Air Quality Assessment	
Leeds Road, Kirklees	
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1   Introduction

1.1.   Development

1.1.1   Air Quality Assessments Ltd (AQA) has been commissioned c/o KPP Planning to undertake an air quality assessment for the proposed warehouse development at Leeds Road, Mirfield. The application site is shown in **Figure 1**.

1.1.2   An Air Quality Management Area (AQMA), declared by Kirklees Council for exceedances of the annual mean nitrogen dioxide (NO_2) objective, lies adjacent to the application site and may be affected by emissions from traffic generated by the proposed development.

1.2.   Scope of Assessment

1.2.1   This report describes the existing air quality conditions in proximity to the site, and assesses the likely impact that traffic generated by the development will have on local air quality. The main air pollutants of concern related to road traffic are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$).

1.2.2   The assessment has been prepared taking into account all relevant local and national guidance and regulations.

1.2.3   The references and a glossary of common air quality terminology used in this assessment are shown in **Section 10** and **Section 11** respectively.

2 Air Quality Legislation and Policy

2.1. EU Limit Values

2.1.1 The European Union's Directive on ambient air quality and cleaner air for Europe (European Parliament, Council of the European Union, 2008) set legally binding limit values for NO_2, PM_{10} and $PM_{2.5}$. The Air Quality Standards Regulations 2010 (as amended) implement the EU Directive limit values in English legislation (The Stationary Office, 2010). Achievement of the limit values is a national obligation rather than a local one.

2.1.2 The United Kingdom left the European Union on 31st January 2020; however, the EU legislation currently remains enshrined in UK law through the Air Quality Standards Regulations.

2.1.3 The limit values for NO_2 and PM_{10} are the same as the objective values (see below). 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. The limit value compliance dates differ from the objectives; the PM_{10} and NO_2 limit value applied from 2005 and 2010 respectively, whereas the $PM_{2.5}$ limit value applied from 2020.

2.2. National Legislation

2.2.1 Part IV of The Environment Act 1995, as amended by the Environment Act 2021, required the UK Government to prepare a national Air Quality Strategy. A new Air Quality Strategy for England was published in April 2023 (Defra, 2023a). The Air Quality Strategy sets out the actions that Defra expects local authorities to take in support of long-term air quality goals, including new $PM_{2.5}$ targets, and provides a framework to enable local authorities to make the best use of their powers and make improvements for their communities.

2.2.2 The strategy sets out air quality standards and objectives intended to protect human health and the environment. Standards are the concentrations of pollutants in the atmosphere, below which there is a minimum risk of health effects or ecosystem damage; they are set with regard to scientific and medical evidence. Objectives are the policy targets set by the Government, taking account of economic efficiency, practicability, technical feasibility and timescale, where the standards are expected to be achieved by a certain date. The Government has also published a Clean Air Strategy, which provides an overview of the actions that the government will take to improve air quality (Defra, 2019). The actions in the Clean Air Strategy focus on emissions from transport, the home, farming, and industry.

2.2.3 The Air Quality Strategy also describes the system of Local Air Quality Management (LAQM), which was introduced in Part IV of the Environment Act 1995. LAQM requires every local authority to carry out regular review and assessments of air quality in its area. Where an objective has not been, or is unlikely to be achieved, the local authority must declare an Air Quality Management Area (AQMA) and prepare an action plan which sets out appropriate measures to be introduced in pursuit of the objectives. $PM_{2.5}$ is not included in the LAQM framework; however, the government

expects all local authorities to effectively use their powers to reduce $PM_{2.5}$ emissions from the sources which are within their control.

2.2.4 The objectives for NO_2 and PM_{10}, as prescribed by the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 (The Stationary Office, 2000; The Stationary Office, 2002), are shown in **Table 1**. The objectives for PM_{10} and NO_2 were to have been achieved by 2004 and 2005 respectively and continue to apply in all future years thereafter.

2.2.5 The air quality standard for $PM_{2.5}$, also shown in **Table 1**, was to be achieved by 2020. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set out two legally binding targets for $PM_{2.5}$, with interim targets for each set out in the Environmental Improvement Plan 2023 (The Stationery Office, 2023; Defra, 2023b). The $PM_{2.5}$ targets are:

- $10\mu g/m^3$ annual mean concentration $PM_{2.5}$ nationwide by 2040, with an interim target of $12\mu g/m^3$ by January 2028; and
- 35% reduction in average population exposure by 2040, with an interim target of a 22% reduction by January 2028, both compared to a 2018 baseline.

Table 1: The Objectives for NO_2 and PM_{10} and the $PM_{2.5}$ Standard

Pollutant	Concentration Measured As	Objective/Standard
NO_2	1-hour Mean	200 $\mu g/m^3$ not to be exceeded more than 18 times a year
	Annual Mean	40 $\mu g/m^3$
PM_{10}	24-hour Mean	50 $\mu g/m^3$ not to be exceeded more than 35 times a year
	Annual Mean	40 $\mu g/m^3$
$PM_{2.5}$	Annual Mean	20 $\mu g/m^3$

2.2.6 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Examples of where the objectives should apply are provided in the Local Air Quality Management Technical Guidance (Defra, 2022) issued by the Department for Environment, Food and Rural Affairs (Defra). The annual mean NO_2 and PM_{10} objectives should apply at the building façades of residential properties, schools, hospitals, care homes etc.; they should not apply at the building façades of places of work, hotels, gardens or kerbside sites. The 24-hour mean PM_{10} objective should apply at all locations where the annual mean objective applies, as well as the gardens of residential properties and hotels. The 1-hour mean NO_2 objective should apply at all locations where the annual and 24-hour mean objectives apply, as well as at kerbside sites where the public have regular access, e.g., the pavements of busy shopping streets.

