

Air Quality Assessment

Bedford Road, Hitchin

Report Ref: AQ2224

September 2025

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Title:

Bedford Road, Hitchin:
Air Quality Assessment

Report Ref:

AQ2224

Date Issued:

September 2025

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1 INTRODUCTION

1.1 Scope

GEM Air Quality Ltd has been commissioned to undertake a detailed air quality assessment based on the potential impacts of a proposed residential development located on land to the east of Bedford Road in Hitchin, Hertfordshire. Planning permission is sought for 50 dwellings.

The detailed air quality assessment will focus on the potential impacts on local traffic emissions once the development has been completed. This will be undertaken by assessing the potential impact of increased traffic emissions due to the development at existing and proposed receptors located adjacent to the modelled road network. The pollutants modelled as part of this assessment are nitrogen oxides (NO_x) and particulate matter (PM₁₀ and PM_{2.5}).

The impacts of vehicle emissions have been assessed using the techniques detailed within Volume 11, Section 3 of the Design Manual for Roads and Bridges (DMRB)¹ and the Local Air Quality Management Technical Guidance (TG22)². The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a “*comprehensive tool for investigating air pollution problems due to small networks of roads*”.

It should be noted that the short-term impacts of NO₂ and PM emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

In addition to this, the assessment has also discussed ways of minimising the impacts of potential poor air quality on existing receptors by way of mitigation measures.

1.2 Consultation

The Council was approached to confirm the scope of the air quality assessment. The methodology undertaken as part of this assessment was agreed with the Council, including consideration of other committed developments in the area. These are discussed further in Section 4.2.1.

¹ Design Manual for Roads and Bridges, Vol 11, Section 3, Part 1 – HA207/07, Highways Agency, May 2007

² Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG22), Defra, August 2023



2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO₂), fine particulates (PM₁₀), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO₂). This air quality assessment focuses on NO₂ and PM₁₀, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO₂ and PM₁₀.

Table 1 – Overview of NO₂ and PM₁₀

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM₁₀)	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO₂)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007³. The Strategy provides an over-arching strategic framework for air quality management in the UK.

With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM₁₀ and PM_{2.5}) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards (Amendment) Regulations 2016, which came into force on 31st December 2016. Table 2 provides the UK Air Quality Objectives for NO₂ and PM₁₀.

³ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007



Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as	Obligation
Particles (PM₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	All local authorities
	50µg/m ³ not to be exceeded more than 7 times a year	24 hour mean	Scotland only
	40µg/m ³	Annual mean	All local authorities
	10µg/m ³	Annual mean	Scotland only
Particles (PM_{2.5})	20µg/m ³	Annual Mean	England only (encouraged in Wales)
	10µg/m ³	Annual Mean	Scotland only
Nitrogen Dioxide (NO₂)	200µg/m ³ not to be exceeded more than 18 times a year	1 hour mean	All local authorities
	40µg/m ³	Annual mean	All local authorities

2.3 Clean Air Strategy

The Clean Air Strategy⁴ was published in January 2019 and sets out the comprehensive action that is required from across all parts of government and society to tackle all sources of air pollution. New legislation will create a stronger and more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanisms.

⁴ Clean Air Strategy 2019, Department for Environment, Food and Rural Affairs, January 2019



2.4 Local Air Quality Management

At the core of LAQM delivery are three pollutant objectives; these are: Nitrogen Dioxide (NO₂), Particulate Matter (PM₁₀) and Sulphur Dioxide (SO₂). All current Air Quality Management Areas (AQMA's) across the UK are declared for one or more of these pollutants, with NO₂ accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

2.4.1 North Hertfordshire District Council

The Council has declared two AQMAs. These are as follows:

- NHDC AQMA Order No.1 2012 – Properties on the south side of Stevenage Road, Hitchin, fronting on to the road, between the Hitchin Hill Three Moorhens PH roundabout and 94-98 Stevenage Road; and
- NHDC AQMA Order No.2 2016 – Paynes Park roundabout, Hitchin

Both AQMAs have been declared for nitrogen dioxide (NO₂) from road transport emissions. Although neither AQMA is adjacent to the proposed development the impact of vehicle movements to and from the completed development could be considered significant within the AQMAs.



3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The updated National Planning Policy Framework (NPPF) for England, released in December 2024, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

Paragraph 110 within the NPPF states that the *“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making”*.

It goes on to state in paragraph 199 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”*.

3.1.2 Planning Practice Guidance (PPG)

The NPPF is supported by the national Planning Practice Guidance (PPG), which includes guiding principles on how planning can take account of the impacts of new development on air quality (updated November 2019). The PPG states that *“Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values”* and *“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”*. The role of the local authorities is covered by the LAQM regime, with the PPG stating that local authority Air Quality Action Plans *“identify measures that will be introduced in pursuit of the objectives”*. The PPG makes clear that *“Odour and dust can also be a planning concern, for example, because of the effect on local amenity”*.



The PPG also 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”*.

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”*. It 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”*.

3.1.3 Land-Use Planning & Development Control

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes⁵.

The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other forms of development where a proposal could affect local air quality and for which no other guidance exists.

3.2 Local Planning Policy & Guidance

3.2.1 NHDC Air Quality Planning Guidance Document (October 2018)

Based on this guidance the proposed development is classified as medium. However, a full impact assessment has been undertaken to determine the impacts of the proposed development within the designated AQMAs. This is consistent with approach taken by other developments in the area and has been agreed with the Council.

3.2.2 NHDC Local Plan 2011 – 2031

Policy D4 within the Councils Local Plan relates specifically to air quality and states the following:

⁵ Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017



“Planning permission will be granted where development proposals:

- a. Give consideration to the potential or actual impact on local air quality, both during the demolition/ construction phase and as a result of its final occupation and use;*
- b. Propose appropriate levels of mitigation to minimise emissions to the atmosphere and their potential effects upon health and the local environment; and*
- c. Carry out air pollution impact assessments, where required, to determine the impact on local air quality of the development, otherwise the development may be refused.*

Where air pollution impact assessments are not required there will still be a requirement on developers to provide appropriate levels of mitigation to address emissions of pollutants to the atmosphere”.



4 ASSESSMENT METHODOLOGY

4.1 Construction Phase

The Institute of Air Quality Management (IAQM) has published guidance on the assessment of dust from construction and demolition⁶. Based on this guidance, the main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM₁₀ and PM_{2.5} concentrations, as a result of dust generating activities on site; and
- an increase in concentrations of PM₁₀, PM_{2.5} and nitrogen dioxide due to exhaust emissions from vehicles and equipment used on site (non-road mobile machinery) and vehicles accessing the site.

In relation to the most likely impacts, the guidance states the following:

“The most common impacts are dust soiling and increased ambient PM₁₀ (including PM_{2.5}) concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of dust and this is most relevant to disamenity, rather than health effects.

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”.

