Step2C)

- 5.8 The risk of dust impacts during each phase of construction, in the absence of mitigation, is summarised in Table 5.4 below.

Table 5.4: Summary of Dust Impact Risk by Construction Stage based on the IAQM's dust guidance.

Stage	Dust Impact Risk		
	Dust Soiling	Human Health	Ecology
Demolition	NA	NA	NA
Earthworks	NA	NA	NA
Construction	Low	Negligible	Negligible
Trackout	Negligible	Negligible	Negligible

- 5.9 Overall, the construction phase of the proposed development is considered to present a Low Risk of nuisance dust soiling effects, a Negligible Risk for PM₁₀ health effects and a Negligible Risk for ecological impacts, in the absence of mitigation.

Site Specific Mitigation

- 5.10 Table 5.5 below includes the IAQM's highly recommended mitigation measures for sites with a low risk of dust impacts.

Table 5.5: Highly Recommended and Desirable Mitigation Measures for Sites with a Low Risk of Dust Impacts

Category	Mitigation Measures
General	Display the name and contact details of person(s) accountable for air quality pollutant emissions and dust issues on the site boundary.
	Display the head or regional office contact information.

	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document
Site Management	Record and respond to all dust and air quality pollutant emissions complaints.
	Make a complaints log available to the local authority when asked.
	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the logbook
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 checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site
	Fully enclosure site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery and sustainable travel	Ensure all on-road vehicles comply with the requirements of the RBC, in terms of emissions.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible
	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 appropriate).
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.
Demolition	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is 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
Construction	Avoid scabbling (roughening of concrete surfaces) if possible
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place
Trackout	Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
	Avoid dry sweeping of large areas
	Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable)
	Record all inspections of haul routes and any subsequent action in a site log book.

Residual Effects

- 5.11 After the implementation of the standard mitigation measures, including a selection of those listed in Table 5.5, the significance of each phase of the construction programme will be reduced and the residual significance of impact of the construction phase is expected to be *Negligible*, which is not significant.

6 Operational Phase Assessment

Impact Assessment

- 6.1 The proposal includes 8 dwellings and fewer than 10 additional car parking spaces. As such, it can be concluded that the proposal would have no significant impact on local air quality.

ADMS Roads Assessment: Exposure

- 6.2 The predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} in the base year and the proposed development's assumed opening year (2025) are set out in Table 6.1 below.

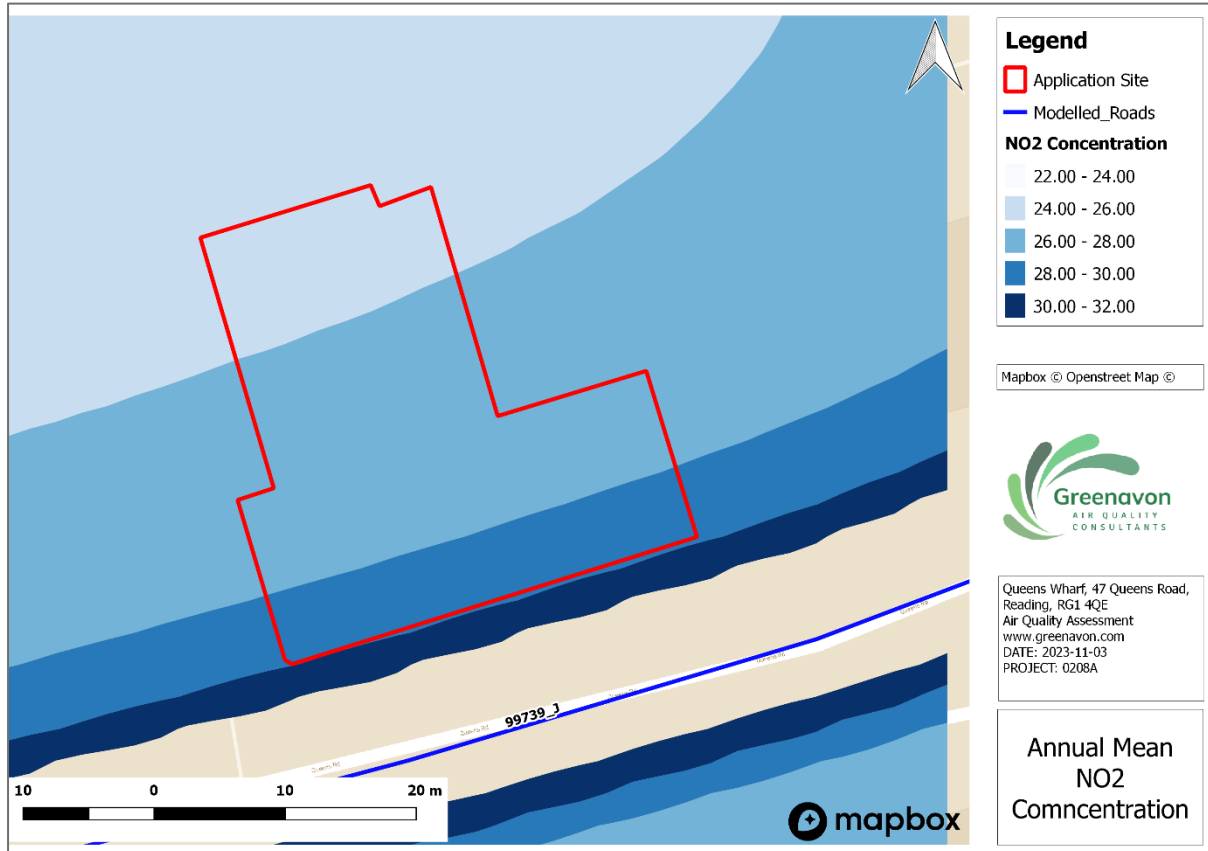
Table 6.1: Predicted Annual Mean Concentrations of NO₂ , PM₁₀ and PM_{2.5}

