Air Quality
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Air Quality Assessment: Land off Keresforth Road, Dodworth

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Executive Summary

The air quality impacts associated with the proposed residential development of land off Keresforth Road in Dodworth have been assessed. The proposed development will consist of up to 215 new dwellings.

The assessment has demonstrated that future residents of the proposed development will experience acceptable air quality, with pollutant concentrations below the air quality objectives.

The proposed development will generate additional traffic on the local road network, but the assessment has shown that there will be no significant effects at any existing, sensitive receptor.

During the construction works, a range of best practice mitigation measures will be implemented to reduce dust emissions and the overall effect will be 'not significant'; appropriate measures have been set out in this report, to be included in the Dust Management Plan for the works.

Overall, the construction and operational air quality effects of the proposed development are judged to be 'not significant'.

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1 Introduction

1.1 This report describes the potential air quality impacts associated with the proposed residential development of land off Keresforth Road, in Dodworth. The proposed development is described as:

"Residential development of up to 215 dwellings and associated works (Outline application with all matters reserved apart from means of access)".

1.2 The proposed development lies partially within an Air Quality Management Area (AQMA) declared by Barnsley Metropolitan Borough Council (BMBC) for exceedances of the annual mean nitrogen dioxide (NO_2) objective. It will introduce new residential exposure into this area of potentially poor air quality, thus an assessment is required to determine the air quality conditions that future residents will experience. The proposed development will also generate additional traffic on local roads, which may impact on air quality at existing residential properties along the affected road network. The main air pollutants of concern related to road traffic emissions are NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$).

1.3 The location of the proposed development is shown in Figure 1, along with the nearby AQMAs.

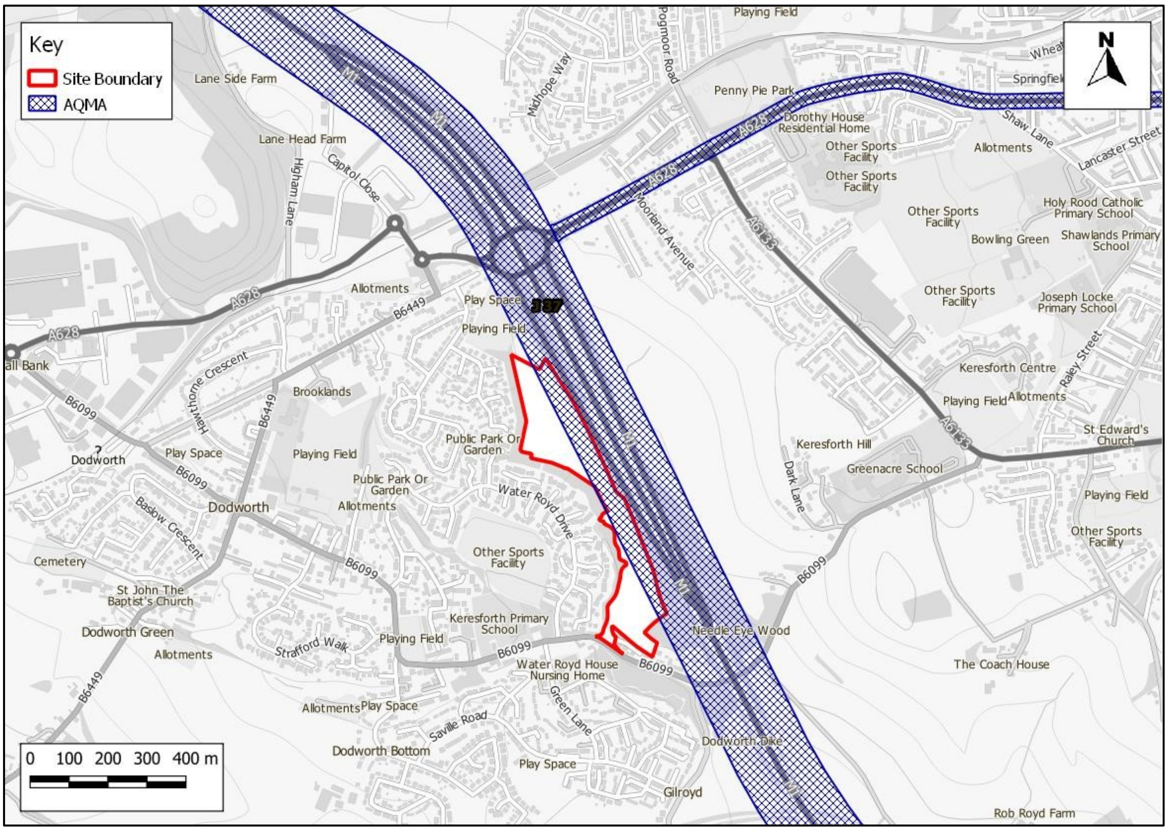

Figure 1: Proposed Development Setting in the Context of Air Quality

1.4 The new homes within the proposed development will be provided with heat and hot water by individual boilers within each unit; there will be no centralised energy plant and thus no significant point sources of emissions within the proposed development.

1.5 There is also the potential for the construction activities to impact upon existing properties. The main pollutants of concern related to construction activities are dust and PM_{10}.

1.6 This report describes existing local air quality conditions (base year 2019; 2020 was not used due to the impacts of the Covid-19 pandemic, discussed further in Paragraphs 4.18 and 4.19), and the predicted air quality in the future assuming that the proposed development does, or does not proceed. The assessment of traffic-related impacts focuses on 2023, which is the anticipated first year of occupation of any new homes. The assessment of construction dust impacts focuses on the anticipated duration of the works.

1.7 This report has been prepared taking into account all relevant local and national guidance and regulations. Damage cost calculations have been provided in accordance with BMBC's Air Quality and Emissions Good Practice Planning Guidance (Barnsley Metropolitan Borough Council, 2021a).

2 Policy Context

2.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy

2.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

2.3 The Clean Air Strategy (Defra, 2019) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Reducing Emissions from Road Transport: Road to Zero Strategy

2.4 The Office for Low Emission Vehicles (OLEV) and Department for Transport (DfT) published a Policy Paper (DfT, 2018) in July 2018 outlining how the government will support the transition to zero tailpipe emission road transport and reduce tailpipe emissions from conventional vehicles during the transition. This paper affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040, and states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. It states that the Government wants to see at least 50%, and as many as 70%, of new car sales, and up to 40% of new van sales, being ultra-low emission by 2030.

2.5 The paper sets out a number of measures by which Government will support this transition, but is clear that Government expects this transition to be industry and consumer led. The Government has since announced that the phase-out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030 and that all new cars and vans must be fully zero emission at the tailpipe from 2035. If these ambitions are realised then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades, likely beyond the scale of reductions forecast in the tools utilised in carrying out this air quality assessment.

Environment Act 2021

2.6 The UK's new legal framework for protection of the natural environment, the Environment Act 2021 passed into UK law on 9th November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.

2.7 The Act requires the Government to set at least one long-term target (spanning a minimum of 15 years), supported by interim targets set in a five year cycle, in each of four identified areas: Air Quality, Biodiversity, Water and Resource Efficiency and Waste Reduction. An additional target for mean levels of $PM_{2.5}$ is also required. These targets must be set before November 2022; a scope for what these targets will involve has been outlined but they are not yet precisely defined. As the targets have not yet been either finalised or adopted by the Government, they cannot impact on current planning policy.

Planning Policy

National Policies

2.8 The National Planning Policy Framework (NPPF) (2021) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (Paragraph 8c) is an 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".

2.9 To prevent unacceptable risks from air pollution, Paragraph 174 of the NPPF states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…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 quality".

2.10 Paragraph 185 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".

2.11 More specifically on air quality, Paragraph 186 makes clear 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".

2.12 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that:

"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with 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".

2.13 Regarding plan-making, the PPG states:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

2.14 The role of the local authorities through the LAQM regime is covered, with the PPG stating that a local authority Air Quality Action Plan "*identifies measures that will be introduced in pursuit of the objectives and can have implications for planning*". In addition, the PPG makes clear that *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*.

2.15 Regarding the need for an air quality assessment, the PPG states 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".

2.16 The PPG sets out the information that may be required in an air quality assessment, making clear 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".

2.17 The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It 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. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

Local Policies

2.18 The Barnsley Local Plan (Barnsley Metropolitan Borough Council, 2019b) was adopted in 2019. Policy Poll1: Pollution Control and Protection states that:

"Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.

Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate."

2.19 Policy AQ1 covers the planning obligations for developments within or close to an AQMA:

"Development which impacts on areas sensitive to air pollution in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development…

… We will only allow development which impacts on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development."

2.20 With regards to energy generation, Policy RE1 on Low Carbon and Renewable Energy states that:

"All developments will be expected to seek to incorporate initially appropriate design measures, and thereafter decentralised, renewable or low carbon energy sources in order to reduce carbon dioxide emissions and should at least achieve the appropriate carbon compliance targets as defined in the Building Regulations."

2.21 In addition, BMBC has published Air Quality and Emissions Good Practice Planning Guidance dealing with planning obligations (Barnsley Metropolitan Borough Council, 2021a). This guidance outlines the requirements of an air quality assessment for development, depending on the potential impacts on the local air quality environment. It also outlines the requirement and methodology for damage cost calculation and construction dust risk assessment.

Building Standards

2.22 Part F(1) of the Building Regulations 2010 (Ministry of Housing, Communities & Local Government, 2020) places a duty on building owners, or those responsible for relevant building work[1], to ensure adequate ventilation is provided to building occupants. Compliance with the Building Regulations is not required for planning approval, but it is assumed that the Regulations will be complied with in the completed building.