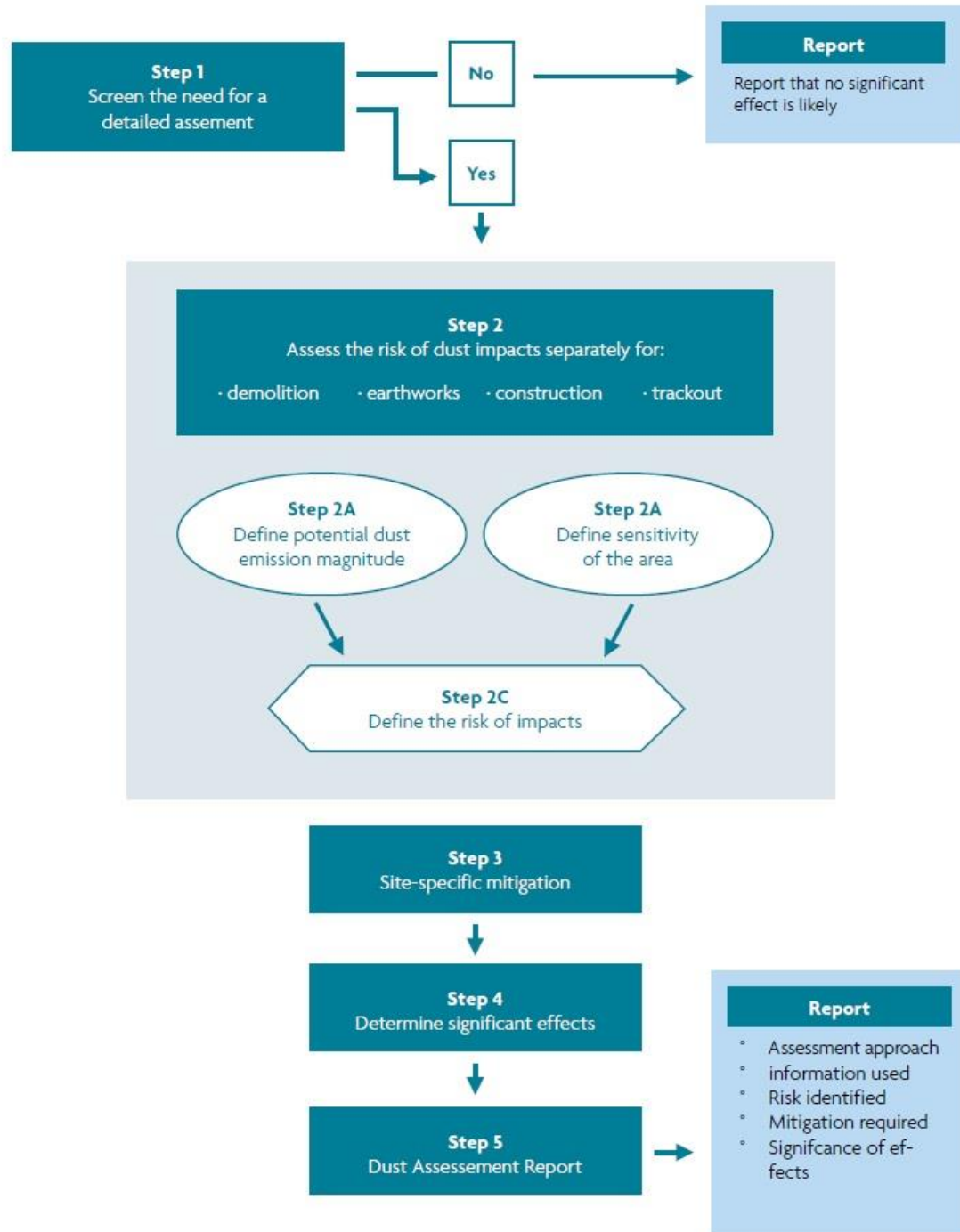
The guidance continues by providing an assessment procedure. This includes sub-dividing construction activities into four types (demolition, earthworks, construction and track out) to reflect their different potential impacts.

With regards to the proposed development the potential for dust emissions is assessed for each activity that is likely to take place. The assessment procedure assumes no mitigation measures are applied. The conditions with no mitigation thus form the baseline or “do-nothing” situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in Figure 1.

⁶ IAQM Guidance on the assessment of dust from demolition and construction (January 2024, v2.2), Institute of Air Quality Management, London



Figure 1 – Dust Assessment Procedure



4.2 Operational Phase (Traffic Emissions)

4.2.1 Modelled Scenarios

A modelled baseline year of 2023 has been used. This corresponds with the latest year of air quality monitoring undertaken by the Council at the time of writing. A future year has also been chosen (2029) representing a future year with the proposed development in place and includes changes to traffic flows due to the proposed development. Overall, four scenarios have been adopted as part of the assessment. These are as follows:

1. Existing levels of air quality / model verification (2023);
2. Do-Minimum, future baseline only (2029);
3. Do-Something, future baseline + proposed development (2029); and
4. Do-Something, future baseline + proposed & committed developments (2029)

Scenarios 2, 3 and 4 will be used to determine the potential impact on existing and proposed receptors adjacent to the modelled road network as a result of increased traffic levels generated by the proposed development in 2029.

As agreed with the Council, the following developments have been considered within the modelled traffic data:

- Site LS1 East of Bedford Road (144 units) – assumed to be completed by the time the Bedford Road development becomes operational. Vehicle movements are included within the future baseline (Scenario 2); and
- Bowman's Mill, Arsley Road (71 units) – assumed to become operational at the same time as the Bedford Road development. Vehicle movements are included as committed developments within Scenario 4.

4.2.2 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model⁷. ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

⁷ Model Version: 5.1.0.2. Interface Version 5.1.0.12184 (26/08/2025)



4.2.3 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 13.1) which incorporates updated NO_x emissions factors and vehicle fleet information⁸. These emission factors have been integrated into the latest ADMS-Roads modelling software.

The Institute for Air Quality Management (IAQM) released a position statement in July 2018 relating to uncertainties in vehicle NO_x emissions within air quality assessments. It states the following:

“It has been known since around 2011 that nitrogen oxides (NO_x) emissions from diesel vehicles have not declined as expected despite the introduction of increasingly more stringent European Union (EU) emission limits since the early 1990s. This, together with an increase in numbers of diesel cars and the use of emission control devices that increase the proportion of the nitrogen dioxide (NO₂) in the exhaust NO_x, has resulted in annual mean concentrations of NO₂ remaining high, particularly at roadside locations”.

However, the IAQM position statement has now been withdrawn and the following statement has been published by the IAQM:

“There is a growing body of evidence to suggest that the latest COPERT vehicle emission factors, which feed into the EFT (v9 and onwards), reflect the real-world NO_x emissions more accurately.

It is judged that an exclusively vehicle emissions-based sensitivity test is no longer necessary.

On this basis, the EFT may be used for future year modelling with greater confidence when considering the per vehicle emission, provided that the assessment is verified against measurements made in the year 2016 or later”.

As such, Scenario 2 has been modelled with vehicle emission factors for 2027 derived from the latest Emission Factors Toolkit.

⁸ https://laqm.defra.gov.uk/wp-content/uploads/2021/02/EFT2025_v13.1.xlsb



4.2.4 Traffic Data

Baseline traffic flows along the local roads are available from the Department for Transport (DfT)⁹. Baseline data has been projected to 2029, which is the anticipated year of completion. Projection of traffic data has been undertaken using growth factors specific to North Hertfordshire District Council, obtained from TEMPro¹⁰. The projected flow rates are provided in Table 3. It is assumed that the percentage HDV and speed will remain unchanged in future years.