Receptor	Height (m)	Annual Mean Concentration (µg.m ⁻³)		
		NO ₂	PM ₁₀	PM _{2.5}
2022 Base Year				
R1	1.5	27.9	19.4	13.1
R2	1.5	27.7	19.3	13.0
R3	1.5	27.7	19.3	13.0
2025 With Development				
R1	1.5	28.2	19.4	13.1
R2	1.5	28.0	19.3	13.0
R3	1.5	28.0	19.3	13.0

- 6.3 The predictions in Table 6.1 show that annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be well below their respective annual mean AQSs, across the application site, in all modelled scenarios. Furthermore, all predictions fall within the London Council's APEC A range (i.e., no air quality grounds for refusal).
- 6.4 LAQM.TG (22) guidance suggests that where annual mean concentrations of NO₂ do not exceed 60 µg.m⁻³, it can be considered likely that the 1-hour mean objective for NO₂ would also be met. As such, the 1-hour mean objective for NO₂ would likely also be met across the application site.
- 6.5 LAQM.TG (22) guidance also suggests that exceedances of the 24-hour mean objective for PM₁₀ (50 µg.m⁻³ not to be exceeded more than 35 times a year) are also unlikely where annual mean PM₁₀ does not exceed 31.2 µg.m⁻³. As such, it can also be concluded that exceedances of the short-term standard for PM₁₀ are also unlikely across the application site in the proposed development's opening year.
- 6.6 The RMSE of predictions (3.7 µg.m⁻³), calculated in the model verification process, suggests that the results presented in the assessment, and the conclusions drawn are robust, as predicted concentrations of all pollutants at all heights are less than their relevant AQS, or indicative threshold, minus the RMSE.

6.7 The contour plot showing the pattern of dispersion of annual mean NO₂ across the application site, in 2025 (with 2022 emission factors), is shown in Figure 6.1 below.

Figure 6:1 Annual Mean NO₂ Concentrations (2025)



Mitigation

6.8 The NPPF requires development to identify opportunities to improve air quality. Opportunities for the proposed development to improve air quality in the area include the provision of:

- An all-electric heating strategy (e.g. Air Source Heat Pumps) to minimise domestic emissions.
- Super-fast internet to facilitate working from home.
- Cycle storage infrastructure.

