

NUTFIELD GREEN PARK

AIR QUALITY ASSESSMENT

OCTOBER 2023



Air Quality Assessment: Nutfield Green Park

October 2023



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management & assessment

Document Control

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Executive Summary

The air quality impacts associated with the proposed residential-led Nutfield Green Park development near Redhill have been assessed.

The assessment has demonstrated that future residents and users 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 Construction Environmental Management Plan.

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-led development (known as 'Nutfield Green Park') at the Former Laporte Works Site, Nutfield Road, Nutfield, Surrey. The proposed development will comprise up to 166 homes and an Integrated Retirement Community, and is described as:

"Outline planning permission for the development of the site for new homes (Use Class C3) and Integrated Retirement Community (Use Classes C2, E(e), F2), creation of new access, landscaping and associated works to facilitate the development, in phases which are severable (Outline with all matters reserved, except for Access)".

1.2 A previous outline planning application (TA/2021/1040) was refused permission in June 2021. One of the reasons for refusal was *"The applicant has failed to demonstrate that the proposed development would not result in significant environmental harm in respect of the construction operations and phasing of construction, the assessment of environmental effects, air quality and mitigation and community benefits contrary to the Local Plan, Regulation 18 and Schedule 4 of the EIA Regulations and the Institute of Environmental Management & Assessment (IEMA) ES Review Criteria."* With the information available at the stage of the scheme, this report has addressed these issues.

1.3 The proposed development site is located on an expanse of land containing a mixture of grassland, blocks of self-seeding woodland and waterbodies just north of the village of Nutfield. The habitable portions of the development are proposed within the south of the site, adjacent to existing residential properties and Nutfield Road (A25). The M23 motorway also lies approximately 580 m east of the proposed development. 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, including those within the nearby Redhill Air Quality Management Area (AQMA), 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 nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).

1.4 Patteson Court Landfill site and South Mercers Quarry also lies in the surrounding area. The effects of dust and odours from these sites on the proposed development have been addressed within a separate odour and dust assessment.

1.5 The location and setting of the proposed development is shown in Figure 1, along with the relevant nearby AQMA.

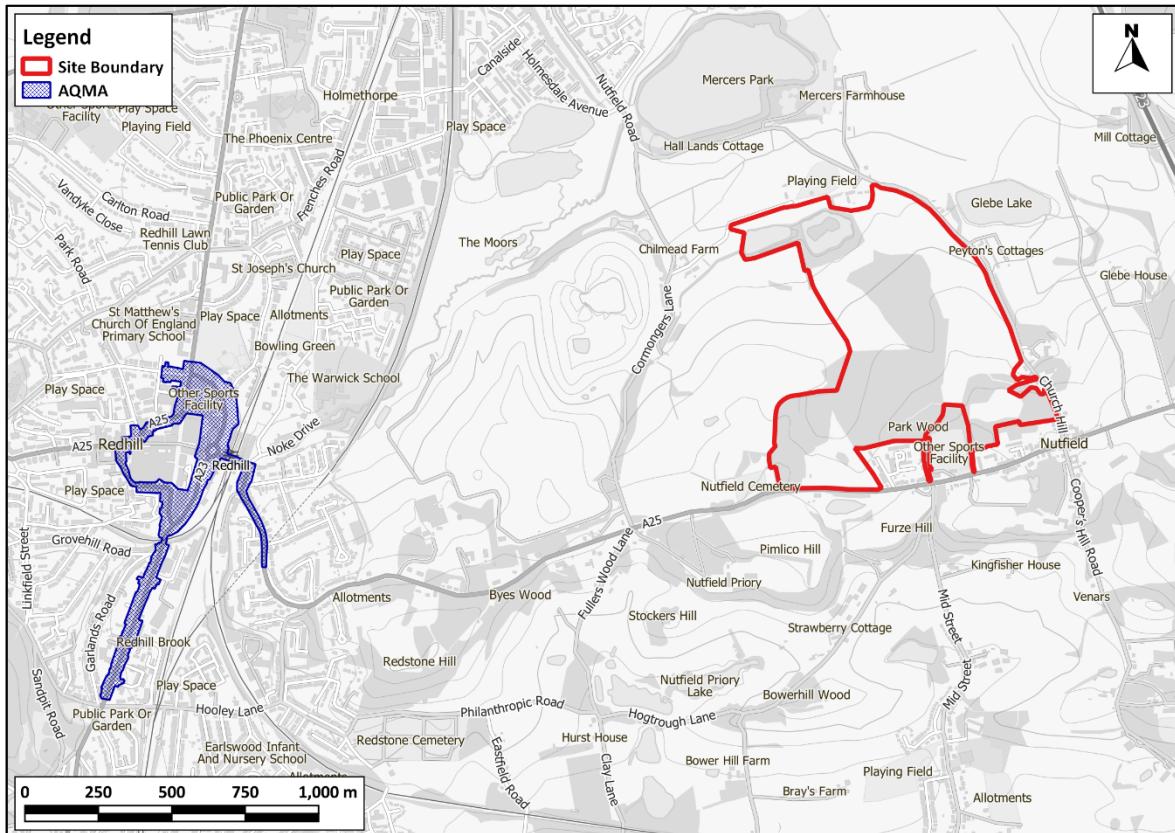


Figure 1: Proposed Development Setting in the Context of Air Quality

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- 1.6 The development design does not currently include centralised energy plant or any backup-power or emergency-power generators. Should these be added at a later stage, the impacts from the plant emissions may necessitate further assessment.
- 1.7 This report describes existing local air quality conditions (base year 2019; the latest year of monitoring data currently available which is not impacted by the Covid-19 pandemic, discussed further in Paragraphs 4.16 and 4.17), and the predicted air quality in the future assuming that the proposed development does, or does not proceed. The traffic-related impacts have been assessed for the year 2029¹. The assessment of construction dust impacts focuses on the anticipated duration of the works.

¹ This report has assessed traffic-impacts for future year 2029, as this is the earliest year of first occupation. The specific first year of occupation of the proposed development will be determined by future planning conditions; at present this is an outline application. Therefore, the assumption that the proposed development is complete and operational in 2029 will likely overestimated the traffic emissions.

1.8 This report has been prepared taking into account all relevant local and national guidance and regulations.

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 2007

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 AQMA, and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Air Quality Strategy 2023

2.3 The Air Quality Strategy: Framework for Local Authority Delivery 2023 (Defra, 2023a) sets out the strategic air quality framework for local authorities and other Air Quality Partners in England. It sets out their powers and responsibilities, and actions the government expects them to take. It does not replace other air quality guidance documents relevant to local authorities.

Clean Air Strategy 2019

2.4 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

2.5 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.

2.6 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

2.7 The UK's new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in 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.

2.8 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) sets two new targets for future concentrations of PM_{2.5}. These targets are described in Paragraph 3.5.

Environmental Improvement Plan 2023

2.9 Defra published its 25 Year Environment Plan in 2018 (Defra, 2018b). The Environment Act (2021) requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2023 (Defra, 2023b) is the first revision. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan, including that of achieving clean air.

2.10 The Environmental Improvement Plan 2023 sets out the new air quality targets which have been set for concentrations of PM_{2.5}. These targets, which are described in more detail in Paragraph 3.5, include the long-term targets in the Statutory Instrument described in Paragraph 2.8, and interim targets to be achieved by 2028.

2.11 The 2023 Plan outlines the role of local authorities in helping it meet both its targets and existing commitments. It also outlines the respective roles of industry, agricultural sectors, and the Department for Transport in providing the coordinated action required to meet both its new, and pre-existing targets and commitments.

Planning Policy

National Policies

2.12 The National Planning Policy Framework (NPPF) (2023) 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".

2.13 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".

2.14 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".

2.15 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".

2.16 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".

2.17 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".

2.18 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"*.

2.19 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".

2.20 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".