2.3. Planning Policy

National Policies

2.3.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied (Ministry of Housing, Communities & Local Government, 2021). It provides a framework within which locally prepared plans for development can be produced. At Paragraph 8c, the NPPF states that the purpose of the planning system is to contribute to the achievement of sustainable development and includes an overarching environmental objective:

"To protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

2.3.2 With regard to environmental impacts from traffic, at Paragraph 104 the NPPF states that:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: …

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; …"

2.3.3 The NPPF also states at Paragraph 174 that:

"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; …"

2.3.4 The NPPF goes on to state at Paragraph 185:

"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."

2.3.5 With specific reference to air quality, the NPPF states at Paragraph 186 that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic

approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

2.3.6   The NPPF also includes the following statement at Paragraph 188:

"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."

2.3.7   The NPPF is supported by Planning Practice Guidance (PPG) (DCLG, 2019). The PPG states that:

"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified."

2.3.8   The PPG goes on to state that:

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

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

"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific."

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

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact."

Local Policies

2.3.11 The Kirklees Local Plan Strategy and Policies includes Policy LP51 Protection and Improvement of Local Air Quality (Kirklees Council, 2019), which states:

"1. Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air pollution which would have an unacceptable impact on the natural and built environment or to people.

2. Proposals that have the potential to increase local air pollution either individually or cumulatively must be accompanied by evidence to show that the impact of the development has been assessed in accordance with the relevant guidance. Development which has the potential to cause levels of local air pollution to increase must incorporate sustainable mitigation measures that reduce the level of this impact. If sustainable measures cannot be introduced the development will not be permitted.

3. Where the development introduces new receptors into Air Quality Management Areas or Areas of Concern or near other areas of relatively poor air quality, for example near roads or junctions, the development must incorporate sustainable mitigation measures that protect the new receptors from unacceptable levels of air pollution. Where sustainable mitigation measures cannot be introduced which prevent receptors from being exposed to unsafe levels of air pollution, development will not be permitted."

3 Methodology

3.1. Existing Conditions

3.1.1 Information on existing air quality within the study area has been collated from the following sources:

- The results of monitoring and the most recent publicly available Air Quality Annual Status Reports (ASR) published by Kirklees Council (Kirklees Council, 2022); and
- Background pollutant concentration maps published by Defra (Defra, 2023c).

3.2. Road Traffic Impacts

Modelling Methodology

3.2.1 Concentrations have been predicted using the ADMS Roads (v5.0.1.3) dispersion model (CERC, 2023). The model requires the input of a range of data, details of which are provided in **Appendix A1**, along with details of the model verification calculations.

Sensitive Locations

3.2.2 Receptors have been identified at locations where members of the public are likely to be regularly present over the averaging period of the objectives. These receptors have been located on the façades of properties closest to the road sources, paying particular attention to those located close to junctions, where traffic may become congested, and there is a combined effect from several road links. The receptors are described in **Table 2** and shown in **Figure 1**.

Assessment Scenarios

3.2.3 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at the receptors for the following scenarios:

- Model verification year (2019);
- Future year without the proposed development (2025); and
- Future year with the proposed development (2025).

3.2.4 The model has been verified against 2019 diffusion tube monitoring data (see **Appendix A1**).

Uncertainty

3.2.5 There are many factors that contribute to uncertainty when predicting pollutant concentrations. The emission factors utilised in the air quality model are dependent on traffic data, which have inherent uncertainties associated with them. There are also uncertainties associated with the model itself, which simplifies real world conditions into a series of algorithms. The model verification process, as described in **Appendix A1**, minimises the uncertainties; however, future year predictions use projected traffic data, emissions data, and background concentrations. The most recent emission factors and background data published by Defra have been used in this assessment.