The proposed development flows and committed development flows have been provided by Rappor Limited.

Modelled speeds have also been provided in Table 3. These are based on local speed limits. However, where a link approaches a junction a speed of 20 kph has been modelled to represent queuing traffic at a junction.

4.2.5 Street Canyons

A street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. Street canyons may result in elevated pollutant concentrations from road traffic emissions due to a reduced likelihood of the pollutants becoming dispersed in the atmosphere. Street canyons have not been modelled as part of this assessment.

⁹ <https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints>

¹⁰ TEMPro (Trip End Model Presentation Program) version 7.2, Department for Transport



Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Selected Roads

Modelled Year/ Scenario	Link	Baseline Flows			Baseline + Proposed Development Flows			Baseline + Proposed & Committed Development Flows		
		24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)
Modelled Baseline (2023)	Site Access	--	--	--						
	A600 Bedford Road (North of Site Access to Turnpike Lane Roundabout)	13,772	2.6%	48						
	Westmill Lane	596	1.7%	48						
	A600 Bedford Road (North of Turnpike Lane Roundabout)	10,634	3.5%	48						
	Turnpike Lane	7,467	0.8%	48						
	A600 Bedford Road (South of Site Access to A505)	13,772	2.6%	48						
	A505 Bedford Road (A600 to A505 Old Park Road)	19,707	3.0%	48						
	Upper Tilehouse Street	23,240	3.5%	48						
	A505 Old Park Road	14,542	3.7%	48						
	A505 Paynes Park	13,534	3.4%	48						
	A602 Park Way	20,576	3.6%	80						
	A602 Stevenage Road	34,876	3.7%	48						
	Turnpike Lane Roundabout	21,239	2.6%	48						
	Old Park Road Roundabout	28,076	3.7%	48						
	Stevenage Road Roundabout	34,876	3.7%	48						



Modelled Year/ Scenario	Link	Baseline Flows			Baseline + Proposed Development Flows			Baseline + Proposed & Committed Development Flows		
		24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)	24-Hr AADT	% HGV	Average Speed (kph)
Future Year (2029)	Site Access	--	--	--	272	1.5%	48	272	1.5%	48
	A600 Bedford Road (North of Site Access to Turnpike Lane Roundabout)	14,540	2.6%	48	14,617	2.6%	48	15,035	2.5%	48
	Westmill Lane	629	1.7%	48	629	1.7%	48	629	1.7%	48
	A600 Bedford Road (North of Turnpike Lane Roundabout)	11,227	3.5%	48	11,246	3.5%	48	11,736	3.4%	48
	Turnpike Lane	7,884	0.8%	48	7,940	0.8%	48	8,012	0.8%	48
	A600 Bedford Road (South of Site Access to A505)	14,540	2.6%	48	14,736	2.6%	48	15,149	2.5%	48
	A505 Bedford Road (A600 to A505 Old Park Road)	20,806	3.0%	48	21,002	3.0%	48	21,469	2.9%	48
	Upper Tilehouse Street	24,536	3.5%	48	24,569	3.5%	48	24,651	3.5%	48
	A505 Old Park Road	15,354	3.7%	48	15,419	3.7%	48	15,562	3.7%	48
	A505 Paynes Park	14,289	3.4%	48	14,354	3.4%	48	14,552	3.3%	48
	A602 Park Way	21,724	3.6%	80	21,822	3.6%	80	22,081	3.6%	80
	A602 Stevenage Road	36,822	3.7%	48	36,920	3.7%	48	37,213	3.7%	48
	Turnpike Lane Roundabout	22,424	2.6%	48	22,557	2.6%	48	23,047	2.5%	48
	Old Park Road Roundabout	29,643	3.7%	48	29,773	3.7%	48	30,114	3.6%	48
	Stevenage Road Roundabout	36,822	3.7%	48	36,920	3.7%	48	37,213	3.7%	48



4.3 Background Concentrations

Background NO_x, NO₂ and PM₁₀ concentrations have been obtained from Defra¹¹. These 1 km x 1 km grid resolution maps are derived from a base year of 2021 (for NO_x, NO₂, PM₁₀ and PM_{2.5} only), which are then projected to future years (2023 and 2028). Background concentrations of NO_x, NO₂, PM₁₀ and PM_{2.5} derived from Defra are provided in Table 4.

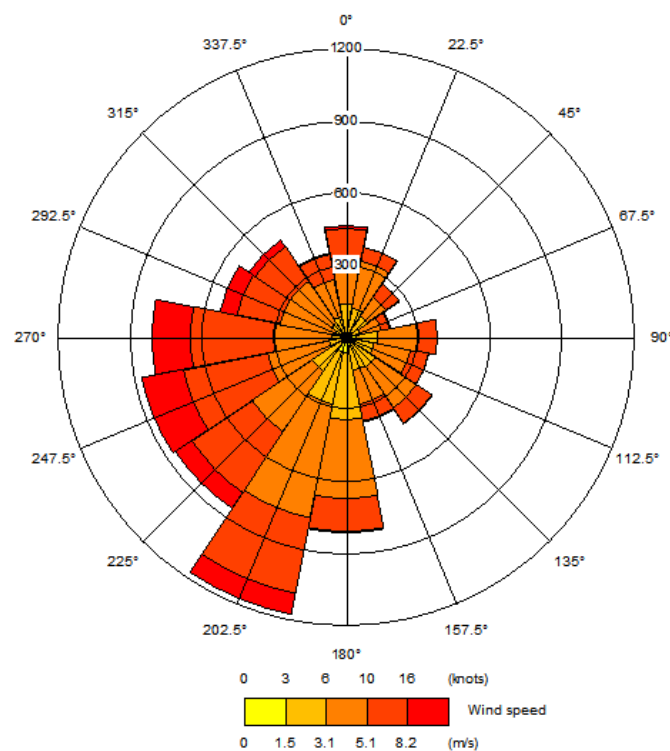
4.4 Surface Roughness

A surface roughness of 1.0 metre has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for cities. This value has been used across the modelled domain.

4.5 Meteorological Data

Hourly sequential meteorological data from the Luton meteorological station has been used. Wind speed and direction data from the Luton meteorological station has been plotted as a wind rose in Figure 2.