2.21 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

2.1 The Tandridge District Council Core Strategy (Tandridge District Council, 2008) states that *"Poor air quality is not a significant issue in Tandridge"*. There are no policies relating to air quality within

the core strategy. However, the Tandridge District Council Local Plan (Tandridge District Council, 2014) has a single policy relating to air quality. Policy DP22 - Minimising contamination, hazards and pollution states that:

“.....H. Development will be permitted provided it would not:

- 1. Have an adverse impact on health, the natural or built environment or amenity of existing or proposed uses by virtue of odour, dust and/or other forms of air pollution; or*
- 2. Be likely to suffer unacceptable nuisance as a result of proximity to existing sources of odour, dust and/or other forms of air pollution.”*

2.2 At the time of writing, the Inspector examining the draft Tandridge Local Plan 'Our Local Plan: 2033' has issued a letter to the Council dated 10th August 2023, following a procedural meeting held on 27th July 2023. Following a three year protracted examination process, the Inspector has acknowledged a number of procedural challenges in progressing the Plan such that it is not possible to make the Plan sound by proposing main modifications to it and will therefore recommend that the Plan is unsound and that it is not adopted. Alternatively, the Inspector has suggested that the Council may wish to withdraw the Local Plan before his recommendation is confirmed within the Inspector's Examination Report. Until the position on the draft Plan is formalised this Report has included draft Local Plan policies, but in the circumstances, limited weight should now be attributed to them. Once the Local Plan has been found unsound / withdrawn, the draft policies referenced will no longer be relevant and carry no weight in the determination process.

2.3 There is one policy in the above mentioned emerging Tandridge Local Plan (Tandridge District Council, 2019) related to Air Quality. Policy TLP46 – Pollution and Air Quality states:

“All development proposals must be located and designed to not cause a significant adverse effect upon the environment, the health of residents or residential amenity by reason of pollution to land, air or water, or as a result of any form of disturbance including, but not limited to noise, light, odour, heat, dust, vibrations and littering.

New residential development located near to existing uses that generate pollutant, noise, odour or light will be expected to demonstrate that the proposal is compatible and will not result in unacceptable living standards.

Planning conditions may be used to manage and mitigate the effects of pollution and/or disturbance arising from development. Where required, conditions limiting hours of construction, opening hours and placing requirements on applicants to submit further proposal details will be implemented in order to ensure impacts on the environment and residential amenity are kept within acceptable limits and where possible reduced.

Development will be supported where it would not result in the national Air Quality Objectives being exceeded; and it would not lead to a significant deterioration in local air quality resulting in unacceptable effects on human health, local amenity or the natural environment.

Proposals for new development should reflect the requirements of the Council's Air Quality Impact Assessments (Tandridge District Council, 2018) and any subsequent update, as well as air quality conditions developed by Surrey Air Alliance. Proposals should also be in accordance with the Local Transport Plan and its supporting, Air Quality Strategy, Low Emissions Transport and Electric Vehicle Strategies, and be cognisant of policy TLP36: Ashdown Forest SPA, where relevant."

Building Standards

- 2.4 Part F(1) of Schedule 1 of the Building Regulations 2010 as amended June 2022 (Ministry of Housing, Communities & Local Government, 2022) places a duty on building owners, or those responsible for relevant building work², to ensure adequate ventilation is provided to building occupants.
- 2.5 Approved Document F (HM Government, 2021a), which accompanies the Building Regulations, explains that care should be taken to minimise entry of external air pollutants. 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 3.9, 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.
- 2.6 Part S(1) of Schedule 1, and Regulation 44D, of the Building Regulations 2010 (Ministry of Housing, Communities & Local Government, 2022) define a requirement for the provision of infrastructure for charging electric vehicles. Precise requirements are explained further within Approved Document S (HM Government, 2021b) and depend on the overall number of parking spaces provided and the average financial cost of installation.
- 2.7 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 development.

Air Quality Action Plans

National Air Quality Plan

- 2.8 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, 2018a) was published in October 2018 and

² 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.

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 Clean Air Zone (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

Tandridge District Council

2.9 Tandridge District Council (TDC) has not declared any AQMAs and thus has not prepared an air quality action plan.

Reigate and Banstead Borough Council

2.10 Reigate and Banstead Borough Council (RBBC) has published air quality action plan for two of its air AQMAs (M25 and Horley), however an air quality action plan is yet to be developed for the AQMA in Redhill Town Centre where the current assessment covers.

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 PM₁₀ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. 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 µg/m³ (Defra, 2022). 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 PM₁₀ objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m³ (Defra, 2022). The predicted annual mean PM₁₀ concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM₁₀ objective. Where predicted annual mean concentrations are below 32 µg/m³ 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, 2022). The annual mean objectives for nitrogen dioxide and PM₁₀ 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 PM₁₀ 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 For PM_{2.5}, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 3.9), originally set at 25 µg/m³ and currently set at 20 µg/m³.

3.5 Defra has also recently set two new targets, and two new interim targets, for PM_{2.5} concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean PM_{2.5} concentration of 10 µg/m³ by the end of 2040, with the interim target being a

value of 12 $\mu\text{g}/\text{m}^3$ by the start of 2028³. The second set of targets relate to reducing overall population exposure to PM_{2.5}. By the end of 2040, overall population exposure to PM_{2.5} should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.

3.6 Defra will assess compliance with the population exposure targets by averaging concentrations measured at its own background monitoring stations. This will not consider small changes over time to precisely where people are exposed (such as would relate to exposure introduced by a new development). Furthermore, as explained in Paragraph 2.11, all four new targets provide metrics against which central Government can assess its own progress. While local authorities have an important role delivering the required improvements, these are expected to relate to controlling emissions and not to directly assessing PM_{2.5} concentrations against the targets.

3.7 In March 2023, the Department for Levelling Up, Housing and Communities (DLUHC, 2023) explained that the new PM_{2.5} targets will:

“need to be integrated into the planning system, and in setting out planning guidance for local authorities and businesses, we will consider the specific characteristics of PM_{2.5}. The guidance will be forthcoming in due course, until then we expect local authorities to continue to assess local air quality impacts in accordance with existing guidance.”

3.8 For the time being, therefore, no assessment is required, and indeed no robust assessment is possible, in relation to the new PM_{2.5} targets and they are not considered further.

3.9 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for nitrogen dioxide, PM₁₀ and PM_{2.5}, and is implemented in UK law through the Air Quality Standards Regulations (2010)⁴. The limit values for nitrogen dioxide, PM₁₀ are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. 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).

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

³ Meaning that it will be assessed using measurements from 2027. The 2040 target will be assessed using measurements from 2040. National targets are assessed against concentrations expressed to the nearest whole number, for example a concentration of 10.4 $\mu\text{g}/\text{m}^3$ would not exceed the 10 $\mu\text{g}/\text{m}^3$ target.

⁴ As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

Table 1: Air Quality Criteria for Nitrogen Dioxide, PM₁₀ and PM_{2.5}.

Pollutant	Time Period	Value
Nitrogen Dioxide	1-hour Mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m ³
PM ₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³ ^a
PM _{2.5}	Annual Mean	20 µg/m ³ ^b

- ^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 PM₁₀ objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM₁₀ objective are possible (Defra, 2022).
- ^b There is no numerical PM_{2.5} objective for local authorities (see Paragraph 3.4). Convention is to assess against the UK limit value which is currently 20 µg/m³.

Construction Dust Criteria

3.11 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)⁵ (2016) has been used. Full details of this approach are provided in Appendix A1.

Screening Criteria

3.12 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.

3.13 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 (HDVs) or 100 light duty vehicles (LDVs) per day; outside of an AQMA the thresholds are 100 HDVs or 500 LDVs. Where these criteria are exceeded, a detailed assessment is likely to be required, 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”*.

3.14 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

⁵ The IAQM is the professional body for air quality practitioners in the UK.

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 (shown in Figure 1) 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 A25 (east and west of the proposed development), the A25 North of Redstone Hollow, the A23 north and south of The Stations Roundabout, and High Street and Queensway within Redhill.
- 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 500m of the site. The specific areas considered are detailed in Section 6.

Receptors

- 4.3 Concentrations of nitrogen dioxide, PM₁₀ 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 roads). 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 Seventeen existing residential 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 six diffusion tube monitoring sites located within RBBC and TDC, 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	530735.5	150530.7	1.5
R2	Residential	530935.3	150607.9	1.5
R3	Residential	530370.3	150471.5	1.5
R4	Residential	530126.8	150452.1	1.5
R5	Residential	528328.4	150061.4	1.5
R6	Residential	528234.1	150223.8	1.5
R7	Residential	528108.9	150801.7	1.5
R8	Residential	530804.4	150563.5	1.5
R9	Residential	530957.1	150626.8	1.5
R10	Residential	528833.4	150123.0	1.5
R11	Residential	528489.1	150145.6	1.5
R12	Residential	528264.4	150265.9	1.5
R13	Residential	528044.8	150517.8	4.5
R14	Residential	527920.5	150446.5	4.5
R15	Residential	527865.9	150471.9	4.5
R16	Residential	527945.7	150706.4	4.5
R17	Residential	527894.8	150692.8	4.5
New properties				
P1	Residential	530114.0	150478.8	1.5
P2	Residential	530167.4	150489.6	1.5
P3	Residential	530246.8	150486.9	1.5
P4	Residential	530322.1	150475.9	1.5
P5	Residential	530501.3	150664.6	1.5
P6	Residential	530702.1	150660.5	1.5
P7	Residential	530812.1	150718.7	1.5

^a A height of 1.5 m is used to represent ground-floor level exposure. Heights of 4.5 m have been modelled for certain receptors to represent first-floor level exposure.