Table 2: Description of Receptors

Receptor	Location	OS Grid Reference		Height (m)
		x	y	
R1	Rose Cottage	417862.59	421041.1	1.5
R2	450 Huddersfield Road	418614.62	420887.4	1.5
R3	8 Leeds Road	418445.47	421166.1	1.5
R4	51 Leeds Road	418505.38	421211.8	1.5
R5	38 Leeds Road	418882.66	421464.0	1.5
R6	87 Leeds Road	418870.38	421475.5	1.5
R7	Robin Hood Cottage	417267.5	421442.8	1.5
R8	Navigation House	417635.31	420644.7	1.5
R9	1285 Leeds Road	417510.03	420578.3	1.5
R10	1263 Leeds Road	417454.34	420540.9	1.5
R11	28 Bradley Road	417334.69	420499.8	1.5
R12	1 Bradley Road	417402.34	420489.6	1.5
R13	1259 Leeds Road	417397.66	420466.2	1.5
R14	1 Colne Bridge Road	417477.34	420496.9	1.5
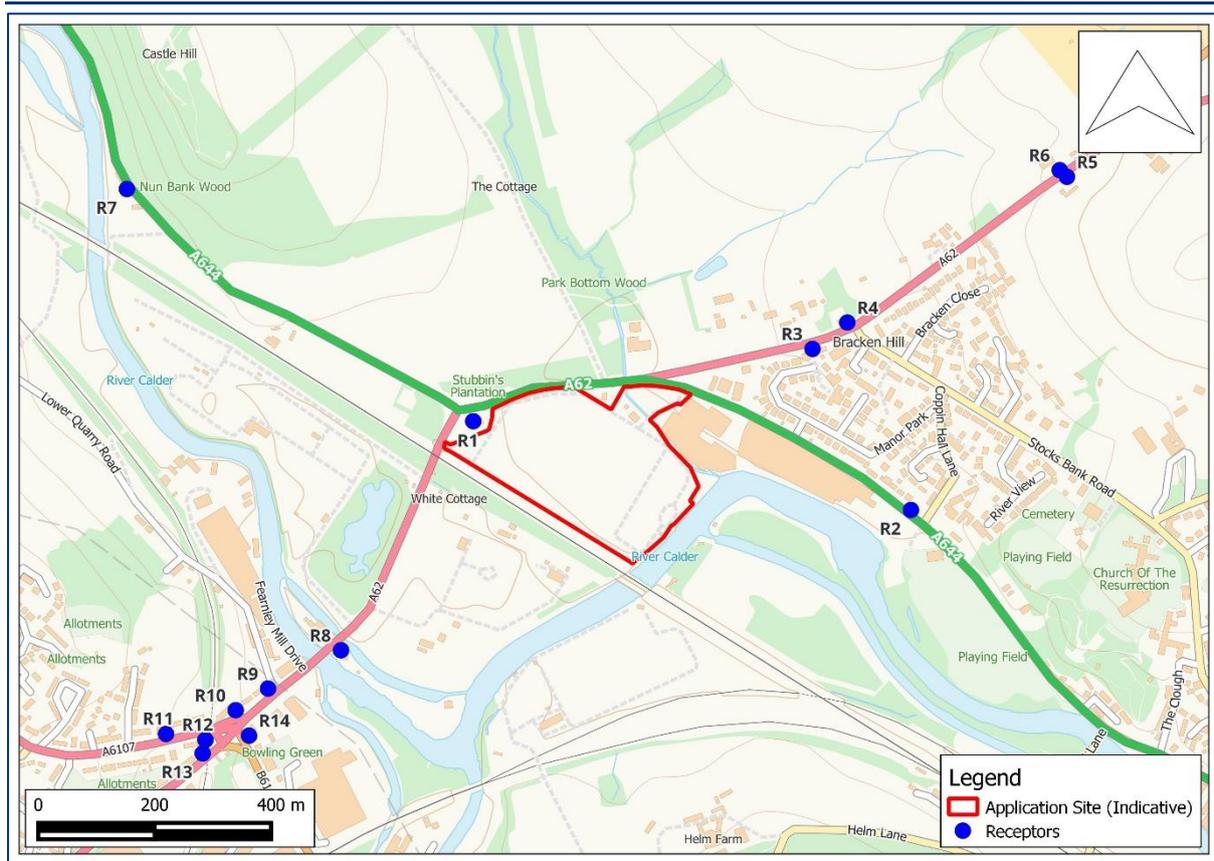
Figure 1: Location of Receptors
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3.3. Assessment Criteria and Significance

Health Criteria

3.3.1   There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach suggested by the EPUK/IAQM in guidance on Land-Use Planning & Development Control: Planning for Air Quality has been used for this assessment (EPUK and IAQM, 2017). The air quality impacts have been described at each receptor by determining the percentage change in concentrations relative to an air quality assessment level (AQAL) and comparing this with the total long-term average concentration, as set out in **Table 3**.

3.3.2   The AQAL for NO_2 is 40µg/m³, based on the annual mean objective.

3.3.3   The AQAL for PM_{10} is an annual mean concentration of 32µg/m³ as measured data show that the 24-hour PM_{10} objective could be exceeded where annual mean concentrations are above 32µg/m³ (Defra, 2022).

3.3.4   The AQAL for $PM_{2.5}$ is a 20µg/m³, based on the annual mean air quality standard. The legally binding $PM_{2.5}$ target value of 10µg/m³ does not need to be achieved until 2040 and guidance on how to assess progress towards the target value has yet to be published. An assessment of whether the proposed development would hinder progress towards the target value has been undertaken based on the 20µg/m³ annual mean standard and the 12µg/m³ 2028 interim annual mean target. Assuming a linear

reduction, annual mean $PM_{2.5}$ concentrations would need to fall by $1\mu g/m^3$/year in order to achieve the 2028 interim target value from the 2020 standard. Therefore, predicted $PM_{2.5}$ concentrations have also been compared with a 2025 annual mean $PM_{2.5}$ assessment target of $15\mu g/m^3$.

Significance

3.3.5 The air quality impact, i.e., the change in concentrations as a result of the development, may have an effect on human health, dependent on the severity of the impact and other factors.

3.3.6 The IAQM guidance advises that the overall effect of the air quality impacts should be judged as either significant or not significant taking account of:

- The descriptions of the predicted impacts;
- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts;
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- The potential for cumulative impacts, i.e., several slight impacts taken together could have a significant effect, or a moderate or substantial effect confined to a small area and not obviously a cause of harm to human health could be described as not significant; and
- The consequences of the impacts, i.e., will the impacts have an effect on human health that can be considered significant? The impacts from an individual development would usually not be large enough to result in a measurable change in health outcomes regarded as significant by healthcare professionals, and therefore the impact on local air quality is used as a proxy for assessing effects on health.

3.3.7 The judgement of significance should be made by a competent, suitably qualified professional, and the professional experience of the consultant preparing the report is set out in **Appendix A2**.

Table 3: Impact Descriptors for Individual Receptors

Long-term Average Concentration at Receptor in Assessment Year [b]	% Change in Concentration Relative to AQAL [a]			
	1	2-5	6-10	>10
≤ 75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
≥ 110% of AQAL	Moderate	Substantial	Substantial	Substantial

a The % change rounded to a whole number. Changes of 0%, i.e., less than 0.5%, are described as negligible. The AQAL for NO_2 is 40 $\mu g/m^3$, the AQAL for PM_{10} is 32 $\mu g/m^3$ and the AQAL for $PM_{2.5}$ is 20 $\mu g/m^3$.

b   The without scheme concentration where there is a decrease in predicted concentrations, and the with scheme concentration where there is an increase in predicted concentrations.