2.23 Approved Document F, which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. The versions of Approved Document F which apply from 15 June 2022 explain that specific steps should be taken to manage ventilation intakes where the building is near to a significant source of emissions, or if local ambient concentrations exceed values set in the Air Quality Standards Regulations 2010 (see Paragraph **Error! Reference source not found.**, later). These steps include maximising the distance between emission source and air intake, considering likely dispersion patterns, and considering the timing of pollution releases when designing the ventilation system.

[1] Building work is a legal term for work covered by the Building Regulations. With limited exemptions, the Regulations apply to all significant building work, including erecting or extending a building.

Air Quality Action Plans

National Air Quality Plan

2.24 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a CAZ. There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in the modelling undertaken for this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Local Air Quality Action Plan

2.25 BMBC's Air Quality Action Plan (Barnsley Metropolitan Borough Council, 2019a) sets out a series of measures by which they will seek to achieve the air quality objectives in their AQMAs. Measure 5 is especially relevant to this assessment, as it focusses on the planning obligations outlined in the Air Quality and Emissions Good Practice Planning Guidance.

3 Assessment Criteria

3.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

3.2 The UK-wide objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective was to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 $\mu g/m^3$ (Defra, 2021a). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level. Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 $\mu g/m^3$ (Defra, 2021a). The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 $\mu g/m^3$ it is unlikely that the 24-hour mean objective will be exceeded.

3.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2021a). The annual mean objectives for nitrogen dioxide and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

3.4 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010). The limit values for nitrogen dioxide and PM_{10} are the same numerical concentrations as the UK objectives, whilst the limit value for $PM_{2.5}$ is 20 $\mu g/m^3$. Achievement of these values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

3.5 The relevant air quality criteria for this assessment are provided in Table 1.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Objective
Nitrogen Dioxide	1-hour Mean	200 µg/m³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m³
PM_{10}	24-hour Mean	50 µg/m³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m³ [a]
$PM_{2.5}$ [b]	Annual Mean	25 µg/m³

[a] A proxy value of 32 µg/m³ as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2021a).

[b] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Construction Dust Criteria

3.6 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management (IAQM)[2] (2016) has been used. Full details of this approach are provided in Appendix A1.

Screening Criteria

3.7 Environmental Protection UK (EPUK) and the IAQM recommend a two-stage screening approach (Moorcroft and Barrowcliffe et al, 2017) to determine whether emissions from road traffic generated by a development have the potential for significant air quality impacts. The approach, as described in Appendix A2, first considers the size and parking provision of a development; if the development is residential and is for fewer than ten homes or covers less than 0.5 ha, or is non-residential and will provide less than 1,000 m² of floor space or cover a site area of less than 1 ha, and will provide ten or fewer parking spaces, then there is no need to progress to a detailed assessment.

3.8 The second stage then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in Appendix A2) inside an AQMA are a change in flows of more than 25 heavy duty vehicles or 100 light duty vehicles per day; outside of an AQMA the thresholds are 100 heavy duty vehicles or 500 light duty vehicles. Where these criteria are exceeded, a detailed assessment is likely to be required,

[2] The IAQM is the professional body for air quality practitioners in the UK.

although the guidance advises that *"the criteria provided are precautionary and should be treated as indicative"*, and *"it may be appropriate to amend them on the basis of professional judgement"*.

3.9 While these screening criteria are specifically intended to act as a trigger for a detailed assessment, they can also sometimes be used to identify the extent of the road network that requires assessment. Where the change in traffic on a given road link is less than the relevant screening threshold, it is unlikely that a significant impact would occur, and these links can be disregarded unless there are additional development-related emissions affecting receptors along the link.

4 Assessment Approach

Study Area

4.1 The study area for the assessment has been identified using professional judgement, focussing on the areas where impacts are anticipated to be greatest. It includes the application site itself and all of the roads along which the development will lead to a potentially significant change in traffic flows. Specifically, the assessment has focussed on the B6099 Keresforth Road, the M1 and the A628 Dodworth Road. Figure 1 in Section 1 of this report effectively shows the study area.

4.2 The construction dust assessment considers the potential for impacts within 350 m of the site boundary, or within 50 m of roads used by construction vehicles within 500 m of the site. The specific areas considered are detailed in Section 6.

Receptors

4.3 Concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been predicted at a number of locations both within, and close to, the proposed development. Receptors have been identified to represent a range of exposure, including worst-case locations (these being at the façades of the residential properties closest to the sources). When selecting receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested and where there is a combined effect of several road links, and close to those roads where the traffic increases as a result of the proposed development will be greatest.

4.4 Fifteen existing properties have been identified as receptors for the assessment. Seven additional receptor locations have been identified within the new development, which represent exposure to existing sources. These locations are described in Table 2 and shown in Figure 2. In addition, concentrations have been modelled at several diffusion tube monitoring sites located at the roadside of the A628 Dodworth Road, in order to verify the model outputs (see Appendix A4 for verification method).

Table 2: Description of Receptor Locations

Receptor	Type	X coordinate	Y coordinate	Heights Modelled (m) [a]
Existing properties				
R1	Residential	432281	405959	1.5
R2	Residential	432344	405958	1.5
R3	Residential	432452	406017	1.5
R4	Residential	432494	406073	1.5
R5	Residential	432562	406077	1.5
R6	Residential	432438	404883	1.5
R7	Residential	432388	404928	1.5
R8	Residential	432505	404842	1.5
R9	School	432176	404903	1.5
R10	Residential	432031	404827	1.5
R11	Residential	432111	404842	1.5
R12	Residential	431880	405008	1.5
R13	Residential	431957	404825	1.5
R14	Residential	431511	405224	1.5
R15	Residential	431683	405131	1.5
New properties				
P1	Residential	432274	405569	1.5
P2	Residential	432327	405479	1.5
P3	Residential	432363	405432	1.5
P4	Residential	432417	405315	1.5
P5	Residential	432465	405237	1.5
P6	Residential	432531	405056	1.5
P7	Residential	432550	404961	1.5

[a] A height of 1.5 m is used to represent ground-floor level exposure.

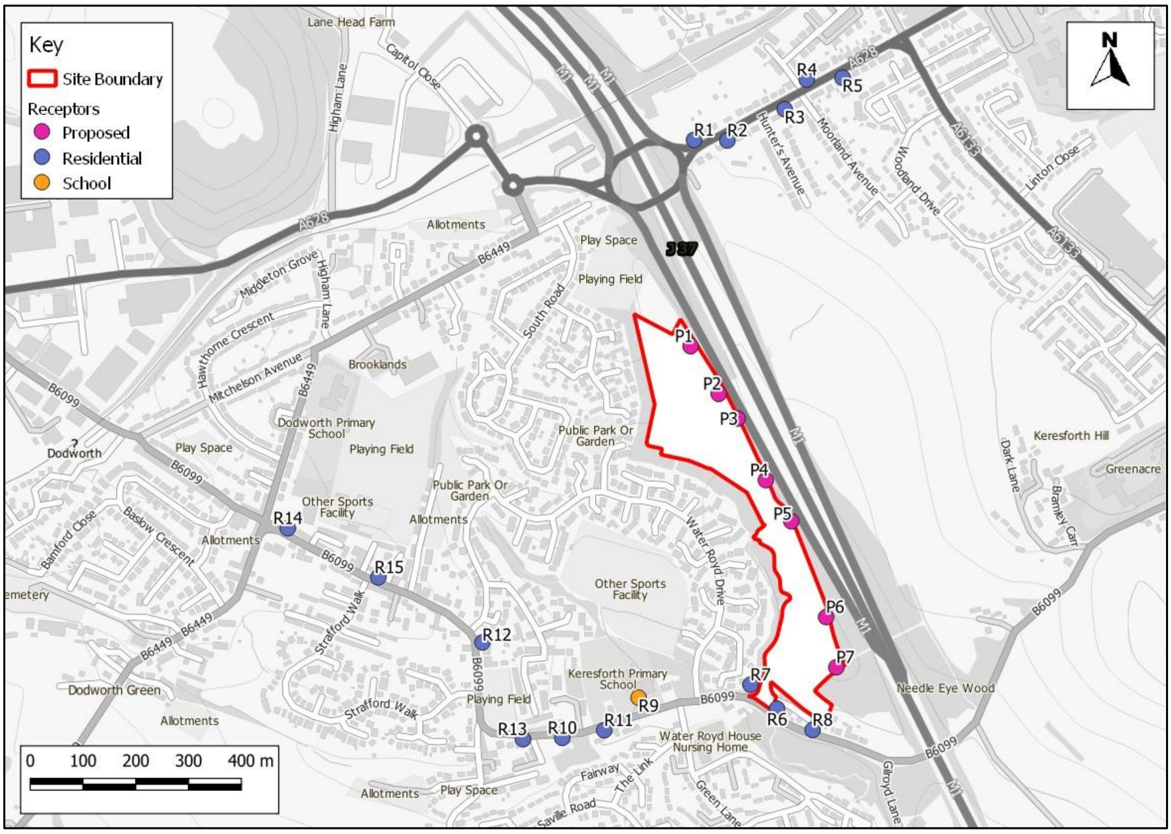

Figure 2: Receptor Locations

4.5 Selected receptors may be representative of air quality conditions at a number of properties; consideration has been given to how many sensitive locations each modelled receptor represents when considering the impacts of the proposed development and the overall significance of effects.

4.6 The construction dust risk assessment approach does not require specific receptors to be identified; instead, the numbers of different types of receptors within given distance bands are counted. These receptor counts are provided in Section 6.