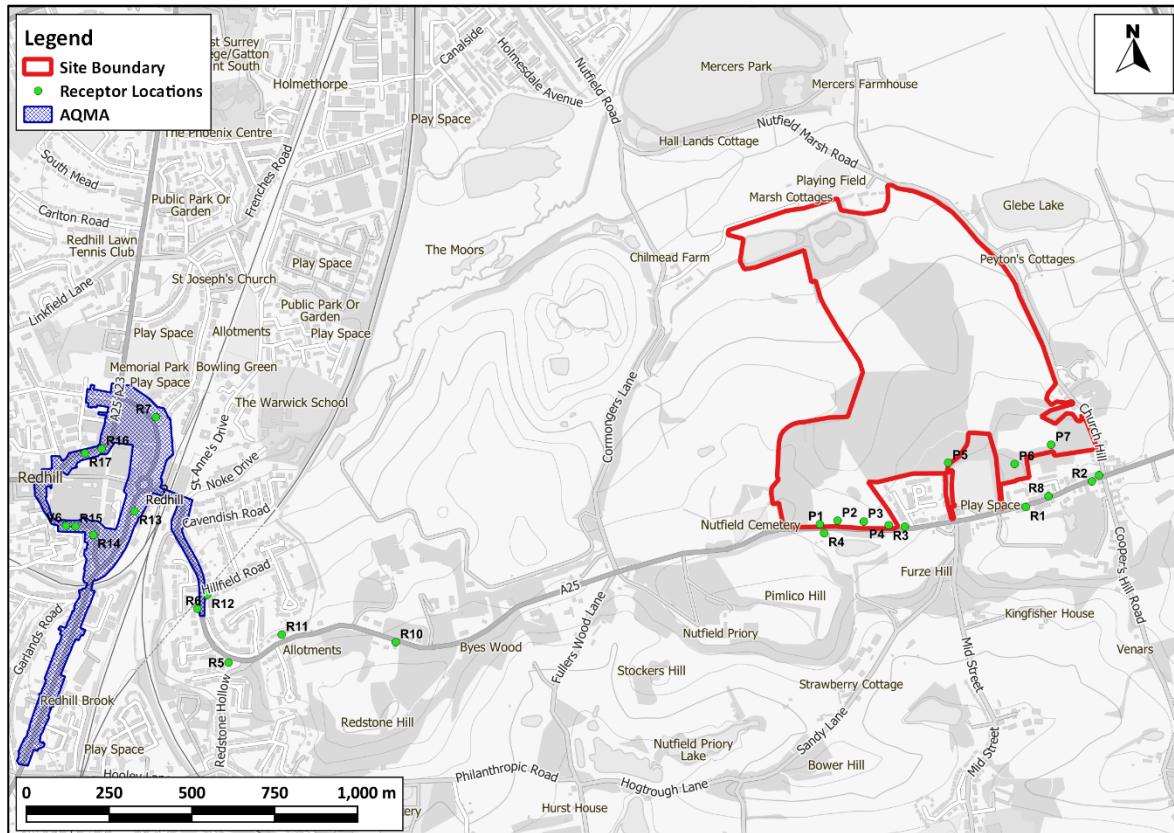


Figure 2: Receptor Locations

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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, 2023d);
- 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, 2023c). 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 PM₁₀ 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) (2023e). 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 PM₁₀ and PM_{2.5} concentrations (Defra, 2023e), 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

4.9 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, 2023c). Details of the model inputs and the model verification are provided in Appendix A4.

Assessment Scenarios

4.11 Nitrogen dioxide, PM₁₀ and PM_{2.5} concentrations have been predicted for the following scenarios:

- base year 2019;
- the assessment year 2029 without the development; and
- the assessment year 2029 with the development.

Impact Description

4.12 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

4.13 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.

4.14 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A4). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2019) concentrations. LAQM.TG22 (Defra, 2022) provides guidance on the evaluation of model performance. Based on the analysis shown in Table A4.3 in Appendix A4, the model performance is considered to be acceptable.

4.15 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.

4.16 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.

4.17 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

4.18 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 operational in 2029.

- the Kenley meteorological monitoring station appropriately represents conditions in the study area (this is discussed further in Appendix A4); and
- a number of roads within Redhill being located within a street canyon (this is discussed further in Appendix A4).

Assessment of Significance

Construction Dust Significance

4.19 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

4.20 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 the 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.

5 Baseline Conditions

Relevant Features

5.1 The proposed development is located on the outskirts of the village of Nutfield and is 2.1 km to the east of Redhill. The application site is surrounded by open grassland and agricultural land to the east, west and north, with Nutfield and the A25 to the south of the site. There are existing residential properties adjacent to the site's southern boundary. RBBC's Redhill AQMA is located about 1.7 km from the proposed development.

Industrial Sources

5.2 The Patteson Court Landfill site (also known as Redhill Landfill) is 250 m west of the site boundary, at its closest point, and the South Mercers Quarry is 220 m away, again at its closest point. These are sources of odour and dust that have the potential to impact on the amenity of the proposed development. The odour and dust effects of the two sites have been addressed within a separate odour and dust assessment.

Local Air Quality Monitoring

5.3 TDC does not operate any automatic monitoring stations within its area. The Council operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Lambeth Scientific Services (using the 50% TEA in acetone method). Two (TD37 and TD40) of these tubes are deployed adjacent to the proposed development along Nutfield Road (A25). RBBC also operates a number of diffusion tubes within the Redhill AQMA (also prepared and analysed by Lambeth Scientific Services using the 50% TEA in acetone method), where potential impacts from the proposed development may occur. RBBC does not operate any automatic monitoring stations that are representative of the study area.

5.4 Annual mean results for the years 2017 to 2021 are summarised in Table 4. The monitoring locations are shown in Figure 3. The monitoring data have been taken from the TDC's 2022 Annual Status Report (Tandridge District Council, 2022 Air Quality Annual Status Report) and RBBC's 2020 Annual Status Report (Reigate and Banstead Borough Council, 2020).

Table 4: Summary of Annual Mean NO₂ Monitoring (2017-2021) (µg/m³)

Site No.	Site Type	Location	2017	2018	2019	2020 ^a	2021 ^a
Tandridge District Council							
TD35	Roadside	Castle Street, Betchingley	26.7	28.4	26.1	20.7	19.2
TD37	Kerbside	Parkwood Road, Nutfield	19.0	19.6	17.0	13.1	13.4
TD38	Roadside	Boterys Cross, Betchingley	25.1	24.2	22.5	18.2	16.4
TD40	Roadside	High Street, Nutfield	33.1	34.3	33.2	24.3	23.2
Reigate and Banstead Borough Council							
RB120	Roadside	Outside 21 Redstone Hill, Redhill	32.9	31.5	27.4	-	-
RB121	Kerbside	Opposite Ladbroke Grove, Redhill	-	41.1	39.9	-	-
RB123	Kerbside	Outside Age Concern Cromwell Road, Redhill	35.8	33.5	33.6	-	-
RB140	Roadside	Flat 2, 45 Ladbroke Grove, Redhill	25.5	22.6	24.3	-	-
Objective			40				

^a 2020 and 2021 monitoring data from Reigate and Banstead Borough Council is yet to be published.