4   Baseline Conditions

4.1.   LAQM Review and Assessment

4.1.1   Kirklees Council has declared ten AQMAs, nine for exceedances of the annual mean NO_2 objective and one for exceedances of the 24-hour mean PM_{10} objective. The AQMA adjacent to the application site has been declared for NO_2 and incorporates properties along two sections of the A62 Leeds Road, in the vicinity of the junctions with the A6107 Bradley Road, and with the A644. The AQMA is shown in **Figure 2**.

4.2.   Local Air Quality Monitoring

4.2.1   Kirklees Council installed two new automatic monitoring sites in 2020 and data from a site on Leeds Road are available. Kirklees Council also operates an NO_2 diffusion tube network. Data from diffusion tube monitoring sites located within 1km of the application site are shown in in **Table 4**, with the monitoring locations shown in **Figure 2**.

4.2.2   Annual mean NO_2 concentrations ranged from 22.7 to 42.6µg/m^3 between 2017 and 2021 exceedances of the annual mean NO_2 objective have been measured at diffusion tube monitoring sites K6, K22 and K23. There is an overall decreasing trend in annual mean NO_2 concentrations, and no exceedances have been measured since 2018. Annual mean NO_2 concentrations ranged from 22.7 to 37.9µg/m^3 between 2019 and 2021.

4.2.3   The low concentrations measured in 2020 and 2021 were due to travel restriction brought in to control the Covid-19 pandemic and would not be representative of the usual air quality.

4.2.4   No exceedances of the 1-hour mean NO_2 standard have been measured at the Leeds Road automatic monitoring site.

4.2.5   An annual mean PM_{10} concentration of 12.2µg/m^3 was measured at Leeds Road in 2020 and the objective was achieved by a wide margin.

Table 4: Measured Annual Mean NO_2 Concentrations [a]

Site ID	Location	Site Type [b]	Annual Mean (µg/m^3)				
			2017	2018	2019	2020	2021
Automatic Monitor							
Roadside 3	Leeds Road	R	-	-	-	25.5	-
Diffusion Tubes							
K6	Leeds Road	R	**42.6**	36.3	37.9	27.0	34.9
K9	Bradley Road	K	35.3	27.5	34.4	28.3	21.7
K10	Leeds Road	R	37.3	39.3	34.5	28.8	-
K12	Leeds Road	R	37.4	38.8	27.3	29.4	-
K22	Leeds Road	K	**41.4**	**40.6**	33.4	22.7	34.7

Site ID	Location	Site Type [b]	Annual Mean (µg/m³)				
			2017	2018	2019	2020	2021
K23	Leeds Road	R	**40.2**	38.5	35.3	31.7	36.0
K102	Stocks Bank Road	R	-	-	-	18.8	24.4
Objective			40				

a   Exceedances are shown in bold.

b   R = Roadside, K = Kerbside.

Figure 2: Air Quality Monitoring Sites and AQMA
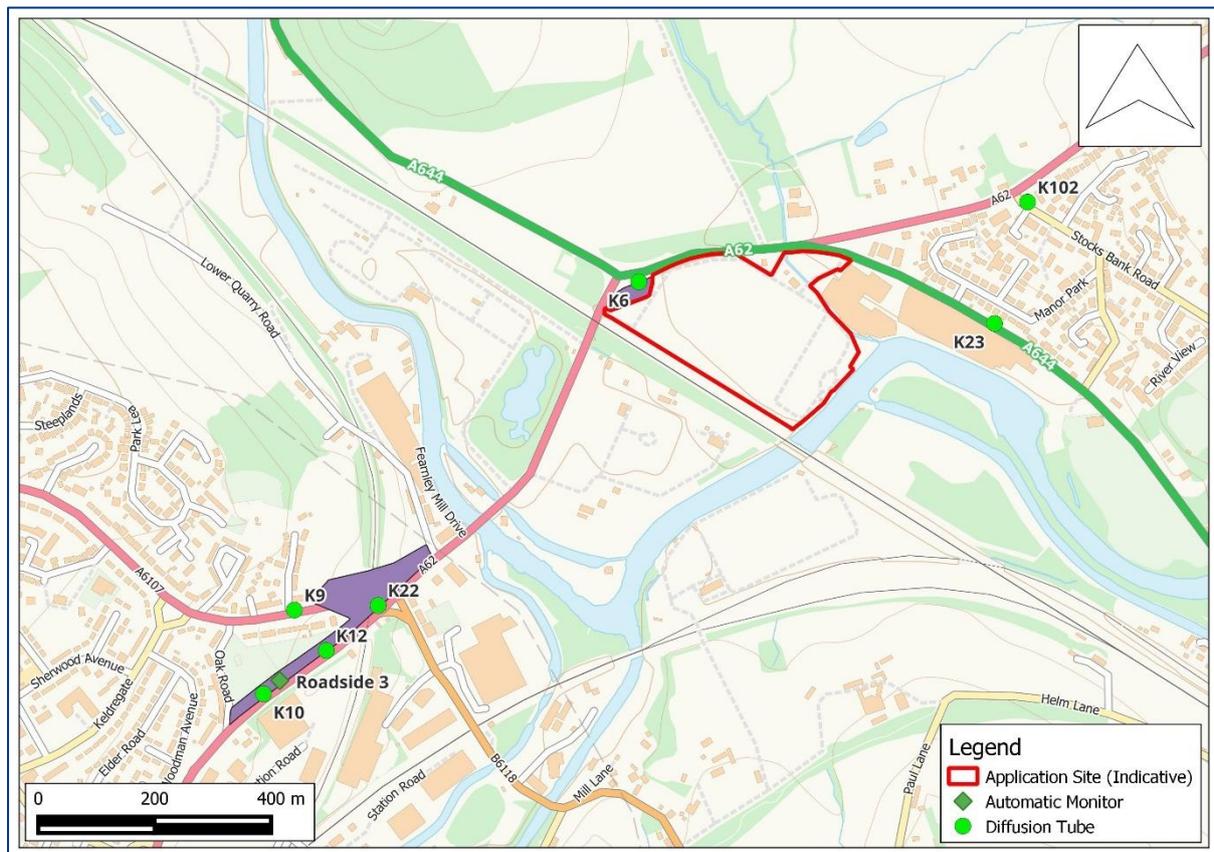Contains Ordnance Survey data © Crown copyright and database right 2023