Existing Conditions

4.7 Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:

- industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2022a);

- local sources have been identified through examination of the Council's Air Quality Review and Assessment reports;
- information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority;
- background concentrations have been defined using Defra's 2018-based background maps (Defra, 2022b). These cover the whole of the UK on a 1x1 km grid. The background annual mean nitrogen dioxide maps for 2019 have been calibrated against concurrent measurements from national monitoring sites (AQC, 2020a). The calibration factor calculated has also been applied to future year backgrounds. Mapped background concentrations of PM_{10} and $PM_{2.5}$ have not been adjusted; and
- whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide in the study area has been identified using the maps of roadside concentrations published by Defra (2020) (2022c). These are the maps used by the UK Government, together with the results from national Automatic Urban and Rural Network (AURN) monitoring sites that operate to the required data quality standards, to identify and report exceedances of the limit value. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations (Defra, 2022c), which are available for the years 2009 to 2019, show no exceedances of the limit values anywhere in the UK in 2019.

Construction Impacts

4.8 The construction dust assessment considers the potential for impacts within 350 m of the site boundary, or within 50 m of roads used by construction vehicles. The assessment methodology is that provided by IAQM (2016). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts. Appendix A1 explains the approach in more detail.

Road Traffic Impacts

Screening

4.9 The first step in considering the road traffic impacts of the proposed development has been to screen the development and its traffic generation against the criteria set out in the EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017), as described in Paragraph 3.7 and detailed further in Appendix A2. Where impacts can be screened out there is no need to progress to a more detailed assessment. The following sections describe the approach to dispersion modelling of road traffic emissions, which has been required for this project.

Modelling Methodology

4.10 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emission Factor Toolkit (EFT) (v11.0) (Defra, 2022b). Details of the model inputs and the model verification are provided in Appendix A4.

Assessment Scenarios

4.11 Nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been predicted for the following scenarios:

- base year 2019;
- the proposed year of opening (2023) without the development; and
- 2023 with the development.

4.12 Predictions for 2023 are based on a return to 'typical' activity levels and assume no impact as a result of the Covid-19 pandemic in this year, to ensure a worst-case assessment (as the influence of the pandemic has generally been to reduce concentrations of the pollutants considered in this assessment); see Paragraphs 4.18 and 4.19.

4.13 Traffic flows were provided for 2027, in line with the Transport Assessment. However, emission factors and background concentrations for 2023 were used in the Air Quality Assessment, as this is the first year of occupation of any new homes. Baseline traffic flows in 2027 will be higher than in 2023, and therefore this approach will result in higher predicted baseline concentrations in 2023.

Impact Description

4.14 The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has been used in describing the modelled impacts. The approach identifies impacts at individual receptors based on the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. Table 3 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table 3: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]

Long-Term Average Concentration At Receptor In Assessment Year [b]	Change in concentration relative to AQAL [c]				
	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.

[b] This is the “Without Scheme” concentration where there is a decrease in pollutant concentration and the “With Scheme” concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, GLA target or an Environment Agency ‘Environmental Assessment Level (EAL)’.

Uncertainty

4.15 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

4.16 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A4). This can only be done for the road traffic model. Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2019) concentrations.

4.17 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions. Historic versions of Defra’s EFT tended to over-state emissions reductions into the future. However, analyses of the most recent versions of Defra’s EFT carried out by AQC (2020b) (2020c) suggest that, on balance, these versions are unlikely to over-state the rate at which NOx emissions decline in the future at an ‘average’ site in the UK. In practice, the balance of evidence suggests that NOx concentrations are most likely to decline more quickly in the future, on average, than predicted by the current EFT, especially against a base year of 2016 or later. Using EFT v11.0 for future-year forecasts in this report thus provides a robust assessment, given that the model has been verified against measurements made in 2019.

4.18 Forecasts of future-year concentrations are usually based on measurements made during a recent year. They then take account of projected changes over time to factors such as the composition of the vehicle fleet and the uptake of other new technologies, as well as population increases etc.. In early 2020, activity in the UK was disrupted by the Covid-19 pandemic. As a result, concentrations of traffic-related air pollutants fell appreciably (Defra Air Quality Expert Group, 2020). While the pandemic may cause long-lasting changes to travel activity patterns, it is reasonable to expect a return to more typical activity levels in the future. 2020 is thus likely to present as an atypically low pollution year for roadside pollutant concentrations, as is 2021.

4.19 It is not currently possible to make robust predictions of the rate at which travel activity patterns will return to historically-normal levels; or the extent of any long-lasting changes to travel behaviour. The most robust approach to making future-year projections is thus to base these on measurements made during 2019, and to use activity forecasts made before the impact of the pandemic was understood, which is the approach that has been taken in this assessment.

Assumptions

4.20 It is necessary to make a number of assumptions when carrying out an air quality assessment; in order to account for some of the uncertainty in the approach, as described above, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- the assumption that the proposed development is complete and fully occupied in 2023; and
- that the Emley Moor meteorological monitoring station appropriately represents conditions in the study area (this is discussed further in Appendix A4).

Assessment of Significance

Construction Dust Significance

4.21 Guidance from IAQM (2016) is that, with appropriate mitigation in place, the effects of construction dust will be ‘not significant’. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be ‘not significant’.

Operational Significance

4.22 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors; the experience of the consultants preparing the report is set out in Appendix A3. Full details of the EPUK/IAQM approach are provided in Appendix A2.

Damage Cost Calculations

4.23 The calculation of damage costs has utilised the most recent EFT (Defra, 2022b), used to determine the development's transport emissions, alongside Defra's damage cost toolkit (Defra, 2021b), used to determine the associated damage costs for those emissions.

4.24 The calculation process includes:

- identifying the additional trips or vehicle numbers generated by the proposed development;
- calculating the emissions from these trips for the pollutants of concern (NOx and $PM_{2.5}$) using the EFT, for each of the five years assessed, starting with the year of opening. This calculation has assumed a 10 km trip length and a 48 kph average speed;
- calculating the damage costs for the specific pollutant emissions using the damage cost toolkit, based on the costs for road transport. The toolkit allows for reductions in emissions over time, applies a discount in line with HM Treasury's Green Book and also adjusts for inflation; and
- extracting the 'Central' total value for each pollutant and summing these for use as the damage cost total for the scheme.

5 Baseline Conditions

Relevant Features

5.1 The proposed development is located approximately 1 km to the east of Dodworth Railway Station, adjacent to the M1. The application site is bounded by the M1 junction 37 slip road to the east, existing residential areas of Dodworth to the west and the B6099 Keresforth Road to the south. It currently consists of undeveloped land.

5.2 The proposed development is located partially within an AQMA, as highlighted in Figure 1.

Industrial sources

5.3 No significant industrial sources have been identified that are likely to affect the proposed development, in terms of air quality.

Local Air Quality Monitoring

5.4 BMBC operates three automatic monitoring stations within its area, including the CM2 monitor located adjacent to the A628. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by South Yorkshire Air Quality Samplers (using the 50% TEA in acetone method). These include multiple locations adjacent to the A628 Dodworth Road. Annual mean results for the years 2016 to 2020 are summarised in Table 4. The monitoring locations are shown in Figure 3. The monitoring data have been taken from BMBC's 2020 Annual Status Report (Barnsley Metropolitan Borough Council, 2021b).

Table 4: Summary of Annual Mean NO_2 Monitoring (2016-2020) ($\mu g/m^3$) [a]

Site No.	Site Type	Location	2016	2017	2018	2019	2020
CM2	Roadside	A628 Barnsley	36.0	35.0	32.0	32.0	25.0
DT14	Roadside	Dodworth Road	**49.2**	**44.4**	39.4	**40.5**	26.6
DT18	Roadside	Pogmoor Road	36.9	34.1	27.6	30.3	16.2
DT19	Roadside	Crown Hill Road	28.1	28.7	25.7	27.2	18.1
DT20	Roadside	Dodworth Road	**43.4**	**40.9**	37.0	39.6	29.3
DT21	Roadside	Dodworth Road	**51.1**	**49.1**	**45.8**	**46.2**	29.5
DT22	Kerbside	Dodworth Road	**52.7**	**50.0**	**44.2**	**48.1**	32.6
DT23	Roadside	Dodworth Road	**50.0**	**52.0**	**43.4**	**47.0**	28.9
Objective			40				

[a] Exceedances of the objectives are shown in bold.