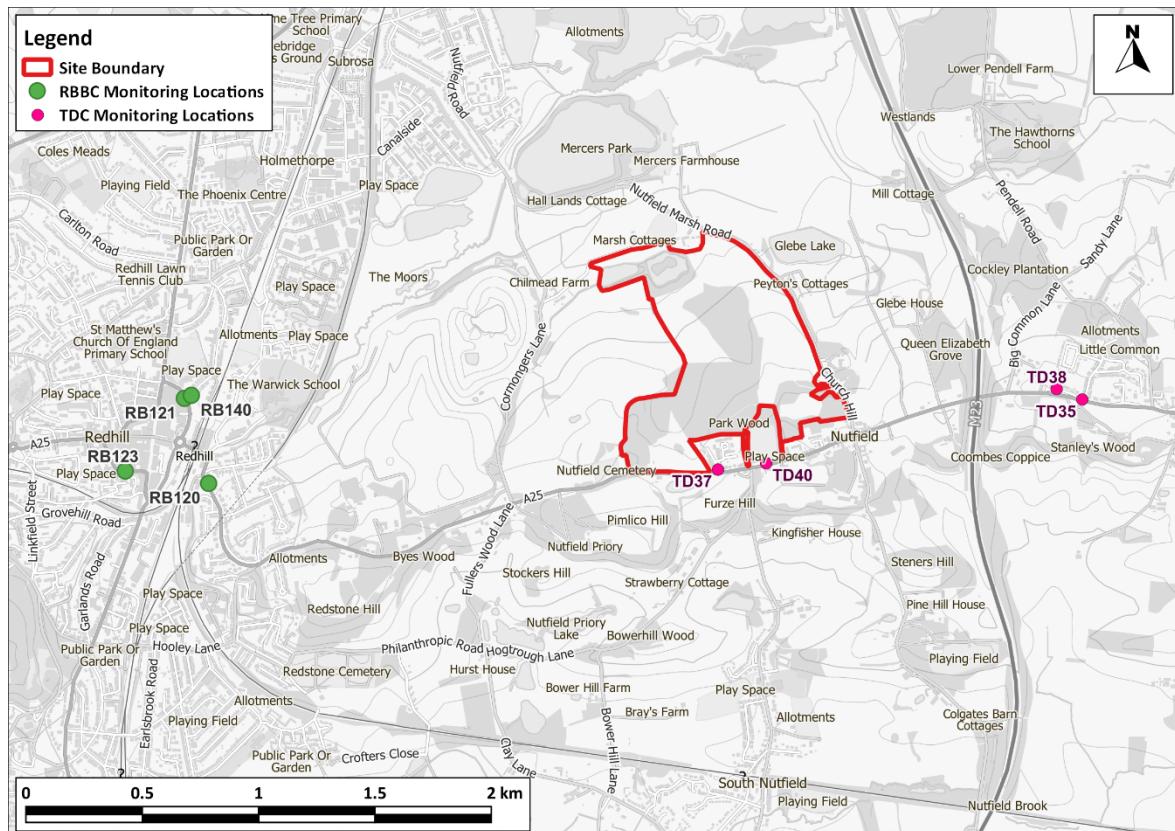


Figure 3: Monitoring Locations

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- 5.5 While 2020 and 2021 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.
- 5.6 There have been no recorded exceedances of the annual mean NO₂ objective near the proposed development since 2017, with one exceedance recorded within Redhill: at a kerbside site in 2018.
- 5.7 No monitoring of PM₁₀ or PM_{2.5} concentrations is undertaken in TDC or by RBBC at locations representative of the study area.

Exceedances of Limit Value

- 5.8 There are no AURN (Defra, 2023f) monitoring sites in 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, 2023e), which are used to identify and report exceedances of the limit value, do not identify any exceedances within the study area in 2019 or 2029. 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 2029 ($\mu\text{g}/\text{m}^3$)

Year	NO_2	PM_{10}	$\text{PM}_{2.5}$
2019	14.7 - 16.7	14.6 - 15.3	9.9 - 10.6
2029	10.4 - 12.2	13.5 - 14.1	9.0 - 9.7
Objective	40	40	20

^a The 20 $\mu\text{g}/\text{m}^3$ $\text{PM}_{2.5}$ 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 $\text{PM}_{2.5}$ 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 (2029) baseline (Without Scheme), are set out in Table 6 for nitrogen dioxide and Table 7 for PM_{10} and $\text{PM}_{2.5}$. The modelled road components of nitrogen oxides, PM_{10} and $\text{PM}_{2.5}$ 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

Receptor	2019	2029 Without Scheme
R1	23.4	13.9
R2	22.9	13.7
R3	21.6	13.1
R4	18.5	11.9
R5	19.6	12.9
R6	20.8	13.3
R7	31.7	17.7
R8	23.9	14.1
R9	24.5	14.4
R10	24.5	14.8
R11	20.3	13.1
R12	20.4	13.1
R13	32.0	17.6
R14	25.5	15.6
R15	32.2	18.4
R16	24.8	15.5
R17	24.5	15.3
Objective	40	

Table 7: Modelled Annual Mean Baseline Concentrations of PM₁₀ and PM_{2.5} at Existing Receptors (µg/m³)

Receptor	PM ₁₀ ^a		PM _{2.5}	
	2019	2029 Without Scheme	2019	2029 Without Scheme
R1	15.9	14.8	10.6	9.8
R2	15.8	14.8	10.6	9.7
R3	15.6	14.5	10.5	9.6
R4	15.2	14.1	10.3	9.3
R5	15.5	14.4	10.7	9.8
R6	15.7	14.6	10.8	9.9
R7	16.7	15.6	11.4	10.4
R8	16.0	14.9	10.7	9.8
R9	16.1	15.0	10.8	9.9
R10	16.2	15.2	11.1	10.2
R11	15.6	14.5	10.7	9.8
R12	15.6	14.5	10.7	9.8
R13	17.3	16.2	11.7	10.8
R14	16.3	15.1	11.2	10.3
R15	17.1	15.9	11.7	10.7
R16	16.2	15.0	11.2	10.2
R17	16.2	15.0	11.1	10.2
Assessment Criterion	32^a		20^b	

^a While the annual mean PM₁₀ objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM₁₀ objective is possible, as outlined in LAQM.TG (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM₁₀ objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

^b The 20 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.

5.11 The predicted annual mean concentrations of nitrogen dioxide are below the objective in 2019 at all receptors. In 2029, baseline concentrations at every receptor are predicted to be below the objective. The annual mean nitrogen dioxide concentrations are below 60 µg/m³ at every receptor in both 2019 and 2029; therefore, it is unlikely that the 1-hour mean nitrogen dioxide objective will be exceeded (see Paragraph 3.2).

5.12 The predicted annual mean concentrations of PM₁₀ and PM_{2.5} are well below the objectives in both 2019 and 2029 at all receptors. The annual mean PM₁₀ concentrations are below 32 µg/m³ and it is, therefore, unlikely that the 24-hour mean PM₁₀ objective will be exceeded.

5.13 These results are consistent with the conclusions of TDC and RBBC in the outcome of their air quality review and assessment work in that they have concluded that there are no exceedances of the objectives, and none have been modelled.

6 Construction Phase Impact Assessment

Construction Traffic

6.1 The construction works will generate HDV movements, primarily through the delivery of building supplies, but these will be temporary and thus won't have a significant lasting effect on local air quality. Traffic volumes generated by the site during construction works are unknown at this stage (as an outline application) and should be assessed if they trigger the relevant screening criteria of 100 AADT for heavy vehicles and 500 AADT for light vehicles recommended for use outside of an AQMA by EPUK/IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

6.2 However, the air quality assessment for the previous application assessed construction trip impacts using an AADT of 272 HDV movements on the A35 east and west of the development and did not conclude significant effects. Given the high number of vehicles, it is likely that the 272 HDV movements will be peak movements and not an AADT; therefore, given the scale of the proposed development, it is judged to be unlikely that AADT construction traffic will exceed the criteria. Any further assessment and mitigation through vehicle routing can be assessed and delivered at detailed design stage.

On-Site Exhaust Emissions

6.3 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".

6.4 The proposed development is large, and the majority of the site area is more than 20 m from any sensitive receptors. The areas in which NRMM and site traffic will typically operate are thus likely to be located more than 20 m away from any sensitive properties. It is judged that there is no risk of significant effects at existing receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

6.5 The construction works will give rise to a risk of dust impacts from 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

6.6 There is no requirement for demolition on site.

Earthworks

6.7 The characteristics of the soil at the site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2023), 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	Deep-Intermediate
Soil Parent Material Grain Size	Mixed (Argillic ^a – Arenaceous ^b)
European Soil Bureau Description	Glacial Till
Soil Group	Light (sandy) – Medium (sandy), Medium - Light (Silty) - Heavy
Soil Texture	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.