4.3. Background Concentrations

4.3.1   Estimated background concentrations across the modelled area are shown in **Table 5**. The background concentrations have been derived from data in the national maps published by Defra. The background concentrations are all well below the objectives/standards.

Table 5: Estimated Annual Mean Background Concentrations in 2019 and 2025 (µg/m³)

Year	NOx	NO₂	PM₁₀	PM₂.₅
2019	18.8-22.5	13.8-16.2	11.3-12.7	7.6-8.2
2025	14.7-17.3	11.0-12.8	10.6-11.9	7.0-7.6
Objective/Standard	**-**	**40**	**40**	**20**

4.4. Predicted Baseline Concentrations

4.4.1 Baseline concentrations of NO₂, PM₁₀ and PM₂.₅ have been modelled at the existing receptor location and the results are shown in **Table 6**. Pollutant concentrations are predicted to be below the AQALs at all of the receptors in 2019 and 2025.

Table 6: Predicted Baseline Concentrations in 2019 and 2025

Receptor	Annual Mean (µg/m³)					
	NO₂		PM₁₀		PM₂.₅	
	2019	2025	2019	2025	2019	2025
R1	30.1	20.0	15.1	14.3	9.6	8.9
R2	26.3	18.0	14.1	13.4	9.2	8.6
R3	24.9	18.0	13.8	13.0	9.0	8.4
R4	29.0	20.4	14.1	13.3	9.2	8.5
R5	26.3	19.0	14.2	13.5	9.3	8.6
R6	26.9	19.3	14.3	13.6	9.3	8.7
R7	28.7	19.3	15.8	15.1	10.0	9.3
R8	28.9	20.0	14.9	14.2	9.8	9.2
R9	31.3	21.3	15.2	14.4	10.0	9.3
R10	33.4	22.5	14.9	14.0	9.9	9.1
R11	28.4	20.0	14.6	13.8	9.7	9.0
R12	33.0	22.5	15.1	14.3	10.0	9.3
R13	36.4	24.4	15.8	15.0	10.4	9.6
R14	29.9	20.5	14.3	13.5	9.5	8.8
AQAL	**40**		**32**		**20**	

5   Road Traffic Impacts

5.1.   NO$_2$

5.1.1   Predicted annual mean NO$_2$ concentrations are shown in **Table 7**. The predicted concentrations are all below the AQAL and the impacts are described as negligible.

Table 7: Predicted NO$_2$ Impacts in 2025 [a]

Receptor	Annual Mean (µg/m^3)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	20.0	20.0	0	50	Negligible
R2	18.0	18.0	0	45	Negligible
R3	18.0	18.1	0	45	Negligible
R4	20.4	20.4	0	51	Negligible
R5	19.0	19.0	0	48	Negligible
R6	19.3	19.3	0	48	Negligible
R7	19.3	19.3	0	48	Negligible
R8	20.0	20.0	0	50	Negligible
R9	21.3	21.4	0	53	Negligible
R10	22.5	22.5	0	56	Negligible
R11	20.0	20.0	0	50	Negligible
R12	22.5	22.5	0	56	Negligible
R13	24.4	24.4	0	61	Negligible
R14	20.5	20.5	0	51	Negligible
AQAL	40		-		

a   WO = without scheme, W = with scheme.

5.2.   PM$_{10}$

5.2.1   Predicted annual mean PM$_{10}$ concentrations are shown in **Table 8**. The predicted concentrations are all well below the AQAL and the impacts are described as negligible.

Table 8: Predicted PM$_{10}$ Impacts in 2025 [a]

Receptor	Annual Mean (µg/m^3)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	14.3	14.3	0	45	Negligible

Receptor	Annual Mean (µg/m³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R2	13.4	13.3	0	42	Negligible
R3	13.0	13.1	0	41	Negligible
R4	13.3	13.3	0	42	Negligible
R5	13.5	13.5	0	42	Negligible
R6	13.6	13.6	0	43	Negligible
R7	15.1	15.1	0	47	Negligible
R8	14.2	14.2	0	44	Negligible
R9	14.4	14.4	0	45	Negligible
R10	14.0	14.1	0	44	Negligible
R11	13.8	13.8	0	43	Negligible
R12	14.3	14.3	0	45	Negligible
R13	15.0	15.0	0	47	Negligible
R14	13.5	13.5	0	42	Negligible
AQAL	32			-	

a   = without scheme, W = with scheme.

5.3.   PM$_{2.5}$

5.3.1   Predicted annual mean PM$_{2.5}$ concentrations are shown in **Table 9**. The predicted annual mean PM$_{2.5}$ concentrations are all well below the AQAL and the impacts are described as negligible.