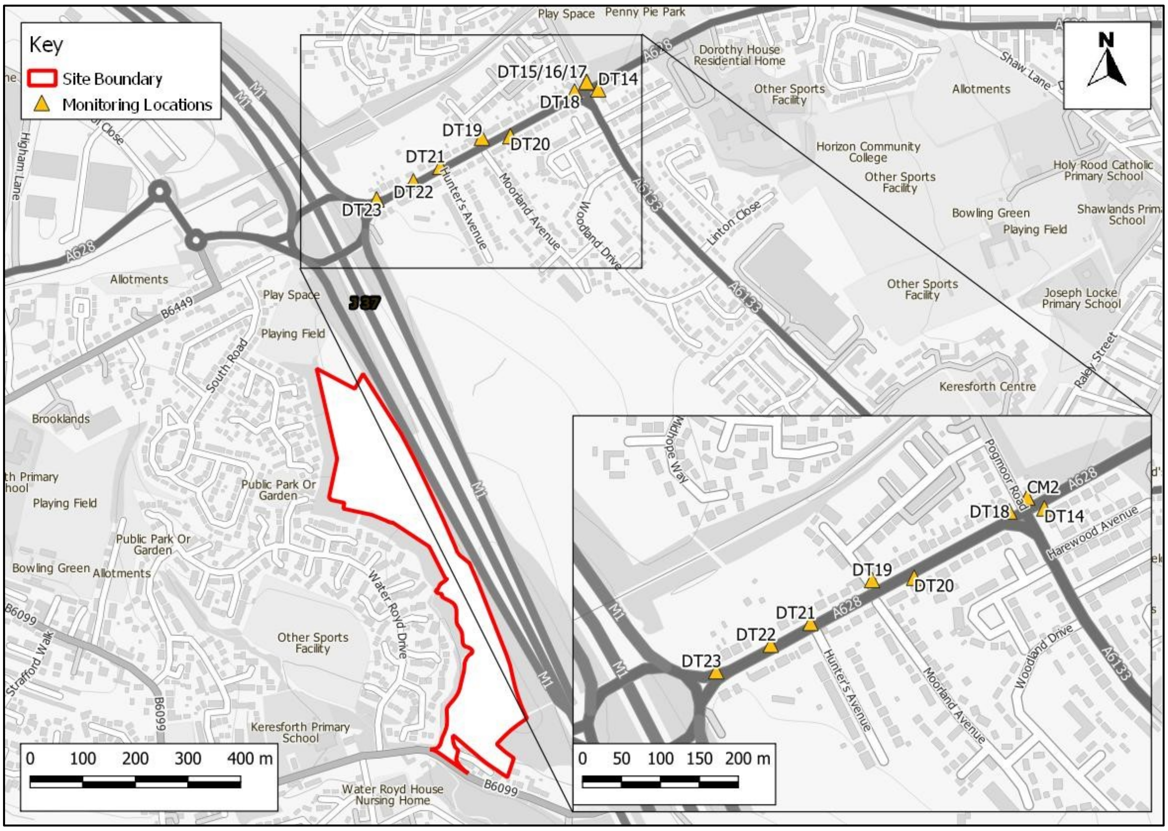

Figure 3: Monitoring Locations

5.5 Annual mean nitrogen dioxide concentrations have exceeded the objective at five of the eight monitoring sites within the study area since 2016, with four sites exceeding in 2019. Concentrations have remained below 60 µg/m^3 at all locations since 2016, indicating that exceedances of the 1-hour mean objective are unlikely. Concentrations have reduced at all monitoring sites between 2016 and 2019.

5.6 While 2020 results have been presented in this Section for completeness, they are not relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

5.7 No monitoring of PM_{10} or $PM_{2.5}$ concentrations is undertaken in the study area.

Exceedances of Limit Value

5.8 There are no AURN (Defra, 2021c) monitoring sites within the study area with which to identify exceedances of the annual mean nitrogen dioxide limit value. Defra's roadside annual mean nitrogen dioxide concentrations (Defra, 2022c), which are used to identify and report exceedances of the limit value, do not identify any exceedances within the study area in 2019. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the proposed development by the time that it is operational.

Background Concentrations

5.9 Estimated background concentrations in the study area are set out in Table 5 and are all well below the objectives. A range of values is presented as the study area covers multiple 1x1 km grid squares.

Table 5: Estimated Annual Mean Background Pollutant Concentrations in 2019 and 2023 (µg/m³)

Year	NO_2	PM_{10}	$PM_{2.5}$
2019	10.2 – 18.1	10.5 – 13.2	6.6 – 8.1
2023	8.8 – 14.7	10.0 – 12.6	6.2 – 7.6
Objective	**40**	**40**	**25** [a]

[a] The 25 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Baseline Dispersion Model Results

5.10 Baseline concentrations of nitrogen dioxide, PM_{10} and $PM_{2.5}$ have been modelled at each of the existing receptor locations (see Figure 2 and Table 2 for receptor locations). The results, which cover both the existing (2019) and future year (2023) baseline (Without Scheme), are set out in Table 6 for nitrogen dioxide and Table 7 for PM_{10} and $PM_{2.5}$. The modelled road components of nitrogen oxides have been increased from those predicted by the model based on a comparison with local measurements (see Appendix A4 for the verification methodology).

Table 6: Modelled Annual Mean Baseline Concentrations of Nitrogen Dioxide (µg/m³) at Existing Receptors [a]

Receptor	2019	2023 Without Scheme
R1	**53.4**	**41.1**
R2	**47.7**	36.8
R3	**41.3**	32.1
R4	36.2	28.2
R5	38.9	30.3
R6	23.9	18.7
R7	21.3	16.8
R8	26.5	20.6
R9	21.1	16.6

Receptor	2019	2023 Without Scheme
R10	25.4	19.8
R11	26.3	20.5
R12	20.6	16.4
R13	19.9	15.7
R14	24.0	18.9
R15	24.6	19.3
Objective	**40**	

[a] Exceedances of the objective are shown in bold.

Table 7: Modelled Annual Mean Baseline Concentrations of PM_{10} and $PM_{2.5}$ at Existing Receptors (µg/m^3)

Receptor	PM_{10} [a]		$PM_{2.5}$	
	2019	2023 Without Scheme	2019	2023 Without Scheme
R1	14.4	13.9	8.8	8.4
R2	14.3	13.8	8.7	8.3
R3	12.6	12.1	8.0	7.6
R4	12.3	11.8	7.9	7.5
R5	12.5	12.0	8.0	7.6
R6	13.0	12.5	7.8	7.4
R7	12.9	12.4	7.8	7.4
R8	13.2	12.7	7.9	7.5
R9	12.9	12.4	7.8	7.4
R10	13.1	12.6	7.9	7.5
R11	13.1	12.7	7.9	7.5
R12	11.0	10.5	7.1	6.7
R13	10.8	10.3	6.8	6.4
R14	11.1	10.6	7.1	6.7
R15	11.1	10.6	7.2	6.8
Assessment Criterion	**32** [a]		**25** [b]	

[a] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16 (Defra, 2021a). A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[b] The 25 µg/m^3 $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

5.11 The predicted annual mean concentrations of nitrogen dioxide exceed the objective at R1, R2 and R3 in 2019 but are below the objective in 2023; concentrations at all other receptors are below the objective in both 2019 and 2023. The annual mean nitrogen dioxide concentrations are well below 60 $\mu g/m^3$ at every receptor in both 2019 and 2023; it is, therefore, unlikely that the 1-hour mean nitrogen dioxide objective will be exceeded (see Paragraph 3.2).

5.12 The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are well below the objectives in both 2019 and 2023 at all receptors. The annual mean PM_{10} concentrations are also below 32 $\mu g/m^3$ and it is, therefore, unlikely that the 24-hour mean PM_{10} objective will be exceeded.

6 Construction Phase Impact Assessment

Construction Traffic

6.1 Typical traffic volumes generated by the site during the construction works will be considerably lower than the operational traffic generation, and below the relevant screening criteria of 100 AADT for heavy vehicles and 500 AADT for light vehicles recommended by EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017). As such, it is judged that the relevant screening thresholds will not be exceeded and there is no requirement for a detailed assessment of construction traffic impacts at existing receptors; it can be concluded that the proposed development will not have a significant impact on local roadside air quality during construction.

On-Site Exhaust Emissions

6.2 The IAQM guidance (IAQM, 2016) states:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur".

6.3 The proposed development is large, and the majority of the site area is more than 30 m from any sensitive receptors. The areas in which NRMM and site traffic will typically operate are thus likely to be located more than 30 m away from any sensitive properties. It is judged that there no risk of significant effects at existing receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

6.4 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway. Step 1 of the assessment procedure is to screen the need for a detailed assessment. There are receptors within the distances set out in the guidance (see Appendix A1), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

6.5 There is no requirement for demolition on site.

Earthworks

6.6 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2021), as set out in Table 8. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 8: Summary of Soil Characteristics

Category	Record
Soil Layer Thickness	Intermediate – Shallow
Soil Parent Material Grain Size	Mixed (Argillaceous [a] – Arenaceous [b])
European Soil Bureau Description	Mudstone and Sandstone
Soil Group	Heavy to Medium
Soil Texture	Clayey Loam [c] to Sandy Loam

[a] grain size < 0.06 mm.

[b] grain size 0.06 – 2.0 mm.

[c] a loam is composed mostly of sand and silt.

6.7 The site covers approximately 78,000 m^2 and most of this will be subject to earthworks. Dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials (such as dry soil). Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for earthworks is considered to be *large*.

Construction

6.8 The development will involve the construction of up to 215 brick built residential properties, with a total building volume in excess of 100,000 m^3. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for construction is considered to be *large*.

Trackout

6.9 The number of heavy vehicles accessing the site, which may track out dust and dirt, is currently unknown, but given the large size of the site it is likely that there will be a maximum of over 50 outward heavy vehicle movements per day. Based on the example definitions set out in Table A1.1 in Appendix A1, the dust emission class for trackout is considered to be *large*.

6.10 Table 9 summarises the dust emission magnitude for the proposed development.

Table 9: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	N/A
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

6.11 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

6.12 The IAQM guidance explains that residential properties are ‘high’ sensitivity receptors to dust soiling (Table A1.2 in Appendix A1). Residential properties are also classified as being of ‘high’ sensitivity to human health effects, while places of work are classified as being of ‘medium’ sensitivity. There are more than 10 residential properties within 20 m of the site (see Figure 4).

Figure 4: 20 m Distance Band around Site Boundary

Imagery ©2022 Google, Imagery ©2022 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2022.

6.13 Table 9 shows that the dust emission magnitude for trackout is *large* and Table A1.3 in Appendix A1 thus explains that there is a risk of material being tracked 500 m from the site exit. Since it is not known which roads construction vehicles will use, it has been assumed that all possible routes could be affected. There are approximately 25 residential properties within 20 m of the roads along which material could be tracked (see Figure 5).