6.8 The site covers an area of approximately 59 hectares, of which the developable area will be seven hectares. While most of the site will be subject to some forms of earthworks, the activities will be more pronounced around the housing development area, involving excavation of materials, haulage, tipping and stockpiling. 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

6.9 Construction will involve some 166 brick-built buildings and an Integrated Retirement Community with an estimated total building volume in excess of 100,000 m³ (based on the size of an average detached house)⁶. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting and grinding 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*.

⁶ English Housing Survey 2018-19 estimates an average detached house has a floor space of 149 m².

Trackout

6.10 The number of heavy vehicles accessing the site, which may track out dust and dirt, is currently unknown, but given the size of the site, more than a maximum of 50 outward heavy vehicle movements per day cannot be ruled out. 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*.

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

Table 9: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

6.12 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 PM₁₀ concentrations.

6.13 The IAQM guidance explains that residential properties are 'high' sensitivity receptors to dust soiling and human health effects (Table A1.2 in Appendix A1). There are approximately 30 residential properties within 20 m of the site, (see Figure 4).

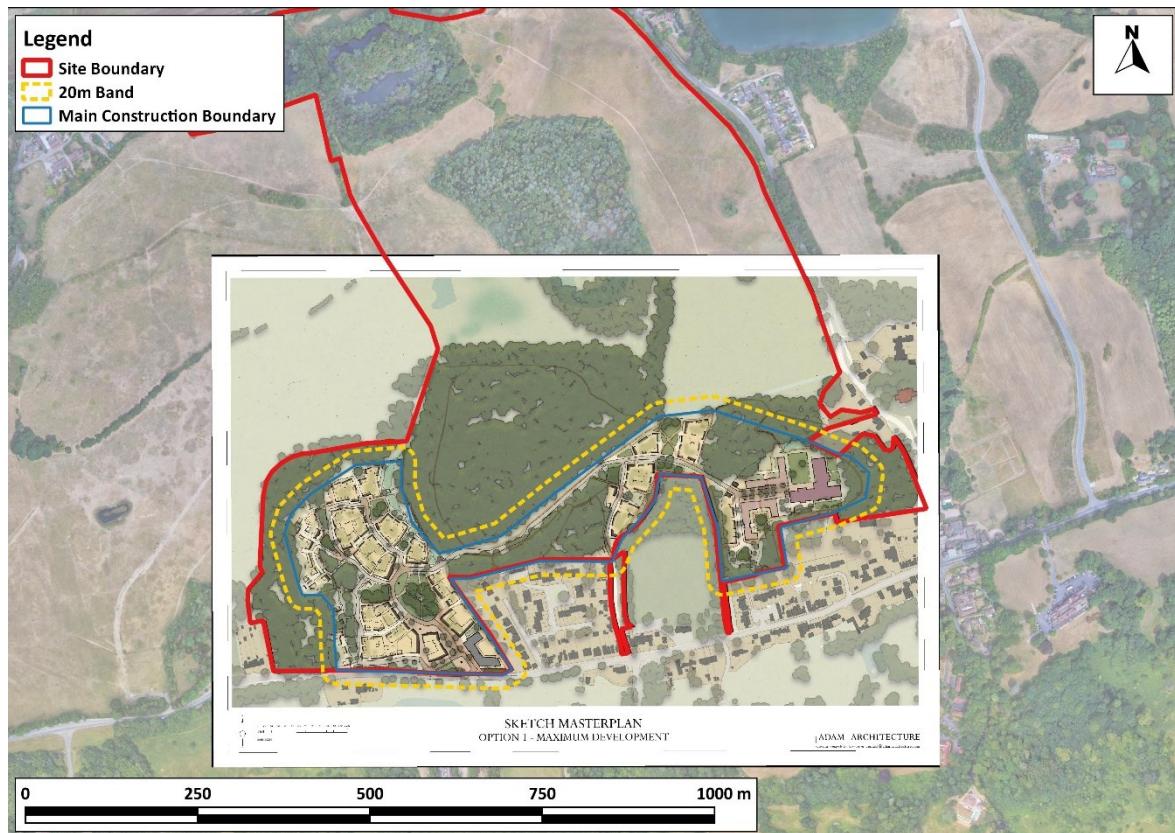


Figure 4: 20 m Distance Band around Site Boundary

Imagery ©2023 Airbus, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Landsat / Copernicus, Maxar Technologies.

6.14 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. There are approximately 50 residential properties within 20 m of the roads along which material could be tracked (see Figure 5).

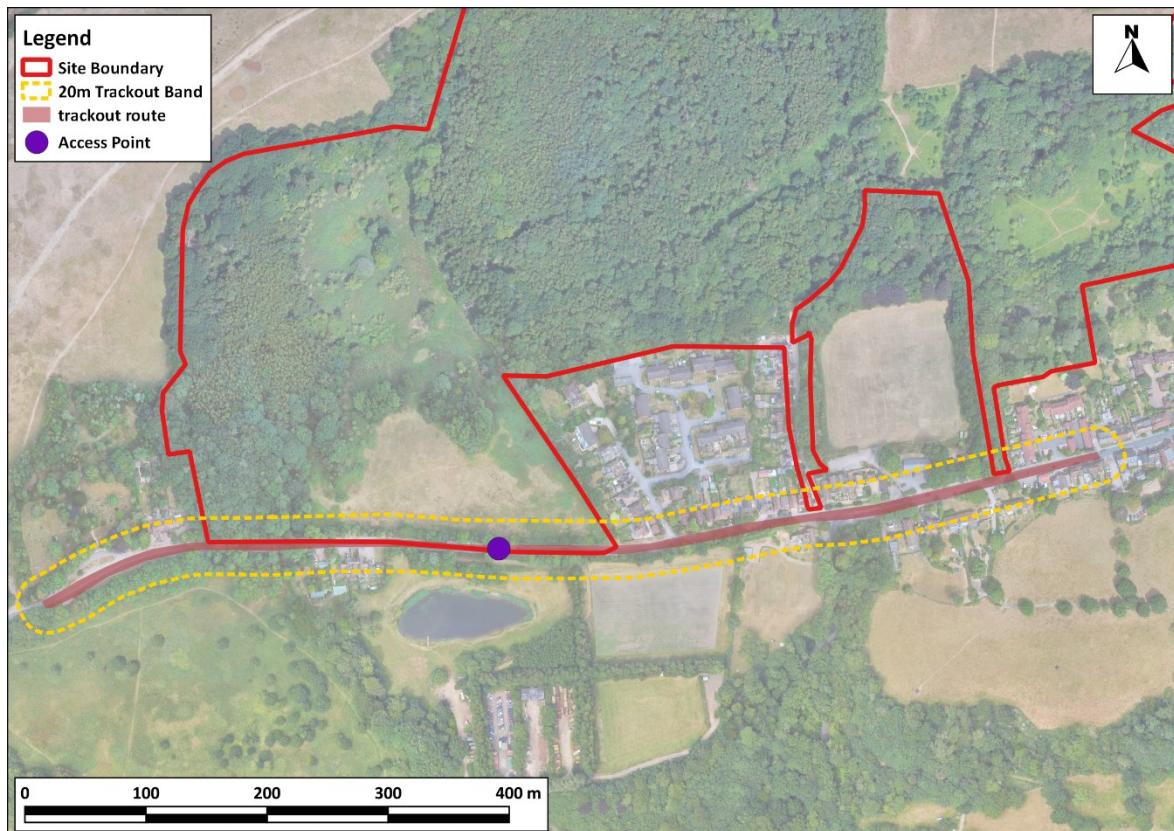


Figure 5: 20 m Distance Band around Road Used by Construction Traffic Within 500 m of the Site Exit

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Sensitivity of the Area to Effects from Dust Soiling

6.15 Using the information set out in Paragraph 6.13 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 6.14 and Figure 5 alongside the same matrix, the area is of 'high' sensitivity to dust soiling due to trackout..

Sensitivity of the Area to any Human Health Effects

6.16 The matrix in Table A1.4 in Appendix A1 requires information on the baseline annual mean PM_{10} concentration in the area. As the majority of the nearest properties to the south boundary are located adjacent the A25 road, the existing annual mean PM_{10} concentration is best described by the modelled baseline concentration at receptor R4 from Table 5 ($15.2 \mu\text{g}/\text{m}^3$). Using the information set out in Paragraphs 6.13 and Figure 4 alongside the matrix in Table A1.4 in Appendix A1, the area surrounding the onsite works is of 'medium' sensitivity to human health effects. Using the information set out in Paragraph 6.14 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

6.17 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

6.18 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	Medium Sensitivity	Low Sensitivity

Risk and Significance

6.19 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 three 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 8 (step 3 of the assessment procedure).