5.3.2   The with development predicted annual mean PM$_{2.5}$ concentrations are all well below the assessment target value of 15µg/m³; therefore, the proposed development would not hinder progress towards the 2028 12µg/m³ interim target.

Table 9: Predicted PM$_{2.5}$ Impacts in 2025 ^{a}

Receptor	Annual Mean (µg/m³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R1	8.9	8.9	0	59	Negligible
R2	8.6	8.5	0	57	Negligible
R3	8.4	8.4	0	56	Negligible
R4	8.5	8.5	0	57	Negligible

Receptor	Annual Mean (µg/m³)		% Change in Concentration Relative to AQAL	Total Concentration as % of AQAL	Impact Descriptor
	WO	W			
R5	8.6	8.6	0	58	Negligible
R6	8.7	8.7	0	58	Negligible
R7	9.3	9.3	0	62	Negligible
R8	9.2	9.2	0	61	Negligible
R9	9.3	9.3	0	62	Negligible
R10	9.1	9.1	0	61	Negligible
R11	9.0	9.0	0	60	Negligible
R12	9.3	9.3	0	62	Negligible
R13	9.6	9.7	0	64	Negligible
R14	8.8	8.8	0	59	Negligible
AQAL	20			-	

a   WO = without scheme, W = with scheme.

6   Mitigation

6.1.1   The assessment has demonstrated that the air quality impact due to the scheme will be negligible and will not cause any new exceedances of the air quality objectives. Mitigation measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation.

6.1.2   The planning application is an outline application. A Travel Plan is likely to be required under reserved matters, with details of electric vehicle and cycle parking provision and promotion of sustainable transport modes provided. It is not considered appropriate to propose further mitigation measures for this scheme.

7   Residual Impacts

7.1.1   The residual impacts will be the same as those identified in **Section 5**.

8   Conclusions

8.1.1   The air quality impacts due to the operation of the proposed development have been assessed.

8.1.2   Concentrations have been modelled at fourteen existing receptors representing properties where the impacts from vehicle emissions are expected to be greatest.

8.1.3   It is concluded that concentrations of NO_2, PM_{10} and $PM_{2.5}$ will remain below the AQALs at the receptors in 2025, whether the scheme is developed or not, and the impacts will be negligible.

8.1.4   The overall operational air quality impact of the proposed development is judged to be *insignificant*. This conclusion is based on the impacts being described as negligible at all of the receptors and total concentrations being below the air quality objectives/standards.

8.1.5   There should be no constraints to the proposed development with regard to air quality as the development is consistent with the relevant parts of:

- The NPPF and Air Quality PPG; and
- Policy LP51 of the Kirklees Local Plan Strategy and Policies.

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10   Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System
AQAL	Air quality assessment level
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
EPUK	Environmental Protection UK
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO$_2$	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO$_2$ + NO)
NPPF	National Planning Policy Framework
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
PM$_{10}$	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM$_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
SPD	Supplementary Planning Document
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

11   Appendices

A1   Modelling Methodology

A1.1.   Traffic Data

A1.1.1   Traffic data have been provided by Fore Consulting Limited. Traffic speeds have been estimated based on the speed limit and the road layout, reduced to 20km/h within 25m of a junction stop line. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by the DfT (DfT, 2022). The traffic data used to calculate emissions are shown in **Table A1** and the modelled road network is shown in **Figure 3**.

Table A1: Summary of Traffic Data used in the Assessment

Road Link	AADT			% HDVs [a]	
	2019	2025 Without Dev.	2025 With Dev.	Without Dev.	With Dev.
A644 Wakefield Road, NW of Cooper Bridge Roundabout	22,540	23,777	23,920	7.4	7.1
A644 Leeds Road, Between Cooper Bridge Rbt and Huddersfield Road junction	28,902	30,489	30,854	5.2	5.2
A644 Huddersfield Road, NW of Mirfield	12,707	13,405	13,385	5.8	5.3
A62 Cooper Bridge Road, SW of Cooper Bridge Roundabout	33,669	35,517	35,630	5.1	5.1
A62 Cooper Bridge Road, E of A6107 Bradley Road junction	33,670	35,518	35,631	5.1	5.1
A62 Leeds Road, W of St Andrews Road	28,033	29,572	29,662	4.1	4.1
A62 Leeds Road, N of Sunny Bank Road	19,245	20,302	20,460	2.3	2.2
A6107 Bradley Road, E of A641 Junction	19,258	20,315	20,338	1.8	1.8

a   HDV is heavy duty vehicle >3.5 tonnes (heavy goods vehicle + buses).