Figure 2 – Wind Speed and Direction Data, Luton (2023)



¹¹ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021>



Table 4 – Background NO_x, NO₂ and PM Concentrations

Location	Pollutant	X	Y	2023	2029
Model Verification: NH1, NH2, S2/NH45, S10/NH103, S19/NH92, S29/NH104, S33, S34, S35/NH110, NH111, NH112, S15/NH87, S17/NH89, S18/NH91, S41/NH82, S38, S32/NH107, S39	NO ₂	518500	228500	9.4	--
	NO _x			12.2	--
	PM ₁₀			13.2	--
	PM _{2.5}			7.6	--
Model Verification: S6/NH63, S11/NH77, S13/NH82, S20/NH93, S21/NH94, S22/NH95, S36/NH114	NO ₂	518500	229500	10.1	--
	NO _x			13.2	--
	PM ₁₀			12.8	--
	PM _{2.5}			7.8	--
Model Verification: S30/NH105, S31/NH106	NO ₂	519500	228500	9.3	--
	NO _x			12.0	--
	PM ₁₀			13.2	--
	PM _{2.5}			7.8	--
Model Verification: S12/NH131	NO ₂	518500	231500	8.6	--
	NO _x			11.2	--
	PM ₁₀			13.0	--
	PM _{2.5}			7.4	--
Receptors: 1 – 10	NO ₂	517500	231500	--	6.5
	NO _x			--	8.2
	PM ₁₀			--	12.9
	PM _{2.5}			--	6.7
Receptors: 11 – 18	NO ₂	517500	230500	--	6.9
	NO _x			--	8.8
	PM ₁₀			--	12.0
	PM _{2.5}			--	7.0
Receptors: 19 – 34, 38 – 39	NO ₂	518500	229500	--	8.2
	NO _x			--	10.6
	PM ₁₀			--	12.2
	PM _{2.5}			--	7.2
Receptors: 35 – 37	NO ₂	518500	228500	--	7.5
	NO _x			--	9.7
	PM ₁₀			--	12.6
	PM _{2.5}			--	7.1

4.6 Model Output

4.6.1 NO_x/NO₂ Relationship

The most NO_x to NO₂ calculator¹² has been used to determine NO₂ concentrations for this assessment, based on predicted NO_x concentrations using ADMS-Roads. Converted NO₂ concentrations are initially compared against local monitoring data to verify the model output. If the model performance is considered unacceptable then the NO_x concentrations are adjusted before conversion to NO₂.

4.6.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short-term impacts of NO₂ and PM₁₀. Research¹³ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³. A concentration of 60 µg/m³ has therefore been used to screen the likelihood of exceedance of the hourly mean NO₂ objective.

For PM₁₀, a relationship between the annual mean and the number of 24-hour mean exceedences has been devised and is as follows:

- No. 24-hour mean exceedences = $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$

This relationship has been applied to the modelled annual mean concentrations to estimate the number of 24-hourly exceedences.

4.6.3 Model Verification

The Council undertakes monitoring at numerous roadside locations adjacent to modelled network. These are summarised in Table 5. Monitored NO₂, PM₁₀ and PM_{2.5} concentrations from these sites have been used for the purposes of model verification.

¹² https://laqm.defra.gov.uk/wp-content/uploads/2024/11/NOx_to_NO2_Calculator_v9.1-1.xlsm

¹³ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003



Table 5 – Modelled Verification Locations

Site ID	Location	X	Y	Height (m)
NH1	Stevenage Road NOx	518740	228348	1.5
NH2	Stevenage Road PM	518713	228349	1.5
S2/NH45	Stevenage Road A, Hitchin	518708	228347	2.5
S6/NH63	(NH02a) Library Hitchin	518160	229092	2.5
S10/NH103	Westbrook Court, Hitchin	518773	228342	2.5
S11/NH77	Upper Tilehouse Street, Hitchin (traffic lights)	518006	229032	2.5
S12/NH131	Turnpike Lane, Ickleford	518215	231528	2.5
S13/NH82	Upper Tilehouse Street, Nr Roundabout	518129	229065	2.5
S19/NH92	Stevenage Road (Griffin), Hitchin	518872	228305	2.5
S20/NH93	Park Way, Hitchin	518130	229036	2.5
S29/NH104	Dower Court (A), Stevenage Road, Hitchin	518757	228334	2.5
S30/NH105	94-98 Stevenage Road, Hitchin	519067	228255	2.5
S36/NH114	Old Park Road, Hitchin (number 20)	518150	229160	2.5
S33, S34, S35/NH110, NH111, NH112	Stevenage Road, AQ Analyser 3, Hitchin	518740	228348	2.0
S15/NH87	11 Stevenage Road, Hitchin	518731	228362	2.5
S17/NH89	London Road, Hitchin	518706	228293	2.5
S18/NH91	BP Garage Stevenage Rd, Hitchin	518997	228297	2.5
S41/NH82, S38	BP Garage Stevenage Rd, Hitchin	518997	228297	2.5
S21/NH94	Offley Road, Hitchin	517915	228967	2.5
S22/NH95	Pirton Road, Hitchin	517886	228975	2.5
S31/NH106	Morello Gardens, Stevenage Road, Hitchin	519250	228218	2.5
S32/NH107	Whitehill Road, Hitchin	518720	228335	2.5
S39	38 Stevenage Rd, Hitchin	518995	228295	2.5



4.6.4 Receptor Locations

To assess the potential impact of the proposed development on existing receptors several receptors have been identified adjacent to the modelled road network. These receptors represent the façade of the property and have been chosen given their proximity to the modelled road network.

The receptors identified represent relevant exposure to air quality, such as residential properties, schools, hospitals or care homes. Not all receptors adjacent to a modelled road have been included in the assessment as the receptors selected will represent worst case locations e.g. closest to a road and/or modelled junction.

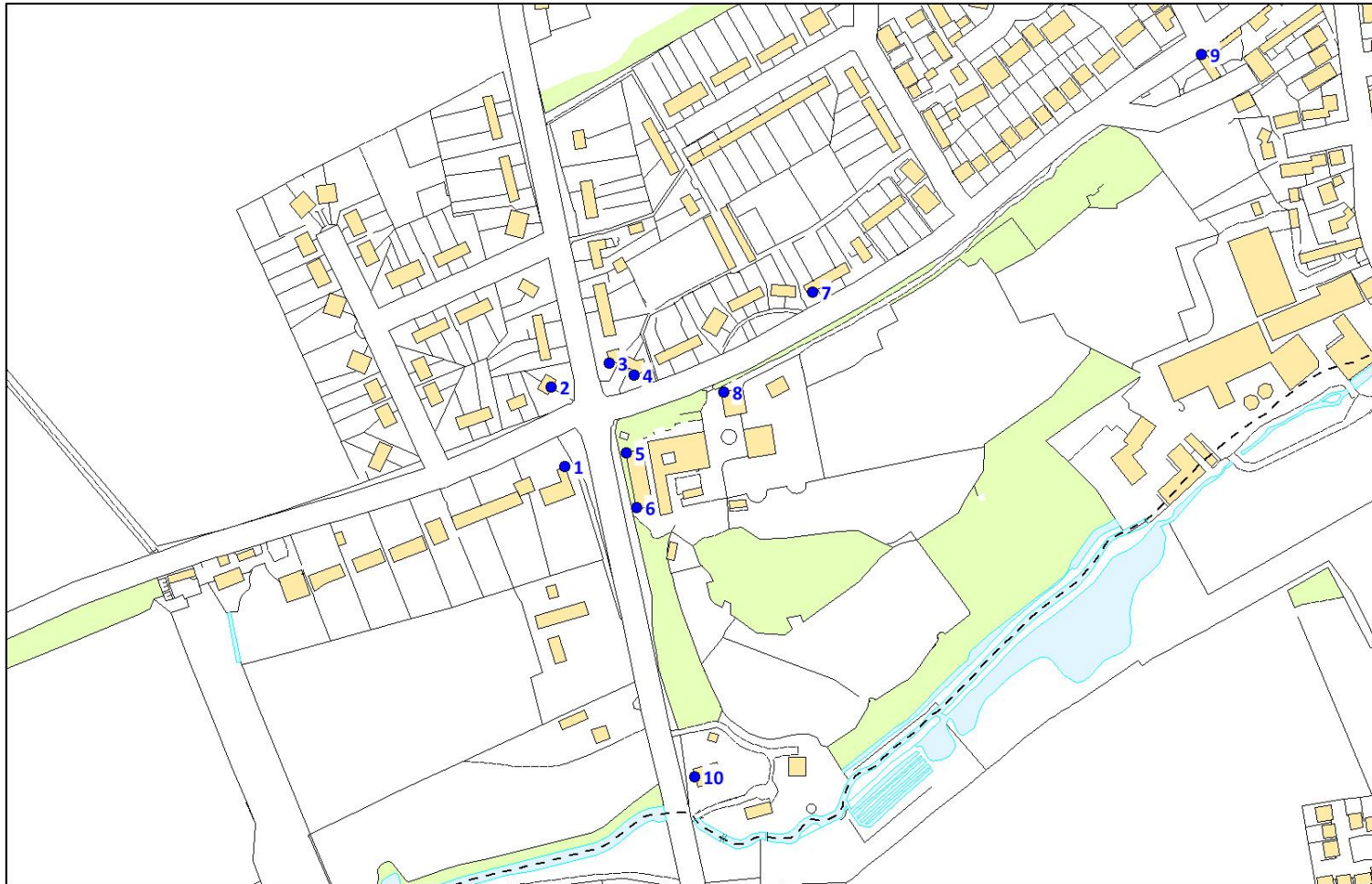
The location of these receptors is provided in Table 6. The location of the modelled receptors is shown in Figures 3 to 6.