Table 11: Summary of Risk of Impacts Without Mitigation

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

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 along the A25 Nutfield Road and on a number of local roads within the Redhill AQMA. Thus, a detailed assessment is required.

Nitrogen Dioxide

7.2 Predicted annual mean concentrations of nitrogen dioxide in 2029 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 2029 (µg/m³)

Receptor	Without Scheme	With Scheme	% Change ^a	Impact Descriptor
R1	13.9	14.0	0	Negligible
R2	13.7	13.8	0	Negligible
R3	13.1	13.3	1	Negligible
R4	11.9	12.0	0	Negligible
R5	12.9	13.0	0	Negligible
R6	13.3	13.4	0	Negligible
R7	17.7	17.6	0	Negligible
R8	14.1	14.3	0	Negligible
R9	14.4	14.5	0	Negligible
R10	14.8	15.1	1	Negligible
R11	13.1	13.2	0	Negligible
R12	13.1	13.2	0	Negligible
R13	17.6	17.6	0	Negligible
R14	15.6	15.7	0	Negligible
R15	18.4	18.6	0	Negligible
R16	15.5	15.5	0	Negligible
R17	15.3	15.4	0	Negligible
Objective	40		-	-

^a % changes are relative to the objective and have been rounded to the nearest whole number.

7.3 The annual mean NO₂ concentrations are well below the objective at all receptors in 2029, with and without the proposed development. The percentage changes in the annual mean concentrations are

not more than 1% of the objective (when rounded) at all receptors, thus the impacts are described as negligible.

7.4 All predicted annual mean concentrations are below 60 $\mu\text{g}/\text{m}^3$; therefore, it is unlikely that the 1-hour mean NO₂ objective will be exceeded at any of the receptors.

PM₁₀ and PM_{2.5}

7.5 Predicted annual mean concentrations of PM₁₀ and PM_{2.5} in 2029 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 PM₁₀ and PM_{2.5} Concentrations in 2029

Receptor	Annual Mean PM ₁₀ ($\mu\text{g}/\text{m}^3$)				Annual Mean PM _{2.5} ($\mu\text{g}/\text{m}^3$)			
	Without Scheme	With Scheme	% Change ^a	Impact Descriptor	Without Scheme	With Scheme	% Change ^a	Impact Descriptor
R1	14.8	14.9	0	Negligible	9.8	9.8	0	Negligible
R2	14.8	14.8	0	Negligible	9.7	9.8	0	Negligible
R3	14.5	14.6	0	Negligible	9.6	9.6	0	Negligible
R4	14.1	14.1	0	Negligible	9.3	9.4	0	Negligible
R5	14.4	14.4	0	Negligible	9.8	9.8	0	Negligible
R6	14.6	14.6	0	Negligible	9.9	9.9	0	Negligible
R7	15.6	15.6	0	Negligible	10.4	10.4	0	Negligible
R8	14.9	15.0	0	Negligible	9.8	9.9	0	Negligible
R9	15.0	15.1	0	Negligible	9.9	9.9	0	Negligible
R10	15.2	15.3	0	Negligible	10.2	10.2	0	Negligible
R11	14.5	14.5	0	Negligible	9.8	9.8	0	Negligible
R12	14.5	14.5	0	Negligible	9.8	9.8	0	Negligible
R13	16.2	16.3	0	Negligible	10.8	10.8	0	Negligible
R14	15.1	15.1	0	Negligible	10.3	10.3	0	Negligible
R15	15.9	15.9	0	Negligible	10.7	10.7	0	Negligible
R16	15.0	15.1	0	Negligible	10.2	10.2	0	Negligible
R17	15.0	15.0	0	Negligible	10.2	10.2	0	Negligible
Criterion	32^b		-	-	20^c		-	-

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

^b While the annual mean PM₁₀ objective is 40 $\mu\text{g}/\text{m}^3$, 32 $\mu\text{g}/\text{m}^3$ is the annual mean concentration above which an exceedance of the 24-hour mean PM₁₀ objective is possible, as outlined in LAQM.TG22 (Defra,

2022). A value of 32 $\mu\text{g}/\text{m}^3$ 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).

- The $\text{PM}_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

7.6 The predicted annual mean PM_{10} and $\text{PM}_{2.5}$ 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 $\mu\text{g}/\text{m}^3$, it is unlikely that the 24-hour mean PM_{10} objective will be exceeded at any of the receptors. The percentage changes in the annual mean concentrations are 0% of the objective (when rounded) at all receptors, thus the impacts are described as *negligible*.

Impacts on Future Occupants of the Development

7.7 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 – 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, PM_{10} and $\text{PM}_{2.5}$ in 2029 for New Receptors in the Proposed Development ($\mu\text{g}/\text{m}^3$)

Receptor	NO_2	PM_{10}	$\text{PM}_{2.5}$
P1	12.4	14.3	9.5
P2	11.7	14.0	9.3
P3	11.7	14.0	9.3
P4	12.4	14.2	9.4
P5	10.7	13.6	9.1
P6	10.8	13.6	9.1
P7	10.8	13.6	9.1
Objective	40	32 ^a	20 ^b

^a While the annual mean PM_{10} objective is 40 $\mu\text{g}/\text{m}^3$, 32 $\mu\text{g}/\text{m}^3$ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 $\mu\text{g}/\text{m}^3$ 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 20 $\mu\text{g}/\text{m}^3$ $\text{PM}_{2.5}$ 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

7.8 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 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 well below the air quality objectives, and all of the impacts are predicted to be *negligible*.

8 Mitigation

Good Design and Best Practice

8.1 The EPUK/IAQM guidance advises that good design and best practice measures should be considered, whether or not more specific mitigation is required.

8.2 The EPUK/IAQM guidance predates the recent publication by Defra of long-term air quality targets for PM_{2.5}. As explained in Paragraph 3.5, meeting the new target will require positive action from many different sectors. While it is not appropriate to determine individual planning applications based on whether future PM_{2.5} concentrations in an area will be above or below the concentration target, it is nevertheless appropriate that new development contributes to meeting the national targets by ensuring that air quality is taken into account in development design.

8.3 The proposed development incorporates the following good design and best practice measures:

- adoption of a Construction Environmental Management Plan (CEMP) to minimise the environmental impacts of the construction works;
- one fast EV charging socket per residential dwelling and 50% provision for care home parking. 50% of visitor spaces will also have charging points;
- provision of cycle parking in line with TDC cycle parking guidance; and
- provision of pedestrian and cycle access to the new development and access links to the with national cycle route.

Recommended Mitigation

Construction Impacts

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

8.5 The site has been identified as a *High* Risk during construction, earthworks and for 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.

- 8.6 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.
- 8.7 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.
- 8.8 With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (IAQM, 2016).

Road Traffic Impacts

- 8.9 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.
- 8.10 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).

9 Conclusions

- 9.1 The assessment has considered the impacts of the proposed development on local air quality in terms of dust and particulate matter emissions during construction and emissions from road traffic generated by the completed and occupied development. It has also identified the air quality conditions that future users will experience.
- 9.2 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

- 9.3 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

- 9.4 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 in 2029.
- 9.5 The assessment has demonstrated that pollutant concentrations will be well below the objectives at all existing receptors in 2029, 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

- 9.6 The overall operational air quality effects of the proposed development are judged to be 'not significant'. This conclusion is based on the concentrations at existing and future receptors being well below the objectives and impacts all being *negligible*.

Policy Implications

- 9.7 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.

9.8 The proposed development is also consistent with Policy DP22 of Tandridge District Council's Local Plan and Policy TLP46 of the emerging Local Plan, as it will not have an adverse impact on health, the of any existing or proposed uses by virtue of air pollution.

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11 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
CEMP	Construction Environmental Management Plan
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)
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)
µg/m³	Microgrammes per cubic metre
NO	Nitric oxide
NO₂	Nitrogen dioxide

NOx	Nitrogen oxides (taken to be NO ₂ + NO)
NPPF	National Planning Policy Framework
OEP	Office for Environmental Protection
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
PM₁₀	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
RDE	Real Driving Emissions
RBBC	Reigate and Banstead Borough Council
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TEA	Triethanolamine – used to absorb nitrogen dioxide
TDC	Tandridge District Council

12 Appendices

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A1 Construction Dust Assessment Procedure

A1.1 The criteria developed by IAQM (2016) divide 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 due to 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 <20,000 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 PM₁₀, 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 PM₁₀		
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 ⁷

<u>Receptor Sensitivity</u>	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

⁷ 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 ⁶

Receptor Sensitivity	Annual Mean PM ₁₀	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
Medium	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
		>10	Medium	Low	Low	Low	Low
	28-32 µg/m ³	1-10	Low	Low	Low	Low	Low
		>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	24-28 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low

Table A1.5: Sensitivity of the Area to Ecological Effects ⁶

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 m² 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 m² 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/Nm³;
 - Compression ignition engine: 400 mgNOx/Nm³;
 - Gas turbine: 50 mgNOx/Nm³.
- 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/Nm³ and 25 mgPM/Nm³.