Emissions

A1.1.2   Emissions have been calculated using the most recent version of the Emissions Factor Toolkit (EFT) v11. The traffic data were entered into the EFT in order to calculate a combined emission rate for each of the road links in the modelled network.
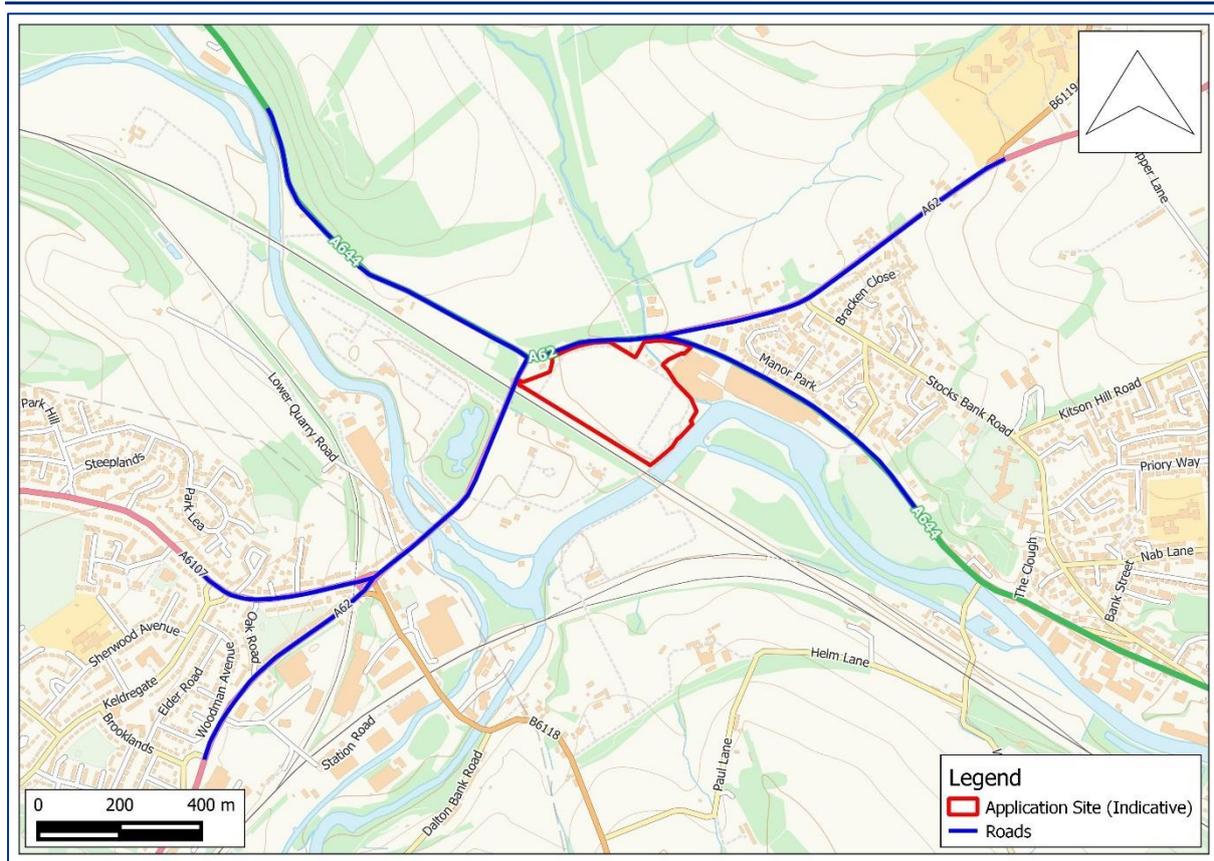
Figure 3: Modelled Roads
Contains Ordnance Survey data © Crown copyright and database right 2023

Meteorological Data

A1.1.3   The model has been run using the full year of meteorological data that corresponds with the nitrogen dioxide monitoring data used for the model verification (2019). The meteorological data has been taken from the monitoring station located at Leeds Bradford Airport meteorological station, which is considered suitable for the area.

A1.2.   Background Concentrations

A1.2.1   Background concentrations have been derived from those published by Defra (Defra, 2023c). These cover the whole country on a 1 km by 1 km grid and are published for each year from 2018 to 2030. The current maps have been verified against measurements undertaken during 2018.

A1.3.   Verification

A1.3.1   The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations. The verification methodology is described below.

NO_2

A1.3.2   Most NO_2 is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant

emissions of nitrogen oxides ($NOx = NO + NO_2$). The model has been run to predict the 2019 annual mean NOx concentrations at diffusion tube monitoring sites K6, K9, K10, K12, K22 and K23 (as described in **Table 4** and shown in **Figure 3**). Travel restrictions to control the Covid-19 pandemic resulted in low measured concentrations in 2020 and 2021 and the use of this data for verification would likely result in an underprediction of future concentrations.

A1.3.3   The model output of road-NOx has been compared with the 'measured' road-NOx, calculated from the measured annual mean NO_2 concentrations and the background concentrations using the NOx from NO_2 calculator v8.1 published by Defra (Defra, 2023c).

A1.3.4   The slope of the best-fit line between the 'measured' road-NOx contribution and the model derived road-NOx contribution, forced through zero, has been used to determine the adjustment factor (**Figure 4**). The adjustment factor of 2.1 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The NOx to NO_2 calculator has then been used to determine total NO_2 concentrations from the adjusted modelled road-NOx concentrations and the background NO_2 concentrations.

A1.3.5   A comparison of the final adjusted modelled total NO_2 at each monitoring site to the measured total NO_2 shows close agreement (**Figure 5**).

A1.3.6   The results imply that the model has under-predicted the road-NOx contribution. This is a common experience with this and most other models. An evaluation of the model performance using statistical methods is shown in **Table A2**.

PM$_{10}$ and PM$_{2.5}$

A1.3.7   As no monitoring of PM was undertaken within the study area in 2019 and the adjustment factor for NOx has been used to adjust modelled road PM_{10} and $PM_{2.5}$.

A1.4.   Model Post-processing

NO$_2$

A1.4.1   The NOx to NO_2 calculator v8.1 published by Defra has been used to convert the modelled, verified road-NOx output for each receptor to road-NO_2. The background NO_2 concentrations have then been added to the predicted road-NO_2 concentrations to give the final predicted concentrations.