Table 6 – Modelled Receptor Locations

ID	X	Y	Height (m)	ID	X	Y	Height (m)
1	517757	231220	1.5	21	518006	229523	1.5
2	517748	231272	1.5	22	518014	229460	1.5
3	517786	231288	1.5	23	518037	229431	1.5
4	517802	231280	1.5	24	518081	229417	1.5
5	517797	231229	1.5	25	518081	229377	1.5
6	517804	231193	1.5	26	518058	229386	1.5
7	517919	231334	1.5	27	518094	229304	1.5
8	517861	231269	1.5	28	518131	229251	1.5
9	518174	231490	1.5	29	518182	229073	1.5
10	517842	231017	1.5	30	518212	229102	1.5
11	517851	230838	1.5	31	518128	229053	1.5
12	517831	230542	1.5	32	518161	229046	1.5
13	517860	230333	1.5	33	518113	228974	1.5
14	517882	230205	1.5	34	518140	228998	1.5
15	517886	230033	1.5	35	518720	228333	1.5
16	517918	230040	1.5	36	518831	228312	1.5
17	517904	229947	1.5	37	519003	228272	1.5
18	517936	229959	1.5	38	518084	229049	1.5
19	517952	229771	1.5	39	518047	229052	1.5
20	517973	229666	1.5	40	517908	228958	1.5



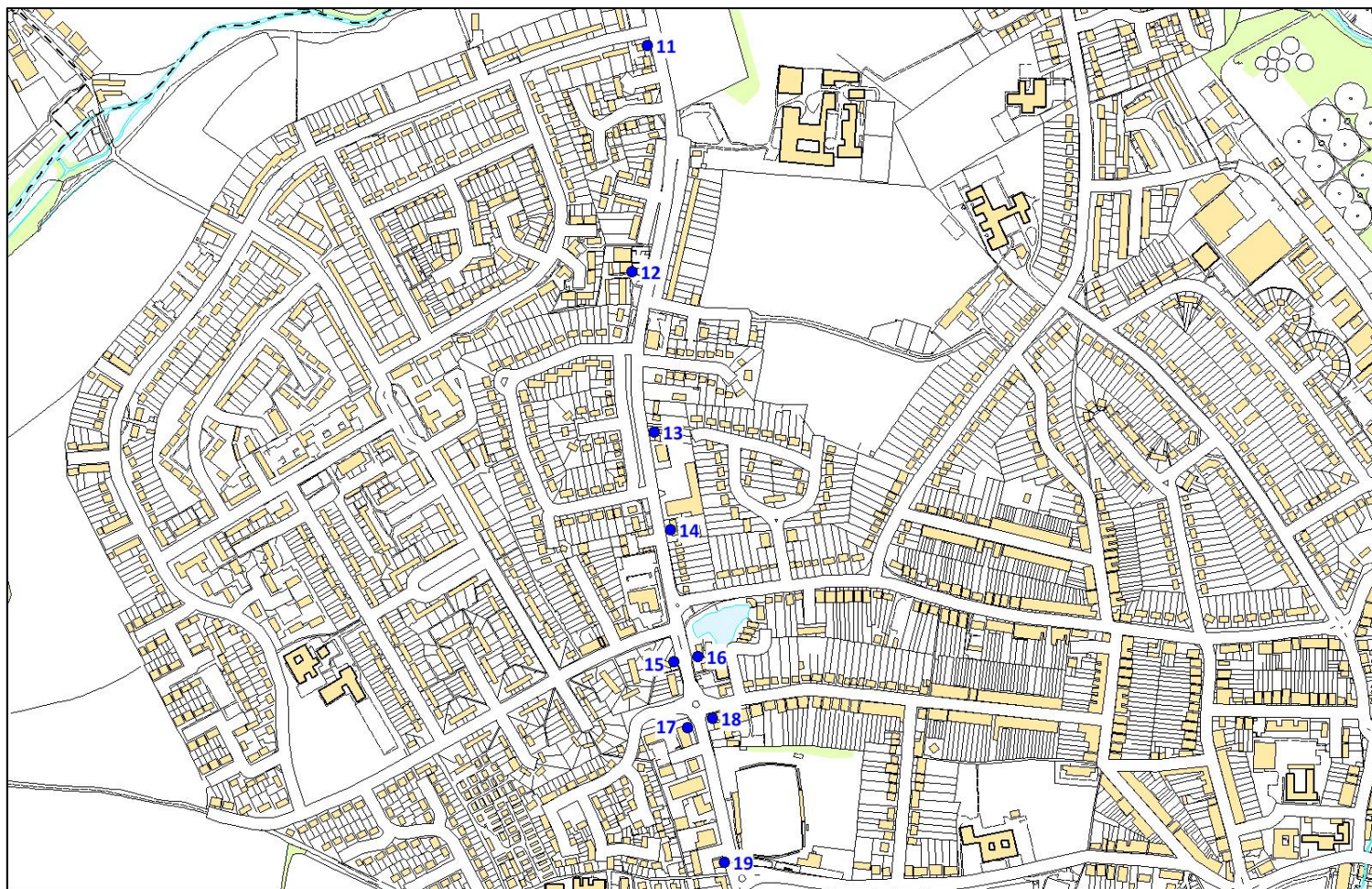
Figure 3 – Modelled Receptor Locations (Bedford Road/Turnpike Lane)