7 Discussion

- 7.1 Local and National Air Quality Policy seeks to sustain compliance with national objectives and limit values, and to prevent new development from contributing to, or being put at unacceptable risk, from unacceptable levels of air pollution. Furthermore, a key theme of the NPPF requires development to identify opportunities to improve air quality.
- 7.2 A review of the baseline air quality conditions was undertaken, referring to data provided by Defra/UK-AIR and RBC. Background concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted to be below the relevant AQSs across the application site, in recent years. Furthermore, measured roadside concentrations of NO₂ have also been mostly below the annual mean AQS, in vicinity of the site, in recent years.
- 7.3 The potential for significant impacts as a result of the operation of the proposed development were screened out, using EPUK & IAQM criteria.
- 7.4 An ADMS-Roads assessment was undertaken to predict the impact of existing air quality on the proposal, in the proposal's likely opening year (2025). Several conservative inputs, including the assumption that there would be no improvement in the UK vehicle fleet or background concentrations beyond 2022, were incorporated into the model. Nevertheless, annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} were predicted to be below all short and long term AQS at the most at-risk façade of the proposal. The results and associated conclusions are considered robust, as predicted concentrations were less than the relevant AQS, even when the RMSE calculated for NO₂ was added to modelled results. Considering the conservative inputs into the model, as well as the RMSE of the model (a measure of model uncertainty), concentrations of NO₂, PM₁₀ and PM_{2.5} across the application site would highly likely be below the relevant long and short-term standards, in 2022 and 2025. As such, no mitigation, or bespoke ventilation strategy is required for air quality purposes.
- 7.5 The NPPF requires that development "wherever possible" help to improve local environmental conditions. The proposal could incorporate an all-electric energy strategy and incorporate cycle parking to help reduce pollutant emissions and encourage more sustainable forms of transportation.
- 7.6 A construction dust risk assessment was undertaken in line with guidance provided by the IAQM. The assessment found that the construction phase of the proposed development presented a *Low* risk of dust soiling effects to neighbouring uses and an appropriate level of mitigation was recommended to negate this risk. As the construction phase consists of internal renovations, standard construction practices should be sufficient to minimise significant off-site effects.

8 Conclusion

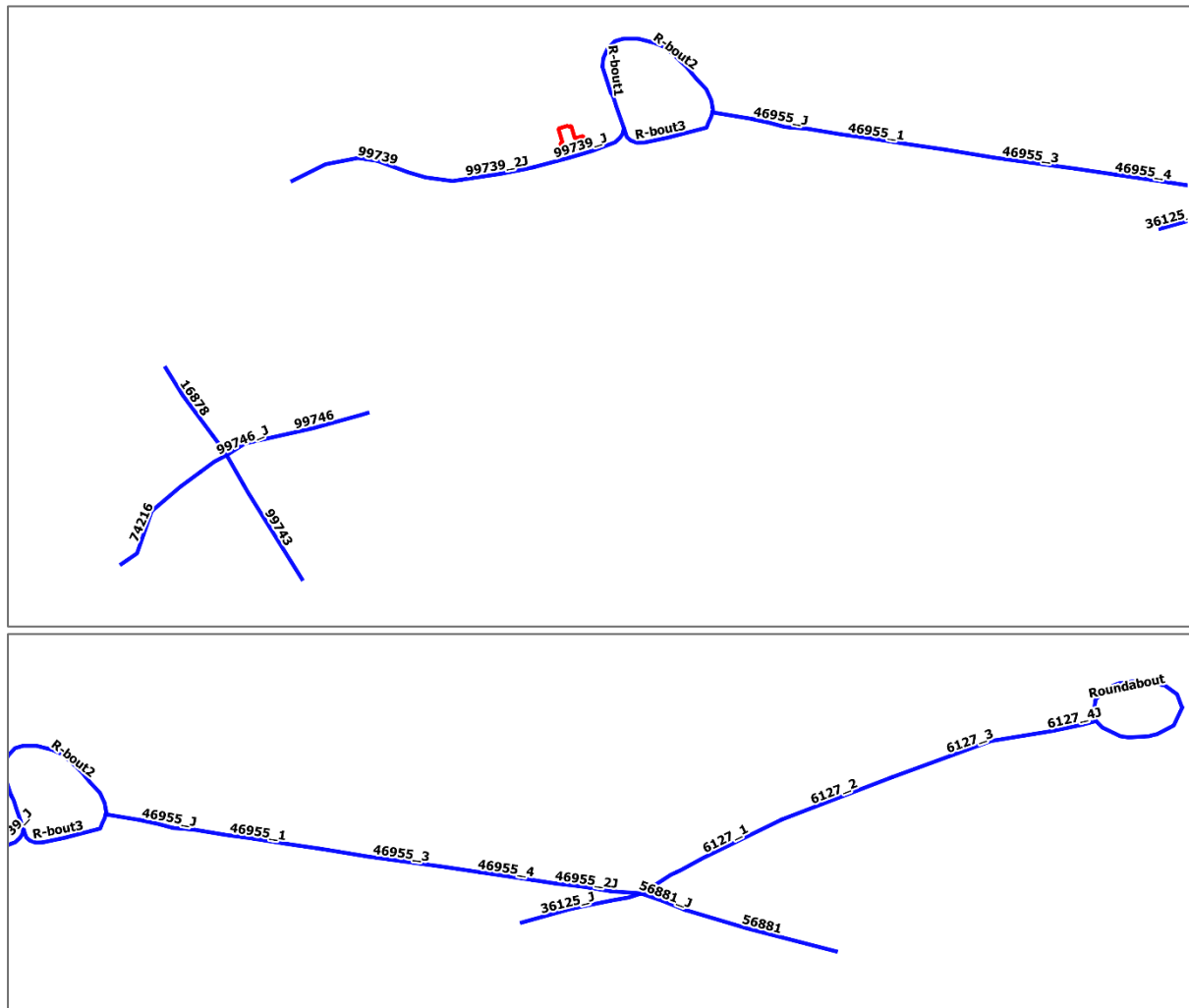
- 8.1 Greenavon Ltd was commissioned by Metrix Developments Ltd to undertake an Air Quality Assessment for a proposed residential development at Queens Wharf, 47 Queens Road, Reading, RG1 4QE.
- 8.2 The assessment concluded that during the operational phase, the proposed development would have no significant impact on, nor would be significantly impacted by, local air quality.
- 8.3 After the implementation of a low level of construction dust mitigation, there would be no significant impacts during the construction phase.
- 8.4 The proposed development is, therefore, considered compliant with all local and national planning policy. Air quality should not, therefore, present a significant barrier to the planning process.