PM$_{10}$ and PM$_{2.5}$

A1.4.2   The verified road-PM outputs need no further processing and have been added to the background concentrations to give the final predicted concentrations.
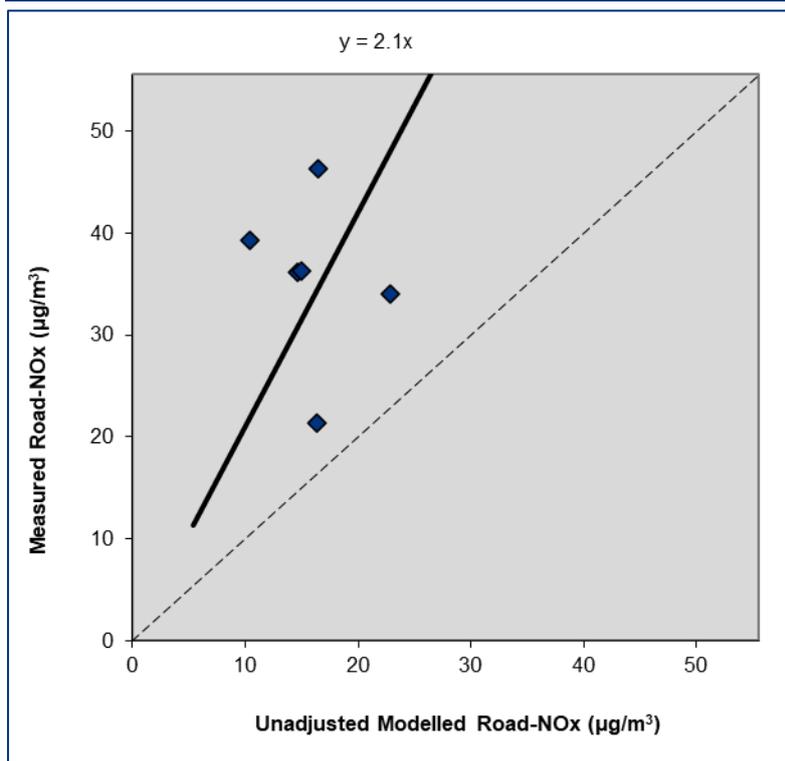
Figure 4: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations.
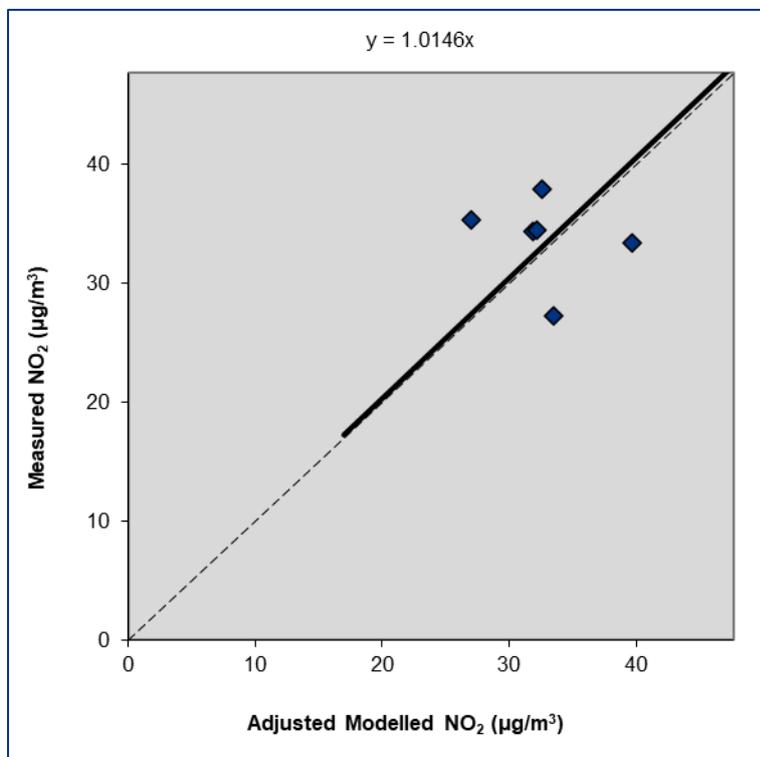

Figure 5: Comparison of Measured Total NO₂ to Primary Adjusted Modelled Total NO₂ Concentrations.

Table A2: Evaluation of Model Performance

Statistical Parameter	Description	Values		
		Before Verification (Figure 4)	After Verification (Figure 5)	Ideal
Correlation coefficient	Linear relationship between predicted and observed data. Less useful for small datasets as single high/low values can have a large effect.	-0.19	-0.25	1.00
Fractional bias	Identifies systematic tendency to over/under predict (negative = over-predict, positive = under-predict).	0.76	0.03	0.00
Root mean square error (RMSE)	Average error of the model ($\mu g/m^3$). Ideally within 10% of the annual mean NO_2 objective, i.e., 4 $\mu g/m^3$; however, within 25% is acceptable, i.e., 10 $\mu g/m^3$.	21.58	5.61	0.00

A2   Professional Experience

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Bob Thomas is a Director at AQA, with over twenty years working in the sciences and fifteen years' experience in the field of air quality management and assessment. He has carried out air quality assessments for a wide range of developments, including residential, commercial, industrial, minerals and waste developments. He has been responsible for air quality projects that include ambient air quality monitoring of nitrogen dioxide, dust and PM_{10}, the assessment of nuisance odours and dust, and the preparation of Review and Assessment reports for local authorities. He has extensive dispersion modelling experience for road traffic, energy centre and industrial sources, and has completed many stand-alone reports and chapters for inclusion within an Environmental Statement. Bob has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers, architects and process operators, and has provided expert witness services at public inquiry. He is a Chartered Scientist, a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

A full CV for Bob Thomas is available at http://aqassessments.co.uk/about