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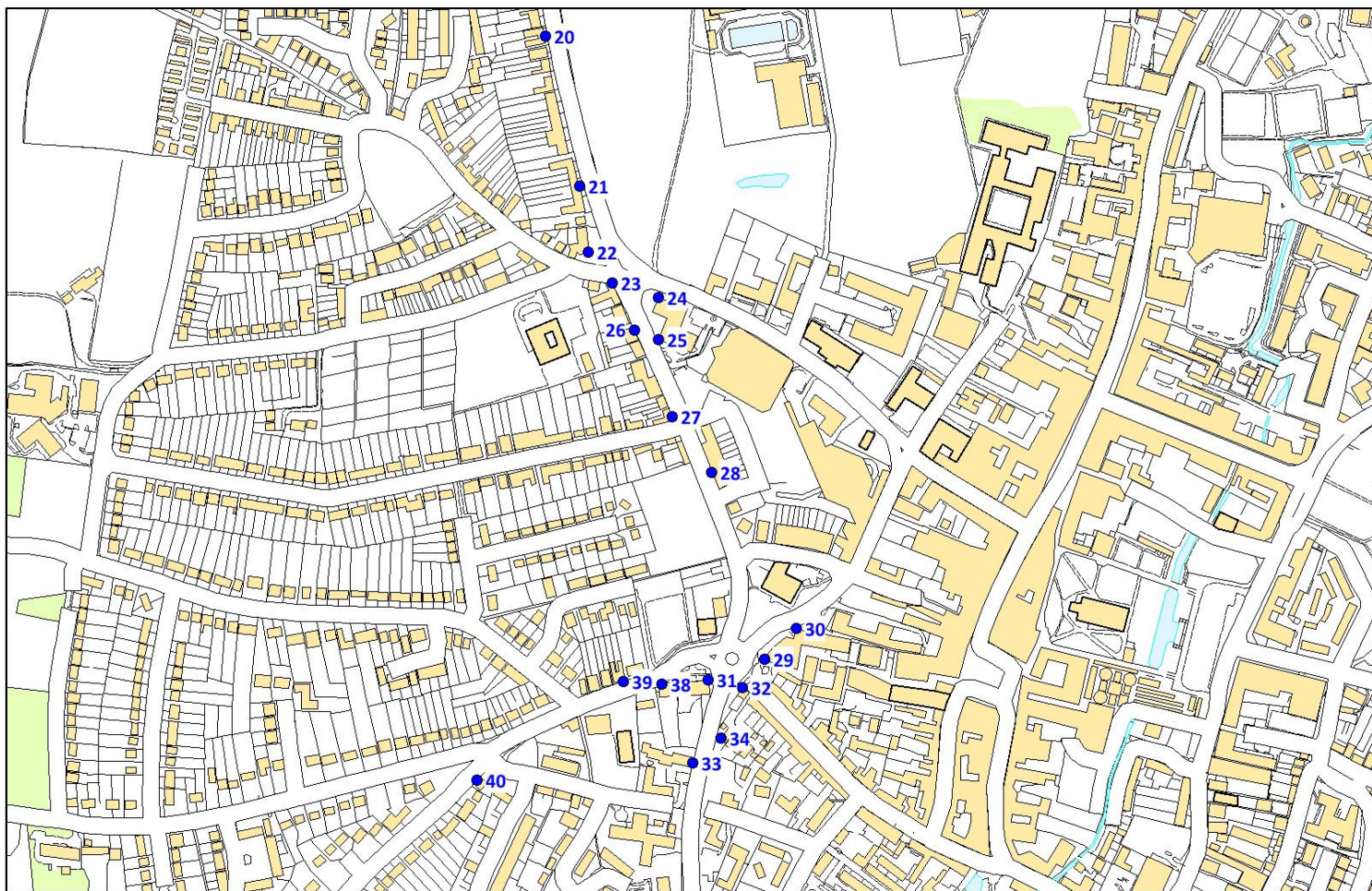
Figure 4 – Modelled Receptor Locations (A600 Bedford Road)



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Figure 5 – Modelled Receptor Locations (A505/Old Park Road/Upper Tilehouse Street/Park Way)



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Figure 6 – Modelled Receptor Locations (A602 Stevenage Road)



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4.7 Significance Criteria

4.7.1 Construction Phase

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A development is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (see Table 7); and
- the sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity (see Tables 8 and 9).

These two factors are combined to determine the risk of dust impacts with no mitigation applied (see Table 10). The risk category assigned to the development can be different for each of the four potential activities (demolition, earthworks, construction and track out).

Table 7 – Dust Emission Magnitude

Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >75,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level	Total building volume 12,000 – 75 000m ³ , potentially dusty construction material, demolition activities 6-12 m above ground level	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6m above ground, demolition during wetter months
Earthworks	Total site area >110,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height	Total site area 18,000 m ² – 110,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m – 6m in height	Total site area <18,000 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3 m in height
Construction	Total building volume >75,000 m ³ , piling, on site concrete batching; sandblasting	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m



Table 8 – Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Table 9 – Sensitivity of the Area to Human Health Impacts

Sensitivity of the Area to Human Health Effects							
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	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
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 10 – Risk of Dust Impacts

Construction Activity	Sensitivity of 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
Track out	High	High Risk	Low Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

4.7.2 Operational Phase

The guidance released by Environmental Protection UK provides steps for a Local Authority to follow to assess the significance of air quality impacts of a development proposal. This procedure, shown in Figure 7, has also been applied to the modelled results.