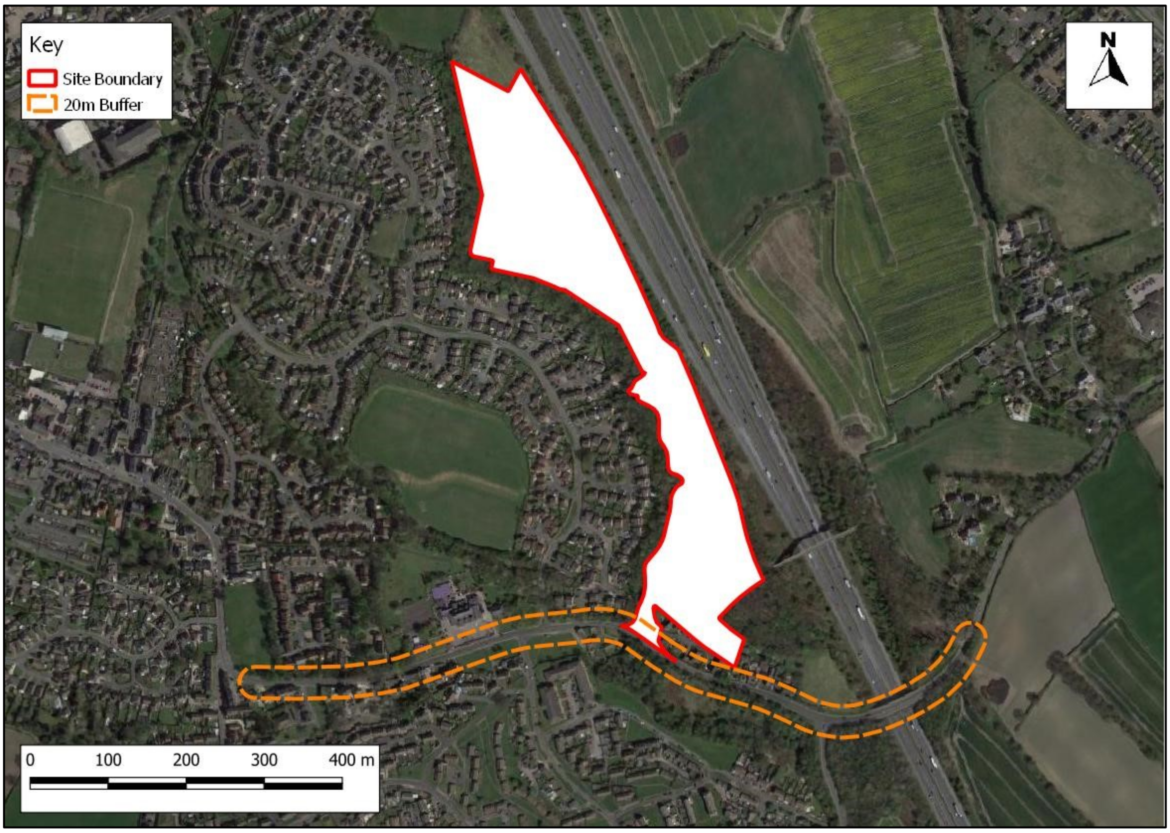

Figure 5: 20 m Distance Band around Roads Used by Construction Traffic Within 500 m of the Site Exit

Imagery ©2022 Google, Imagery ©2022 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2022.

Sensitivity of the Area to Effects from Dust Soiling

6.14 Using the information set out in Paragraph 6.12 and Figure 4 alongside the matrix set out in Table A1.3 in Appendix A1, the area surrounding the onsite works is of 'high' sensitivity to dust soiling. Using the information set out in Paragraph 6.13 and Figure 5 alongside the same matrix, the area is also of 'high' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

6.15 The matrix in Table A1.4 in Appendix A1 requires information on the baseline annual mean PM_{10} concentration in the area. The maximum predicted baseline PM_{10} concentration at the modelled existing receptors is 14.5 $\mu g/m^3$ (Table 7), and this value has been used. Using the information set out in Paragraphs 6.12 and Figure 4 alongside the matrix in Table A1.4 in Appendix A1, the area surrounding the onsite works is of 'low' sensitivity to human health effects. Using the information set out in Paragraph 6.13 and Figure 5 alongside the same matrix, the area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity.

Sensitivity of the Area to any Ecological Effects

6.16 The guidance only considers designated ecological sites within 50 m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50 m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

Summary of the Area Sensitivity

6.17 Table 10 summarises the sensitivity of the area around the proposed construction works.

Table 10: Summary of the Area Sensitivity

Effects Associated With:	Sensitivity of the Surrounding Area	
	On-site Works	Trackout
Dust Soiling	High Sensitivity	High Sensitivity
Human Health	Low Sensitivity	Low Sensitivity
Ecological	N/A	N/A

Risk and Significance

6.18 The dust emission magnitudes in Table 9 have been combined with the sensitivities of the area in Table 10 using the matrix in Table A1.6 in Appendix A1, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 11. These risk categories have been used to determine the appropriate level of mitigation as set out in Section 9 (step 3 of the assessment procedure).

Table 11: Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Earthworks	High Risk	Low Risk
Construction	High Risk	Low Risk
Trackout	High Risk	Low Risk

6.19 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (IAQM, 2016).

7 Operational Phase Impact Assessment

Impacts at Existing Receptors

7.1 The proposed development will generate traffic volumes that exceed the EPUK/IAQM screening thresholds on a number of local roads, thus a detailed assessment is required.

Nitrogen Dioxide

7.2 Predicted annual mean concentrations of nitrogen dioxide in 2023 for existing receptors are set out in Table 12 for both the "Without Scheme" and "With Scheme" scenarios. The impact at each receptor is also described using the impact descriptors given in Table 3.

Table 12: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2023 (µg/m^3)

Receptor	Without Scheme	With Scheme	% Change [b]	Impact Descriptor
R1	**41.1**	**41.1**	0	Negligible
R2	36.8	36.9	0	Negligible
R3	32.1	32.2	0	Negligible
R4	28.2	28.2	0	Negligible
R5	30.3	30.4	0	Negligible
R6	18.7	19.1	1	Negligible
R7	16.8	17.2	1	Negligible
R8	20.6	21.1	1	Negligible
R9	16.6	16.9	1	Negligible
R10	19.8	20.4	1	Negligible
R11	20.5	21.1	1	Negligible
R12	16.4	16.7	1	Negligible
R13	15.7	16.2	1	Negligible
R14	18.9	19.4	1	Negligible
R15	19.3	19.9	1	Negligible
Objective	**40**		**-**	**-**

[a] Exceedances of the objective are shown in bold.

[b] % changes are relative to the objective and have been rounded to the nearest whole number.

7.3 The annual mean nitrogen dioxide concentrations are below the objective at all but one receptor (R1), with or without the proposed development, but the impacts at all receptors as a result of the proposed development are predicted to be *negligible*.

PM_{10} and $PM_{2.5}$

7.4 Predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in 2023 for existing receptors are set out in Table 13 for both the "Without Scheme" and "With Scheme" scenarios. The impacts at each receptor are also described using the impact descriptors given in Table 3.

Table 13: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ Concentrations in 2023

Receptor	Annual Mean PM_{10} (µg/m^3)				Annual Mean $PM_{2.5}$ (µg/m^3)			
	Without Scheme	With Scheme	% Change [a]	Impact Descriptor	Without Scheme	With Scheme	% Change [a]	Impact Descriptor
R1	13.9	13.9	0	Negligible	8.4	8.4	0	Negligible
R2	13.8	13.8	0	Negligible	8.3	8.3	0	Negligible
R3	12.1	12.1	0	Negligible	7.6	7.6	0	Negligible
R4	11.8	11.9	0	Negligible	7.5	7.5	0	Negligible
R5	12.0	12.0	0	Negligible	7.6	7.6	0	Negligible
R6	12.5	12.6	0	Negligible	7.4	7.5	0	Negligible
R7	12.4	12.4	0	Negligible	7.4	7.4	0	Negligible
R8	12.7	12.7	0	Negligible	7.5	7.5	0	Negligible
R9	12.4	12.5	0	Negligible	7.4	7.4	0	Negligible
R10	12.6	12.7	0	Negligible	7.5	7.5	0	Negligible
R11	12.7	12.7	0	Negligible	7.5	7.5	0	Negligible
R12	10.5	10.5	0	Negligible	6.7	6.7	0	Negligible
R13	10.3	10.4	0	Negligible	6.4	6.4	0	Negligible
R14	10.6	10.6	0	Negligible	6.7	6.8	0	Negligible
R15	10.6	10.7	0	Negligible	6.8	6.8	0	Negligible
Criterion	32 [b]		-	-	25 [c]		-	-

[a] % changes are relative to the criterion and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m^3, 32 µg/m^3 is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16 (Defra, 2021a). A value of 32 µg/m^3 is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

7.5 The annual mean PM_{10} and $PM_{2.5}$ concentrations are well below the relevant criteria at all receptors, with or without the proposed development. Furthermore, as the annual mean PM_{10} concentrations are below 32 µg/m³, it is unlikely that the 24-hour mean PM_{10} objective will be exceeded at any of the receptors.

Impacts of Existing Sources on Future Residents of the Development

7.6 Predicted air quality conditions for future residents of the proposed development, taking account of emissions from the adjacent road network, are set out in Table 14 for Receptors P1 to P7 (see Table 2 and Figure 2 for receptor locations). All of the values are well below the objectives. Air quality for future residents within the development will thus be acceptable.