Appendix A – Model Inputs

Table A.1: Traffic Data

Road/ DFT ID	Speed (kph)	2022 AADT		2025	
		LDV/HR	HDV/hr	LDV/HR	HDV/hr
6127_2	48.3	979	48	1077	52
99743	48.3	300	9	330	10
74216	48.3	269	4	296	4
46955_4	48.3	674	44	741	49
99743_J	38.3	300	9	330	10
16878	48.3	629	24	691	26
16878_J	38.3	629	24	691	26
99746_J	38.3	436	12	480	13
99739	48.3	767	19	844	20
99739_J	38.3	767	19	844	20
46955_2J	38.3	674	44	741	49
36125_J	38.3	464	18	510	19
6127_J	38.3	979	48	1077	52
6127_1	48.3	979	48	1077	52
6127_3	48.3	979	48	1077	52
74216_J	38.3	269	4	296	4
46955_3	48.3	674	44	741	49
6127_4J	38.3	979	48	1077	52
56881	48.3	400	16	439	18
99746	48.3	436	12	480	13
56881_J	38.3	400	16	439	18
R2	38.3	612	14	673	15
99739_2J	38.3	767	19	844	20
R1	38.3	581	13	639	15
R3	38.3	586	14	645	15
46955_1	48.3	674	44	741	49
46955_J	38.3	674	44	741	49
LDV = light duty vehicle HDV = heavy duty vehicle					

Figure A:1: Road Link Schematic



Appendix B – Model Verification

Model verification is the process by which the differences between observed and predicted values are explored and uncertainties associated with the model are investigated and, where possible, minimised.