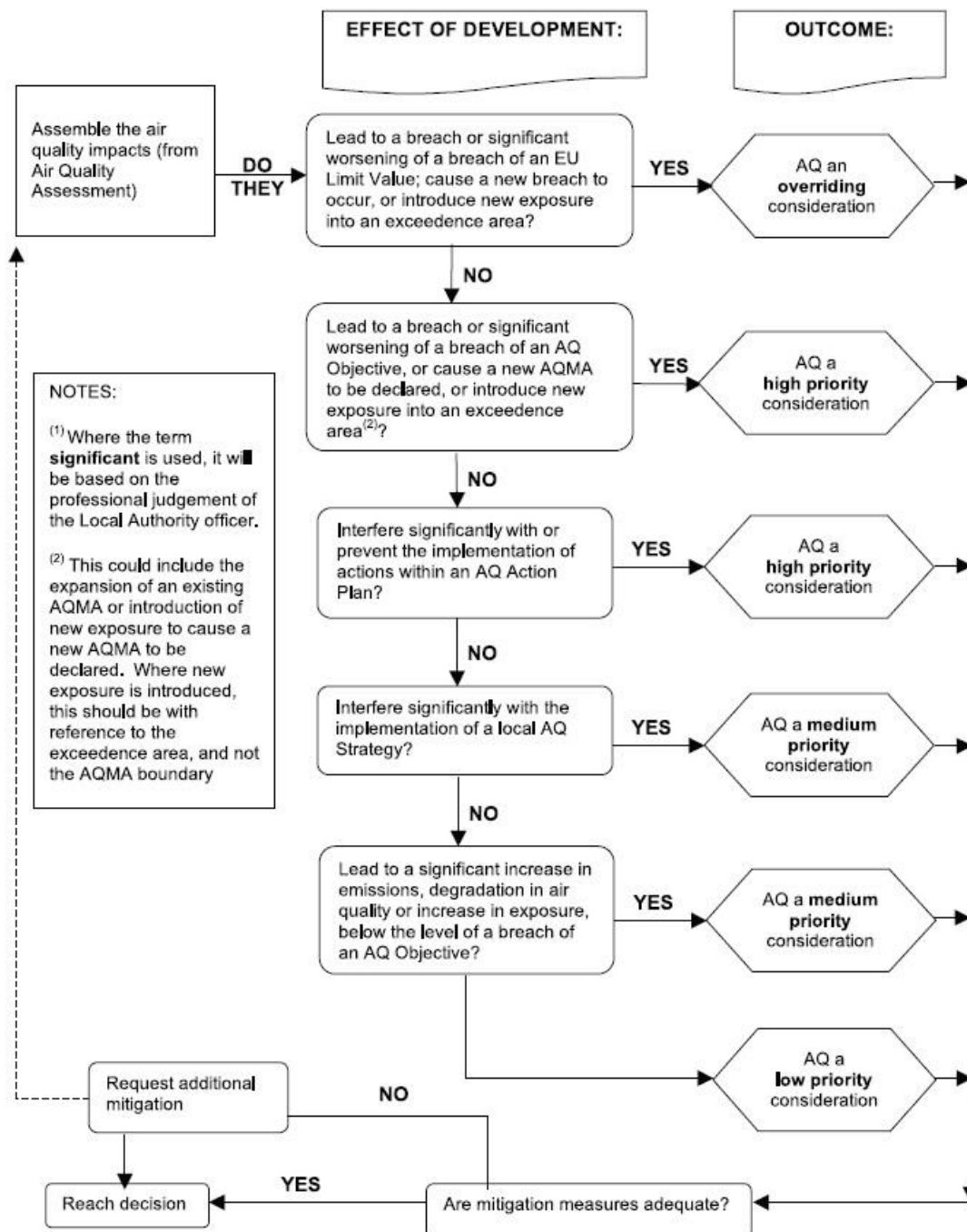
The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in Table 11.

Table 11 – Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQ objective			
	1%	2-5%	6-10%	>10%
75% or less of AQ objective	Negligible	Negligible	Slight	Moderate
76-94% of AQ objective	Negligible	Slight	Moderate	Moderate
95-102% of AQ objective	Slight	Moderate	Moderate	Substantial
103-109% of AQ objective	Moderate	Moderate	Substantial	Substantial
110% or more of AQ objective	Moderate	Substantial	Substantial	Substantial



Figure 7 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5 AIR QUALITY ASSESSMENT

5.1 Impact from Construction Activities

The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the site. Using the criteria provided in Table 7 the dust emission magnitude for each activity is as follows:

- Demolition = N/A;
- Earthworks = Small (Total site area <18,000 m²);
- Construction = Medium (Total building volume 25,000 m³ – 100,000 m³); and
- Track out = Medium (10 – 50 HDV (>3.5t) trips in any one day).

The sensitivity of the surrounding area to dust soiling and human health (Table 12) is then defined based on the criteria in Tables 8 and 9, which includes the number of medium and highly sensitive receptors that fall within a certain distance of the proposed construction phase (see Figure 8). There are no designated ecological receptors within 350 metres of the proposed development.

Table 12 – Sensitivity of the Surrounding Area

Potential Impact	Comments	Sensitivity
Dust Soiling	There are >100 high sensitivity receptors e.g. residential dwellings, within 100 metres of the proposed development. This includes the Priory School to the southeast of the proposed development, which is classified in the >100 receptor category.	Medium
Human Health	There are between 1 and 10 high sensitivity receptors e.g. residential dwellings, within 20 metres of the proposed development.	Low

The dust emission magnitudes and sensitivity of the surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in Table 13.

Table 13 – Summary of Dust Risk

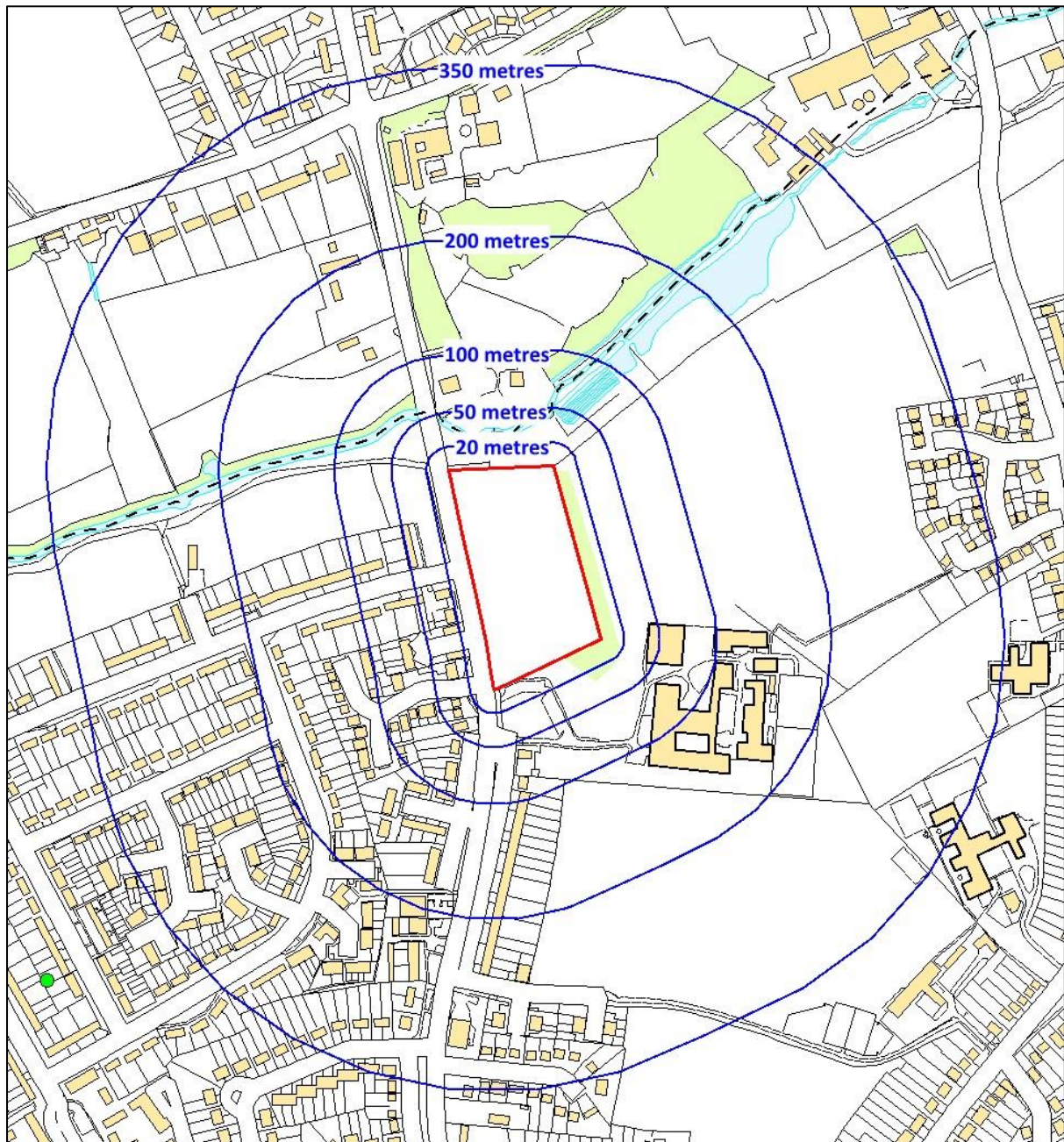
Potential Impact	Risk			
	Demolition	Earthworks	Construction	Track out
Dust Soiling	N/A	Low Risk	Medium Risk	Low Risk
Human Health	N/A	Negligible	Low Risk	Low Risk