Table 14: Predicted Annual Mean Concentrations of Nitrogen Dioxide (NO_2), PM_{10} and $PM_{2.5}$ in 2023 for New Receptors in the Proposed Development (µg/m³)

Receptor	NO_2	PM_{10}	$PM_{2.5}$
P1	29.2	13.1	8.0
P2	30.7	13.2	8.0
P3	34.4	13.4	8.1
P4	31.8	13.3	8.0
P5	34.4	13.4	8.1
P6	27.1	13.1	7.9
P7	20.8	12.5	7.4
Objective / Criterion	**40**	**32** [a]	**25** [b]

[a] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG16 (Defra, 2021a). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[b] The 25 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Significance of Operational Air Quality Effects

7.7 The operational air quality effects without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in Appendix A2, and takes account of the assessment that:

- pollutant concentrations at worst-case locations within the proposed development will all be well below the objectives, thus future residents will experience acceptable air quality; and
- pollutant concentrations at all of the selected worst-case existing receptors along the local road network will be below the air quality objectives, and all of the impacts are predicted to be *negligible*.

8 Damage Cost Calculations

Background

8.1 Defra developed the damage cost approach to enable proportionate analysis when assessing relatively small impacts on air quality. The damage costs are a set of impact values which were derived using the more detailed Impact Pathway Approach. These values estimate the societal costs associated with small changes in pollutant emissions. Combined with emission change estimates, they provide an approximate valuation of the aggregate societal impacts of a policy. Such impacts can then be set against the direct monetary costs of a scheme to provide a cost-benefit calculation. Thus, damage costs do not provide a figure for the abatement of emissions to a given level.

8.2 Abatement costs are usually derived from a marginal abatement cost curve (MACC) which gives the incremental cost of measures to achieve a certain outcome, such as the removal of an exceedance of the air quality objectives. However, the measures available and their associated costs are quite time-specific which means that they need to be updated in a regular basis. Defra's last MACC for NO_2 exceedances was produced several years ago and has now been withdrawn. There are therefore no Defra approved abatement costs for air quality currently available. Thus, while damage costs are not the same as abatement costs, they provide a current and available resource for assigning value to air pollution emissions.

Calculations

8.3 Local Transport Projects, who have undertaken the Transport Assessment for the proposed development, have advised that the development will generate 1,433 additional vehicle trips per day, on average, on the local road network, all of which will be Light Duty Vehicles (LDVs). The annual emissions from each of these trips in the five years from the year of opening have been calculated using the EFT and entered into Defra's damage cost toolkit. The calculations and results are presented in Table 15.

Table 15: Damage Cost Calculation

Year	2023	2024	2025	2026	2027
NOx					
Total Emissions (tonnes)	1.095	0.991	0.894	0.805	0.721
Central Damage Cost (£) [a]	10,817	11,033	11,254	11,479	11,709
Discounted Central Cost (£)	11,840	10,566	9,394	8,332	7,355
Total Central Present Value (£)	**47,487**				
$PM_{2.5}$					
Total Emissions (tonnes)	0.093	0.092	0.091	0.091	0.091
Central Damage Cost (£) [a]	97,263	99,209	101,193	103,217	105,281
Discounted Central Cost (£)	9,032	8,821	8,635	8,467	8,312
Total Central Present Value (£)	**43,266**				

[a] Road transport

8.4 Summing the values for NOx and $PM_{2.5}$ gives a total damage cost of **£90,753**.

9 Mitigation

Required Mitigation

9.1 The BMBC Air Quality and Emissions Good Practice Planning Guidance (Barnsley Metropolitan Borough Council, 2021a) sets out various criteria for classifying developments as 'minor', 'medium' or 'major', and details appropriate mitigation measures for each category. As the proposed development will comprise greater than 50 new residential units and is partially located within an AQMA, it is classed as 'major'.

9.2 The following are required mitigation measures for 'major' developments:

- One electric vehicle (EV) charging point per residential unit (with dedicated parking), or one per 10 units (unallocated parking); and
- A detailed Travel Plan, including an agreed mechanism for encouraging sustainable transport use and uptake of low emission technologies.

9.3 In addition, the damage costs attributed to the proposed development (set out in Section 8) determine the level of compensation required to offset the air quality impacts. The Air Quality and Emissions Good Practice Guidance sets out a suite of suggested compensation measures, which may be used to partially, or fully, mitigate the calculated damage costs. The relevant suggested measures are detailed below:

- Support measures to reduce private car use:
  - Development of car clubs and car sharing with financial incentives and promotion.
  - Use of pooled low emission vehicles – cars, vans, taxis, bicycles.
  - Provision of dedicated low emission shuttle bus including managed pick-up and drop-off.
  - Contribution to the emerging low emission vehicle infrastructure.
  - Contribution to site low emission waste collection services.
  - Incentives for the take-up of low emission vehicle technologies and fuels.
  - Support driver training schemes.
- Measures to support improved public transport:
  - Provision of new or enhanced public transport services to the site.
  - Shuttle services to public transport interchange, rail station or park and ride facilities.
  - Support improving information services for public transport.

  - Promoting low emission bus service provision.
  - Support air quality monitoring programmes.
- Further measures to promote cycling and walking:
  - Improvements to district walking and cycling networks including lighting, shelters, and information points and timetables.
  - Support cycle and training awareness schemes.
  - Bike/e-bike hiring schemes.
  - Guaranteed ride home in emergencies.
  - Support secure and safe cycle parking facilities.
- Further measures to promote sustainable travel plans:
  - Support local travel to school and school travel plans initiatives.
  - Marketing aimed at encouraging a switch to sustainable modes with incentives.
  - Promotion of subsidised/sponsored travel plan measures through social or other media
  - Supporting community/local organisation groups to promote sustainable travel.

Recommended Mitigation

Construction Impacts

9.4 Measures to mitigate dust emissions will be required during the construction phase of the development in order to minimise effects upon nearby sensitive receptors.

9.5 The site has been identified as a *High* Risk during earthworks, construction and trackout, as set out in Table 11. Comprehensive guidance has been published by IAQM (2016) that describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on monitoring during demolition and construction (IAQM, 2018). This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in Appendix A5.

9.6 The mitigation measures should be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring.

9.7 Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Road Traffic Impacts

9.8 The assessment has demonstrated that the overall air quality effect of the proposed development will be ‘not significant; it will not introduce any new exposure into areas of unacceptable air quality, nor will the development-generated traffic emissions have a significant impact on local air quality. It is, therefore, not considered appropriate to propose further mitigation measures for this development.

9.9 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 (which is written into UK law). The Air Quality Action Plan that BMBC has produced in order to address objective exceedances in its AQMAs will also be helping to improve air quality.

10 Residual Impacts and Effects

Construction

10.1 The IAQM guidance, is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Section 9 and Appendix A5 are based on the IAQM guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

10.2 The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

Road Traffic Impacts

10.3 The residual impacts will be the same as those identified in Section 7. The overall effects of the proposed development will be 'not significant'.

11 Conclusions

11.1 The assessment has considered the impacts of the proposed development on local air quality in terms of dust and particulate matter emissions during construction, emissions from road traffic generated by the completed and occupied development. It has also identified the air quality conditions that future residents will experience. Damage cost calculations have been carried out in accordance with BMBC's Air Quality and Emissions Good Practice Planning Guidance. The assessment has been based on measurements made during 2019, and pre-pandemic activity and emissions forecasts, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

Construction Impacts

11.2 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. Appropriate measures have been recommended and, with these measures in place, it is expected that any residual effects will be 'not significant'.

Operational Impacts

Impacts

11.3 Air quality conditions for future residents of the proposed development have been shown to be acceptable, with concentrations well below the air quality objectives throughout the site.

11.4 The assessment has demonstrated that pollutant concentrations will be below the objectives at all existing receptors in 2023, with or without the proposed development, and that the emissions from the additional traffic generated by the proposed development will have a *negligible* impact on air quality conditions at all existing receptors along the local road network.

Significance

11.5 The overall operational air quality effects of the proposed development are judged to be 'not significant'.

Damage Cost Calculations

11.6 Damage cost calculations for NOx and $PM_{2.5}$, carried out in accordance with BMBC's Air Quality and Emissions Good Practice Planning Guidance, give a total damage cost of **£90,753**. It should be noted that the damage cost approach was not developed to provide a figure for the abatement of emissions to a given level (see Paragraphs 8.1 and 8.2).

Policy Implications

11.7 Taking into account these conclusions, it is judged that the proposed development is consistent with Paragraph 185 of the NPPF, being appropriate for its location both in terms of its effects on the local air quality environment and the air quality conditions for future residents. It is also consistent with Paragraph 186, as it will not affect compliance with relevant limit values or national objectives. The proposed development is also consistent with Policy AQ1 of BMBC's Local Plan, as the air quality experienced by future residents will be acceptable.

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13 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AQAL	Air Quality Assessment Level
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMP	Dust Management Plan
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
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
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
JAQU	Joint Air Quality Unit
kph	Kilometres Per hour
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
$\mu g/m^3$	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
OLEV	Office for Low Emission Vehicles
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
PPG	Planning Practice Guidance
TEA	Triethanolamine – used to absorb nitrogen dioxide

14 Appendices

A1 Construction Dust Assessment Procedure

A1.1 The criteria developed by IAQM (2016) divides the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A1.2 The assessment procedure includes the four steps summarised below:

STEP 1: Screen the Need for a Detailed Assessment

A1.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A1.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

STEP 2: Assess the Risk of Dust Impacts

A1.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A1.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

Step 2A – Define the Potential Dust Emission Magnitude

A1.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A1.1.