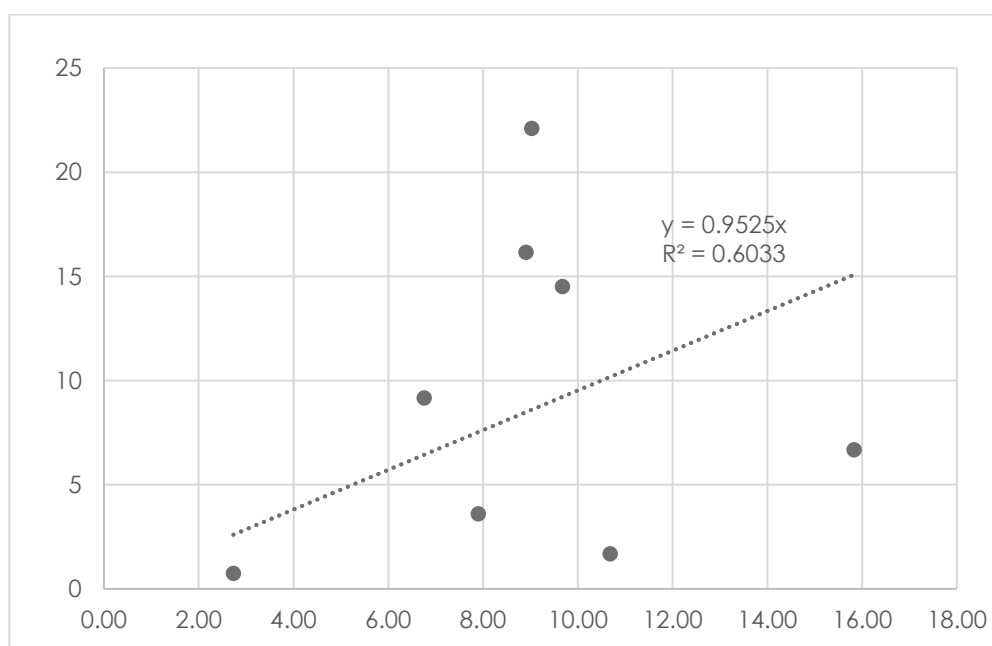
According to LAQM.TG (22), where the results of the model all lie within 25% of the monitored concentrations, and there is no systematic under or over-predicting the model is considered a suitable predictive tool. Table B.1 presents the monitored and modelled concentrations of NO₂ at local monitors, prior to verification.

Table B 1: Monitored and Modelled Road Contributions of NO₂ at Roadside Monitoring Sites

Monitor	Annual mean concentration (µg.m ⁻³)			Difference (%)
	Background NO ₂	Monitored NO ₂	Modelled NO ₂	
King Oak Flats	21.6	22.5	27.1	20.5%
181 Kings Road	21.6	32.7	26.3	-19.7%
Amity Road	19.1	22.6	27.2	20.5%
419 London Rd	19.1	27.4	23.8	-13.3%
276 Kings Road	21.6	22.0	23.0	4.7%
Red Cow	19.4	26.9	24.5	-9.0%
44 Crown Street	19.4	24.2	23.0	-5.1%
RD4	19.1	21.0	23.2	10.6%

As the model is generally under-predicting at most locations, it was decided to proceed with adjustment. The modelled versus monitored NO_x contributions, plotted on Figure B.1, displays a positive correlation.

Figure B 1 Monitored vs Modelled Road NO_x



The equation of the trend line suggests that the modelled road contribution is under-predicted by a factor of 0.95. Table B.2 displays predicted NO₂ following the adjustment of the road NO_x contribution by this factor.

Table B 2: Monitored and Adjusted Modelled Total NO₂ at Roadside Monitoring Sites

Monitor	Annual mean concentration (µg.m ⁻³)			Difference (%)
	Background NO ₂	Monitored NO ₂	Modelled NO ₂	
King Oak Flats	21.6	22.5	26.8	19.3%
181 Kings road	21.6	32.7	26.0	-20.4%
Amity Road	19.1	22.6	26.9	18.8%
419 London Rd	19.1	27.4	23.5	-14.2%
276 Kings Road	21.6	22.0	23.0	4.4%
Red Cow	19.4	26.9	24.2	-10.0%
44 Crown Street	19.4	24.2	22.8	-5.8%
RD4	19.1	21.0	23.0	9.7%

The data in Table B.2 shows that most modelled NO₂ concentrations were within 25% of monitored concentrations, and that there was no systematic under or over-predicting.

Furthermore, the Root Mean Square Error (RMSE) between observed and predicted NO₂, post adjustment, was 3.7 µg.m⁻³, which equates to 9.3% of the annual mean AQS. As a result, the adjustment factor was considered appropriate for use in the dispersion modelling assessment.

Modelled contributions of PM₁₀ were adjusted by a factor of 1.80, after undertaking verification for this pollutant (using RD4). Concentrations of PM_{2.5} were also adjusted by this factor, in accordance with LAQM.TG (22).



Greenavon Ltd

Experts in Air Quality and Odour Assessment

Registered Office Address: 128 City Road, London,
United Kingdom, EC1V 2NX

Company Number: 14788658

www.greenavon.com