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 m² 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/Nm³.

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

Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is a Technical Director with AQC, with 17 years' experience in the field of air quality including the detailed assessment of emissions from road traffic, airports, heating and energy plant, and a wide range of industrial sources including the thermal treatment of waste. He has experience in ambient air quality monitoring for numerous pollutants using a wide range of techniques and is also competent in the monitoring and assessment of nuisance odours, dust, greenhouse gas emissions and climate change. Mr Caird has worked with a wide variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. Mr Caird has provided expert advice and acted as expert witness in relation to matters relating to air quality, odours and climate change at a number of Planning Inquiries. He is a Member of the Institute of Air Quality Management (and a former IAQM Committee Member) and is a Chartered Scientist.

Adam Dawson, BSc (Hons) MSc MIEnvSc MIAQM

Mr Dawson is a Principal Consultant with AQC with over nine years' experience in the field of air quality assessment. He undertakes air quality and odour assessments for AQC, covering residential and commercial developments, industrial installations, energy centres and waste facilities. He has experience using a range of dispersion models including ADMS-Roads, ADMS-5 and Breeze AERMOD to complete quantitative modelling assessments, for both planning and permitting purposes. He previously spent over two years as part of the Environment Agency's permitting team, so has extensive experience of the permitting process and industrial emissions. He is a Member of the Institute of Air Quality Management and a Member of the Institution of Environmental Sciences.

Dr Wale Abiye, MIENVSC MIAQM

Dr Abiye is an Assistant Consultant with AQC and joined the company in 2022. Prior to joining the company, he worked as a Research Fellow in Nigeria. He obtained his master's and PhD degrees from Obafemi Awolowo University, Ile-Ife, Nigeria. He is experienced in monitoring urban air pollution and analysing its chemical constituents, as well as using dispersion modelling to assess air quality. He is nominated to the United Nations Framework Convention on Climate Change's Rosters of Experts.

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, street canyon width, and street canyon height etc.). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 11.0) published by Defra (2023c). 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?	No
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	Yes
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Kenley
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	0.5
Dispersion Site Minimum MO Length (m)	10
Met Site Surface Roughness Length (m)	0.2
Met Site Minimum MO Length (m)	1
Gradients?	No

A4.2 AADT flow data and the proportions of HDVs have been provided by SLR Consulting Limited, 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). Figure A4.1 shows the road network included within the model, along with the speed at which each link was modelled, and the sections of road that have been modelled with canyons.

Table A4.2: Summary of Traffic Data used in the Assessment

Road Link	2019		2029 (Without Scheme)		2029 (With Scheme)	
	AADT	HDV	AADT	HDV	AADT	HDV
A25 east of the proposed development	14,897	4%	16,422	5%	17,001	5%
A25 west of the proposed development	12,527	5%	13,809	5%	14,934	5%
A25 north of Redstone Hollow	12,815	5%	14,126	6%	15,039	5%
A23 south of the station road roundabout	20,542	6%	22,644	6%	22,964	6%
A23 north of the station road roundabout	24,566	5%	27,081	6%	27,607	5%
North of Belfry roundabout	7,945	2%	8,758	2%	9,046	2%
South of Belfry roundabout	19,035	3%	20,983	3%	21,014	3%
North of Lombard roundabout	16,513	2%	18,203	2%	18,297	2%
South of Lombard roundabout	6,950	1%	7,661	1%	7,778	1%

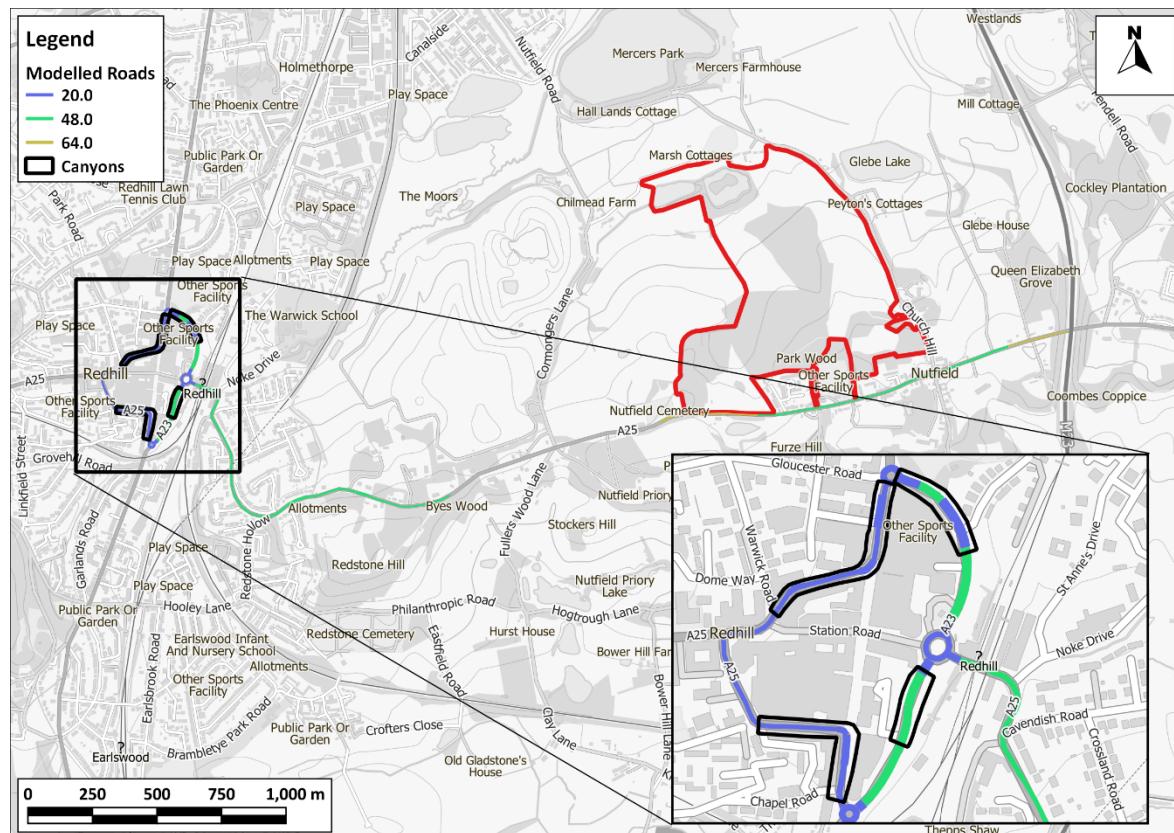


Figure A4.1: Modelled Road Network, Speeds and the Location of Canyons

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A4.3 For the purposes of modelling, it has been assumed that the façades of buildings on High Street, Marketfield Way, London Road and the facades of Sainsbury's on Princes Way are located within a street canyon. These roads have a number of canyon-like features, which reduce dispersion of traffic emissions, and can lead to concentrations of pollutants being higher here than they would be in areas with greater dispersion. Therefore, they have been modelled as street canyons using ADMS-Roads' advanced canyon module, with appropriate input parameters determined from plans, on-site measurements, local mapping and photographs. The modelled canyons are shown in Figure A4.1.