Table A1.1: Examples of How the Dust Emission Magnitude Class May be Defined

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

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

Step 2B – Define the Sensitivity of the Area

A1.8 The sensitivity of the area is defined taking account of a number of factors:

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

A1.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A1.2. These receptor sensitivities are then used in the matrices set out in Table A1.3, Table A1.4 and Table A1.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

Step 2C – Define the Risk of Impacts

A1.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A1.6 as a method of assigning the level of risk for each activity.

STEP 3: Determine Site-specific Mitigation Requirements

A1.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A5.

STEP 4: Determine Significant Effects

A1.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

A1.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

Table A1.2: Principles to be Used When Defining Receptor Sensitivities

Class	Principles	Examples
Sensitivities of People to Dust Soiling Effects		
High	users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land	dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms
Medium	users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land	parks and places of work
Low	the enjoyment of amenity would not reasonably be expected; or there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land	playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads
Sensitivities of People to the Health Effects of PM_{10}		
High	locations where members of the public may be exposed for eight hours or more in a day	residential properties, hospitals, schools and residential care homes
Medium	locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	may include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	locations where human exposure is transient	public footpaths, playing fields, parks and shopping streets
Sensitivities of Receptors to Ecological Effects		
High	locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species	Special Areas of Conservation with dust sensitive features
Medium	locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition	Sites of Special Scientific Interest with dust sensitive features
Low	locations with a local designation where the features may be affected by dust deposition	Local Nature Reserves with dust sensitive features

Table A1.3: Sensitivity of the Area to Dust Soiling Effects on People and Property [3]

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

3 For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude for trackout, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table A1.4: Sensitivity of the Area to Human Health Effects [3]

Receptor Sensitivity	Annual Mean PM_{10}	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A1.5: Sensitivity of the Area to Ecological Effects [3]

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table A1.6: Defining the Risk of Dust Impacts

Sensitivity of the Area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

A2 EPUK & IAQM Planning for Air Quality Guidance

A2.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

"Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations".*

Recommended Best Practice

A2.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

"The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions".

A2.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m^2 of commercial floorspace;
- are carried out on land of 1 ha or more.

A2.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new "street canyon", as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNOx/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
  - Spark ignition engine: 250 mgNOx/Nm^3;
  - Compression ignition engine: 400 mgNOx/Nm^3;
  - Gas turbine: 50 mgNOx/Nm^3.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNOx/Nm^3 and 25 mgPM/Nm^3.

A2.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

“It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the “damage cost approach” used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential”.

A2.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

"There may be a requirement to carry out an air quality assessment for the impacts of the local area's emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

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

Impacts of the Development on the Local Area

A2.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

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

A2.8 Coupled with any of the following:

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

A2.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A2.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A2.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

"Typically, any combustion plant where the single or combined NOx emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NOx gas boiler or a 30kW CHP unit operating at <95mg/Nm^3.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable".

A2.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

"The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive 'trigger' for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality".

A2.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

"The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer".

A2.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

Assessment of Significance

A2.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

A2.16 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A2.17 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A2.18 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A3.

A3 Professional Experience

Dr Denise Evans, BSc (Hons) PhD MIEnvSc MIAQM

Dr Evans is an Associate Director with AQC, with more than 22 years' relevant experience. She has prepared air quality review and assessment reports for local authorities, and has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has extensive modelling experience, completing air quality and odour assessments to support applications for a variety of development sectors including residential, mixed use, urban regeneration, energy, commercial, industrial, and road schemes, assessing the effects of a range of pollutants against relevant standards for human and ecological receptors. Denise has acted as an Expert Witness and is a Member of the Institute of Air Quality Management.

Jack Buckley, BSc (Hons) MSc AMIEnvSc AMIAQM

Mr Buckley is a Senior Consultant with AQC. He has over four years' experience in the field of air quality, carrying out technical work for a range of projects, including road and rail infrastructure schemes, residential and mixed-use developments and industrial facilities. Jack has produced air quality, greenhouse gas and climate change assessments for numerous EIA schemes, using qualitative and quantitative methods, and has air quality monitoring experience. He has also has a strong understanding of relevant local, regional and national policies, having been seconded to the Greater London Authority to undertake technical reviews of planning applications, and has assisted in the development of new Air Quality Neutral and Air Quality Positive guidance. Jack completed a BSc (Hons) in Chemistry and an MSc in Environmental Science and Management, with both dissertations investigating the performance of low-cost air quality sensors. He is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

A4 Modelling Methodology

Model Inputs

A4.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 10.1) published by Defra (2022b). Model input parameters are summarised in Table A4.1 and, where considered necessary, discussed further below.

Table A4.1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	Yes – 12km x 12km Cartesian grid at 50m resolution
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Emley Moor
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	N/A (variable surface roughness file used)
Dispersion Site Minimum MO Length (m)	30
Met Site Surface Roughness Length (m)	0.1
Met Site Minimum MO Length (m)	1
Gradients?	No

A4.2 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Local Transport Projects, who have undertaken the transport assessment work for the proposed development. Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic data used in this assessment are summarised in Table A4.2. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2020).

Table A4.2: Summary of Traffic Data used in the Assessment (AADT Flows)

Road Link	2019		2023 (Without Scheme)		2023 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
M1 (North)	102,026	10.6	112,280	10.6	112,503	10.6
M1 (South)	101,773	10.9	112,001	10.9	112,213	10.8
Dodworth Green Road	8,475	2.6	9,327	2.6	9,339	2.6
Keresforth Road	5,947	6.3	6,765	6.3	7,435	5.8
A628 (East)	27,271	4.2	30,824	4.2	30,965	4.2
Keresforth Hill Road	5,947	6.3	6,765	6.3	7,528	5.7
B6449 Barnsley Road	8,475	2.6	9,327	2.6	9,762	2.5
A628 (West)	12,716	4.4	13,994	4.4	14,429	4.2
Site Access	0	0.0	0	0.0	1,433	0.0
M1 Southbound Off Slip Road	6.617	6.7	7,479	6.7	7,479	6.7
M1 Southbound On Slip Road	9,840	5.1	11,122	5.1	11,122	5.1
M1 Northbound Off Slip Road	10,010	4.6	11,314	4.6	11,314	4.6
M1 Northbound On Slip Road	6,445	5.8	7,285	5.8	7,285	5.8

A4.3 Figure A4.1 shows the road network included within the model, along with the speed at which each link was modelled.

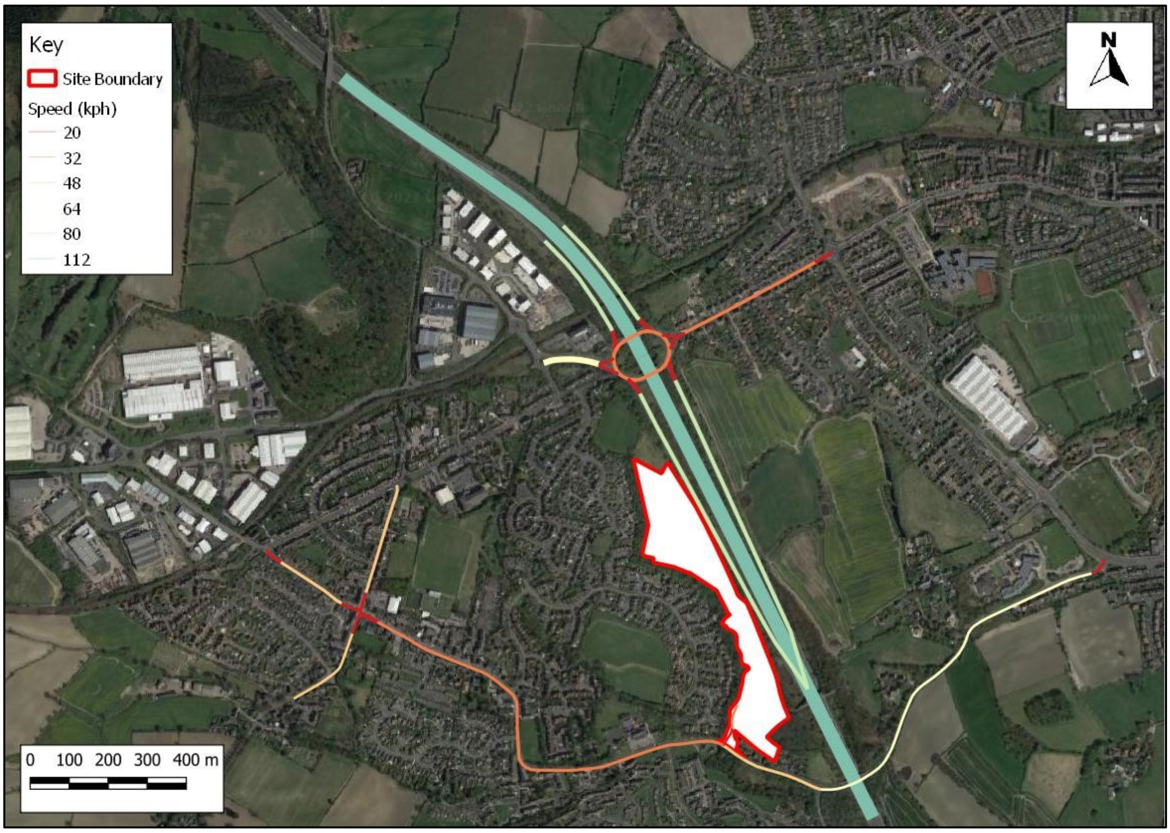

Figure A4.1: Modelled Road Network & Speed

A4.4 Hourly sequential meteorological data in sectors of 10 degrees from Emley Moor for 2019 have been used in the model. The meteorological monitoring station is located at Farnborough Airfield, approximately 12.3 km to the northwest of the proposed development. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development; both the application site and the meteorological monitoring station are located in the southwest of England where they will be influenced by the effects of inland meteorology over hilly topography. A wind rose for the site for the year 2019 is provided in Figure A4.2. The station is operated by the UK Met Office. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