A4.4 Hourly sequential meteorological data in sectors of 10 degrees from Kenly meteorological station for 2019 have been used in the model. The Kenly meteorological monitoring station is located at Kenly Aerodrome, approximately 7.5 km to the north of the proposed development. Both the application site and the Kenly meteorological monitoring station are located in the southeast of England where they will be influenced by the effects of inland meteorology. The topography of the model domain is similar to that around the meteorological monitoring station and measurements from this site are considered to provide the most robust basis to predict meteorology within the model domain. A wind rose for the site for the year 2019 is provided in Figure A4.2. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

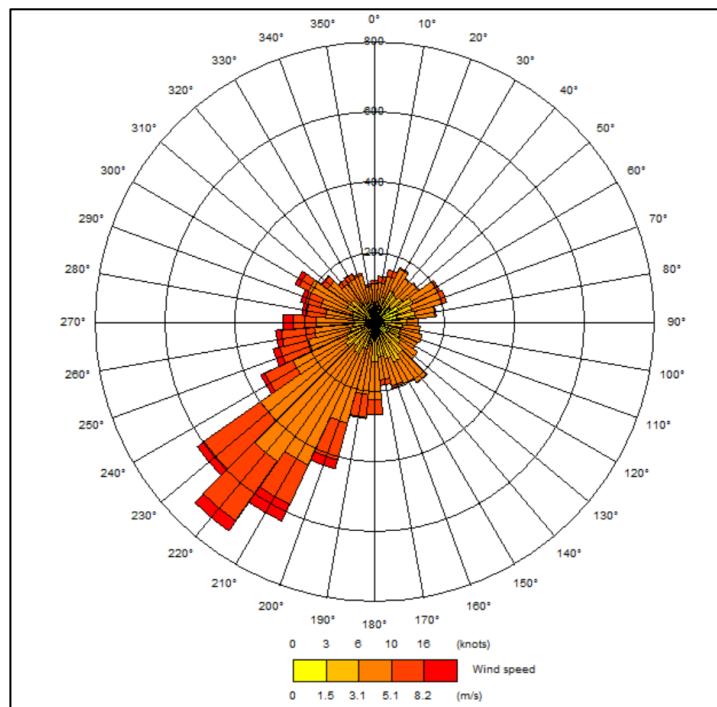


Figure A4.2: 2019 Wind Rose from Kenly Meteorological Station

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 TD37, TD40, RB120, RB121, RB123 and RB40 diffusion tube monitoring sites.

A4.6 The background annual mean nitrogen dioxide concentration used in the model verification were derived from the national maps using the same approach as described in Paragraph 4.7

Nitrogen Dioxide

A4.7 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 ($\text{NO}_x = \text{NO} + \text{NO}_2$).

A4.8 The model output of road- NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road- NO_x . Measured road- NO_x has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NO_x from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2023c).

A4.9 The unadjusted model has under predicted the road- NO_x 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 1.3788 has been applied to the modelled road- NO_x concentration for each receptor to provide adjusted modelled road- NO_x concentrations.

A4.10 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road- NO_x concentrations with the predicted background NO_2 concentration within the NO_x 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.

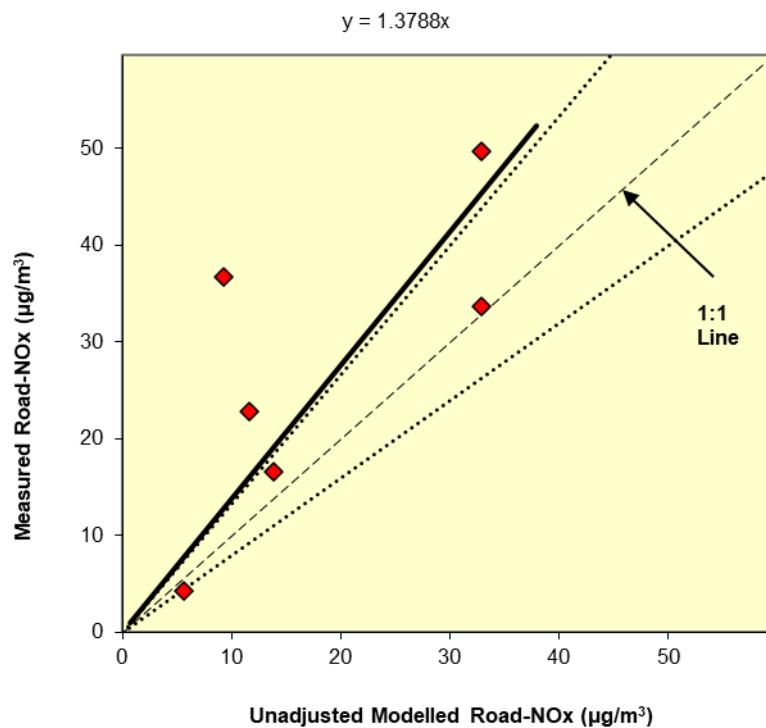


Figure A4.3: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show $\pm 25\%$.

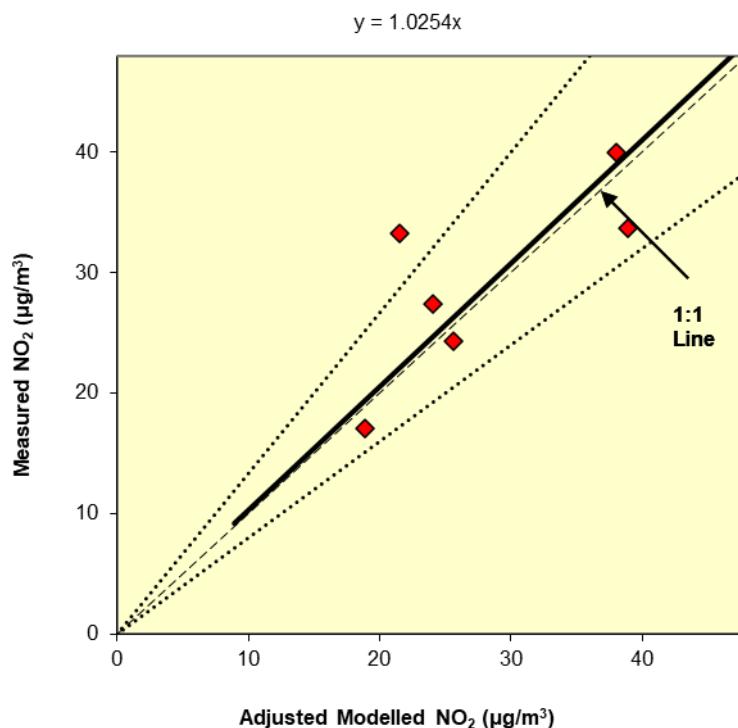


Figure A4.4: Comparison of Measured Total NO₂ to Final Adjusted Modelled Total NO₂ Concentrations. The dashed lines show $\pm 25\%$.

4.10.1 Table A4.3 shows the statistical parameters relating to the performance of the model, as well as the 'ideal' values (Defra, 2022). The values calculated for the model demonstrate that it is performing within the requirements of TG22 (Defra, 2022); the RMSE is within 25% of the objective (which in this case is 10). It is, however, desirable for the RMSE to be within 10% of the objective (in this case, four). The increased RMSE is caused by the low prediction at diffusion tube TD40 (as seen as the outlier in Figure A4.4). As the tube is on a free-flowing road, it is unclear why the concentrations are higher than other roadside sites in the area. However, as the other sites used in the study are providing reasonable predictions, there is confidence within the model, and TD40s inclusion is conservative.

Table A4.3: Statistical Model Performance

Statistical Parameter	Model-Specific Value	'Ideal' Value
Correlation Coefficient ^a	0.75	1
Root Mean Square Error (RMSE) ^b	5.55	0
Fractional Bias ^c	0.05	0

^a Used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship.

^b Used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared (i.e. $\mu\text{g}/\text{m}^3$). TG22 (Defra, 2022) outlines that, ideally, a RMSE value within 10% of the air quality objective ($4\mu\text{g}/\text{m}^3$) would be derived. If RMSE values are higher than 25% of the objective ($10\mu\text{g}/\text{m}^3$) it is recommended that the model is revisited.

^c Used to identify if the model shows a systematic tendency to over or under predict. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.

PM₁₀ and PM_{2.5}

A4.11 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 PM₁₀ 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.

A4.12 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM₁₀ 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 NO₂ is not appropriate for PM₁₀ and PM_{2.5}. Historically, many studies have derived a model adjustment factor for NOx and applied this to PM₁₀ and PM_{2.5}. This is also not appropriate, since there is no reason to expect the same bias in emissions of NOx, PM₁₀ and PM_{2.5}.

A4.13 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 PM₁₀ and PM_{2.5}. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM₁₀ and PM_{2.5} have thus not been adjusted.

Post-processing

A4.14 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 NO₂, has been processed through the NOx to NO₂ calculator available on the Defra LAQM Support website (Defra, 2023c). 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 NO₂ based on the adjusted road-NOx and the background NO₂.

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 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		✓

Apply dust suppressants to locations where a large volume of vehicles enter and exit the construction site		✓
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