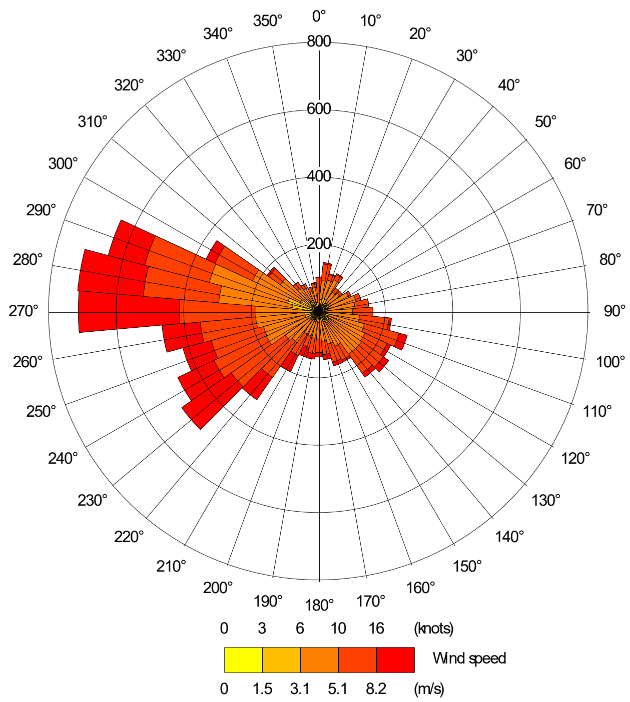

Figure A4.2: Wind Rose

Model Verification

A4.5 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside nitrogen dioxide concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean nitrogen dioxide concentrations during 2019 at the DT19, DT20, DT21 and DT22 diffusion tube monitoring sites. These sites have been selected because of their roadside locations within the study area and the availability of traffic flow data for the A628 Dodworth Road.

Nitrogen Dioxide

A4.6 Most nitrogen dioxide (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).

A4.7 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2022b).

A4.8 The unadjusted model has under predicted the road-NOx contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A4.3). The calculated adjustment factor of 4.278 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A4.9 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator. Figure A4.4 compares final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2, and shows a close agreement.

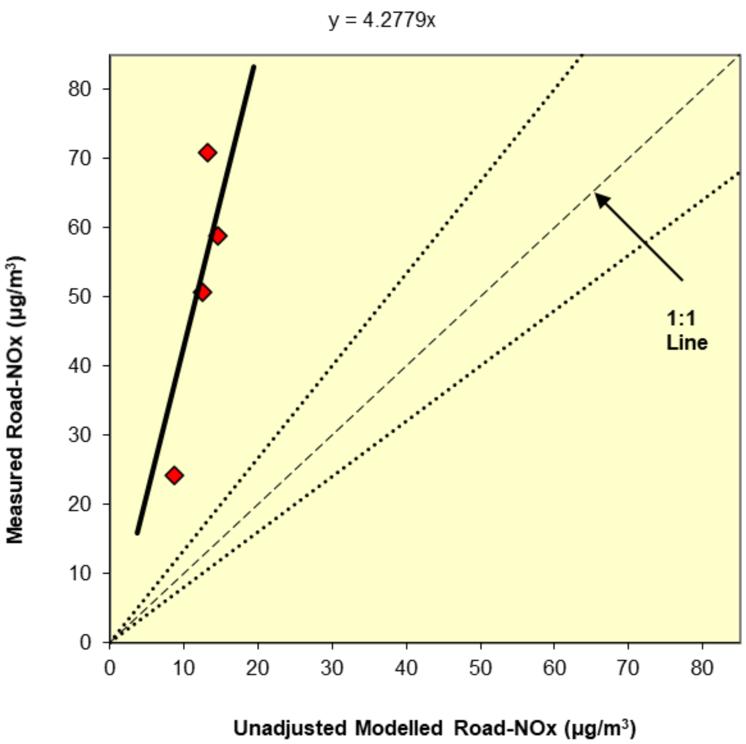

Figure A4.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

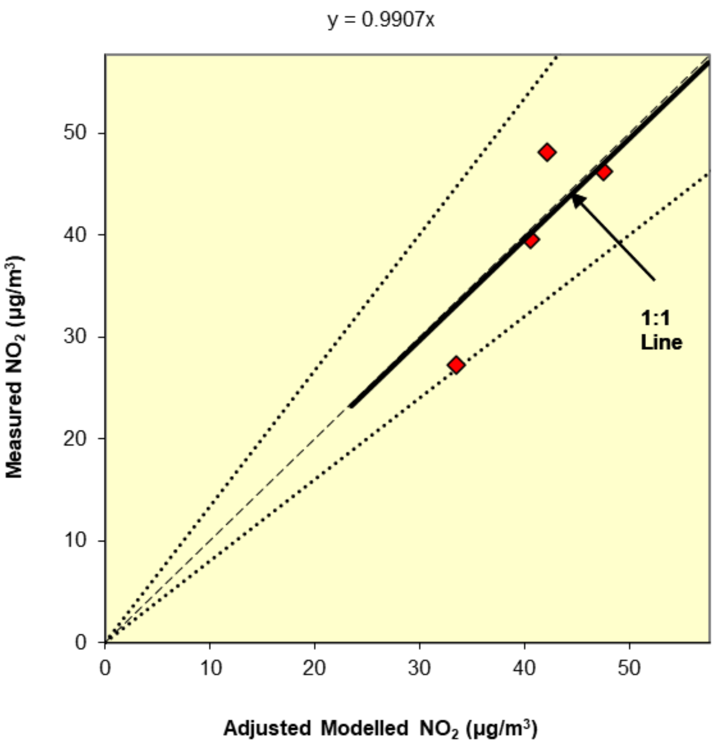

Figure A4.4: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

PM_{10} and $PM_{2.5}$

A4.10 The approach described above for NOx and nitrogen dioxide determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NOx because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM_{10} and $PM_{2.5}$ concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured $PM_{2.5}$ in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean $PM_{2.5}$ concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.

A4.11 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM_{10} and $PM_{2.5}$ concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for

NOx and NO_2 is not appropriate for PM_{10} and $PM_{2.5}$. Historically, many studies have derived a model adjustment factor for NOx and applied this to PM_{10} and $PM_{2.5}$. This is also not appropriate, since there is no reason to expect the same bias in emissions of NOx, PM_{10} and $PM_{2.5}$.

A4.12 While there is very strong evidence that EFT-based models have consistently under-predicted road-NOx concentrations in urban areas, there is no equivalent evidence for PM_{10} and $PM_{2.5}$. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM_{10} and $PM_{2.5}$ have thus not been adjusted.

Post-processing

A4.13 The model predicts road-NOx concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2022b). The traffic mix within the calculator has been set to “All other urban UK traffic”, which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.

A5 Construction Mitigation

A5.1 Table A5.1 sets out a list of best-practice measures from the IAQM guidance (IAQM, 2016) that should be incorporated into the specification for the works. These measures should ideally be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan.

Table A5.1: Best-Practice Mitigation Measures Recommended for the Works

Measure	Desirable	Highly Recommended
Communications		
Develop and implement a stakeholder communications plan that includes community engagement before and during work on site		✓
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager		✓
Display the head or regional office contact information		✓
Dust Management Plan		
Develop and implement a Dust Management Plan (DMP) approved by the Local Authority which documents the mitigation measures to be applied, and the procedures for their implementation and management		✓
Site Management		
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken		✓
Make the complaints log available to the local authority when asked		✓
Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book		✓
Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes		✓
Monitoring		
Undertake daily on-site and off-site inspections 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 window sills within 100 m of the site boundary, with cleaning to be provided if necessary		✓

Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority when asked		✓
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions		✓
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 is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction **(IAQM, 2018)**		✓
Preparing and Maintaining the Site		
Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible		✓
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site		✓
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period		✓
Avoid site runoff of water or mud		✓
Keep site fencing, barriers and scaffolding clean using wet methods		✓
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below		✓
Cover, seed, or fence stockpiles to prevent wind whipping		✓
Operating Vehicle/Machinery and Sustainable Travel		
Ensure all vehicles switch off their engines when stationary – no idling vehicles		✓
Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable		✓
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced 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)		✓
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials		✓
Implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing)		✓
Operations		
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems		✓

Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate		✓
Use enclosed chutes, conveyors and covered skips		✓
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate		✓
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods		✓
Waste Management		
Avoid bonfires and burning of waste materials		✓
Measures Specific to 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		✓
Measures Specific to Earthworks		
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable		✓
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable		✓
Only remove the cover from small areas during work, not all at once		✓
Measures Specific to 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		✓
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery		✓
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust	✓	
Measures Specific to Trackout		
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use		✓
Avoid dry sweeping of large areas		✓

Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport		✓
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;		✓
Record all inspections of haul routes and any subsequent action in a site log book;		✓
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems or mobile water bowsers, and regularly cleaned;		✓
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);		✓
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and		✓
Access gates should be located at least 10 m from receptors, where possible		✓