It should also be noted that the likelihood of an adverse impact occurring is correlated to wind speed and wind direction. As such, unfavourable wind speeds and wind directions must occur



at the same time as a dust generating activity to generate an adverse impact. The overall impacts also assume that the dust generating activities are occurring over the entirety of the site meaning that as an activity moves further away from a potential receptor the magnitude and significance of the impact will be further reduced.

Figure 8 – Distance from the Proposed Development



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5.2 Impact of Vehicle Emissions

5.2.1 Model Verification

Using the guidance provided in the Local Air Quality Management Technical Guidance (TG22), the modelled output has been verified against the monitoring data obtained from the diffusion tube described in Table 5. The following tables provide a summary of the model verification process for NO₂, PM₁₀ and PM_{2.5} concentrations.

For PM_{2.5}, no data was reported for 2023 due to low data capture below the minimum level of 25%. As such, the modelled concentration has been compared against the monitored concentration from 2022.

As described in the LAQM Technical Guidance (TG22), to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within $\pm 25\%$ (ideally $\pm 10\%$) of the monitored concentrations. To improve the confidence in modelled concentrations across the modelled domain the model output has been adjusted. This is described further in the next section.

NH93 has been removed from the verification process as the recorded concentrations may be influenced by reduced airflow caused by the speed limit sign and the adjacent vegetation. As stated in LAQM guidance *“the flow around the inlet sampling probe shall be unrestricted without any obstructions affecting the airflow in the vicinity of the sampler (normally some metres away from buildings, balconies, trees and other obstacles and ideally at least 0.5m from the nearest building in the case of sampling points representing air quality at the building line)”*. Similarly, NH110-111-112 has also been removed from the verification process as *“sites should be in as open a setting as possible in relation to surrounding buildings. Immediately above the site should be open to the sky, with no overhanging trees, structures or buildings”*.

S15/NH87, S17/NH89 and S22/NH95 have been removed from the model verification process due to the distance from the modelled road network.



Table 14 – Comparison of Modelled and Monitored NO₂, PM₁₀ and PM_{2.5} Concentrations (µg/m³), 2023

Site ID	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/ monitored] x100
Nitrogen Dioxide (NO₂)			
NH1	18.0	26.5	-32.2%
S2/NH45	17.4	25.3	-31.4%
S6/NH63	16.9	24.5	-31.2%
S10/NH103	16.9	27.9	-39.5%
S11/NH77	14.8	27.2	-45.4%
S12/NH131	9.9	15.4	-35.5%
S13/NH82	14.7	22.7	-35.5%
S19/NH92	14.5	27.0	-46.2%
S29/NH104	15.7	18.0	-12.6%
S30/NH105	14.1	26.4	-46.7%
S36/NH114	12.7	20.7	-38.7%
S18/NH91	14.7	19.5	-24.6%
S41/NH82, S38	14.7	22.9	-35.8%
S21/NH94	13.9	18.6	-25.3%
S31/NH106	16.7	21.0	-20.3%
S39	15.5	24.5	-36.6%
Particulate Matter (PM₁₀)			
NH2	15.2	17.7	-14.1%
Particulate Matter (PM_{2.5})			
NH2	8.7	8.1	7.4%

5.2.2 Model Adjustment

To undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NO_x (excluding background). The modelled road contribution NO_x is taken directly from the ADMS-Roads output before it has been converted to NO₂ using the NO_x to NO₂ calculator described in Section 4.6.1. The NO_x to NO₂ calculator can also be used to derive monitored road contributions of NO_x from NO₂ diffusion tube results. A summary of these calculations is provided in Table 15.

Modelled PM₁₀ concentrations have been adjusted by a factor of 1.16. Modelled PM_{2.5} concentrations have not been adjusted.



Table 15 – Monitored NO_x and NO₂ concentrations

Site ID	Monitored Total NO ₂	Defra Background NO ₂	Monitored road contribution NO ₂ (total – background)	Monitored road contribution NO _x (total – background)	Modelled road contribution NO _x (excludes background)	Ratio of monitored road contribution NO _x / modelled road contribution NO _x
NH1	26.5	9.4	17.1	40.2	18.7	2.2
S2/NH45	25.3	9.4	15.9	36.9	17.2	2.1
S6/NH63	24.5	10.1	14.4	33.2	14.6	2.3
S10/NH103	27.9	9.4	18.5	44.1	16.2	2.7
S11/NH77	27.2	10.1	17.1	40.4	10.1	4.0
S12/NH131	15.4	8.6	6.8	14.5	2.7	5.3
S13/NH82	22.7	10.1	12.6	28.6	9.7	3.0
S19/NH92	27.0	9.4	17.6	41.6	10.9	3.8
S29/NH104	18.0	9.4	8.6	18.8	13.6	1.4
S30/NH105	26.4	9.3	17.1	40.2	10.1	4.0
S36/NH114	20.7	10.1	10.6	23.6	5.4	4.4
S18/NH91	19.5	9.4	10.1	22.3	11.3	2.0
S41/NH82, S38	22.9	9.4	13.5	30.7	11.3	2.7
S21/NH94	18.6	10.1	8.5	18.6	8.0	2.3
S31/NH106	21.0	9.3	11.7	26.2	16.1	1.6
S39	24.5	9.4	15.1	34.8	13.1	2.7

Once the monitored and modelled road contributions of NO_x (excluding background) have been derived the contributions of NO_x are compared using a linear regression. This is shown in Figure 9. The gradient of this line is 2.463 and is used to adjust the modelled road contribution of NO_x. This is shown in Table 16.

Following adjustment of the modelled NO_x concentrations by a factor of 2.463 the total NO₂ concentration at the model verification location has been calculated using the method described in Section 4.6.1. The revised NO₂ concentration, shown in Table 16, indicates a more acceptable model performance when compared against the monitored NO₂ concentrations. As such, an adjustment factor of 2.463 has been applied to all modelled NO_x concentrations across the model domain before conversion to NO₂.



Figure 9 – Linear Regression of Modelled and Monitored NOx Road Contributions

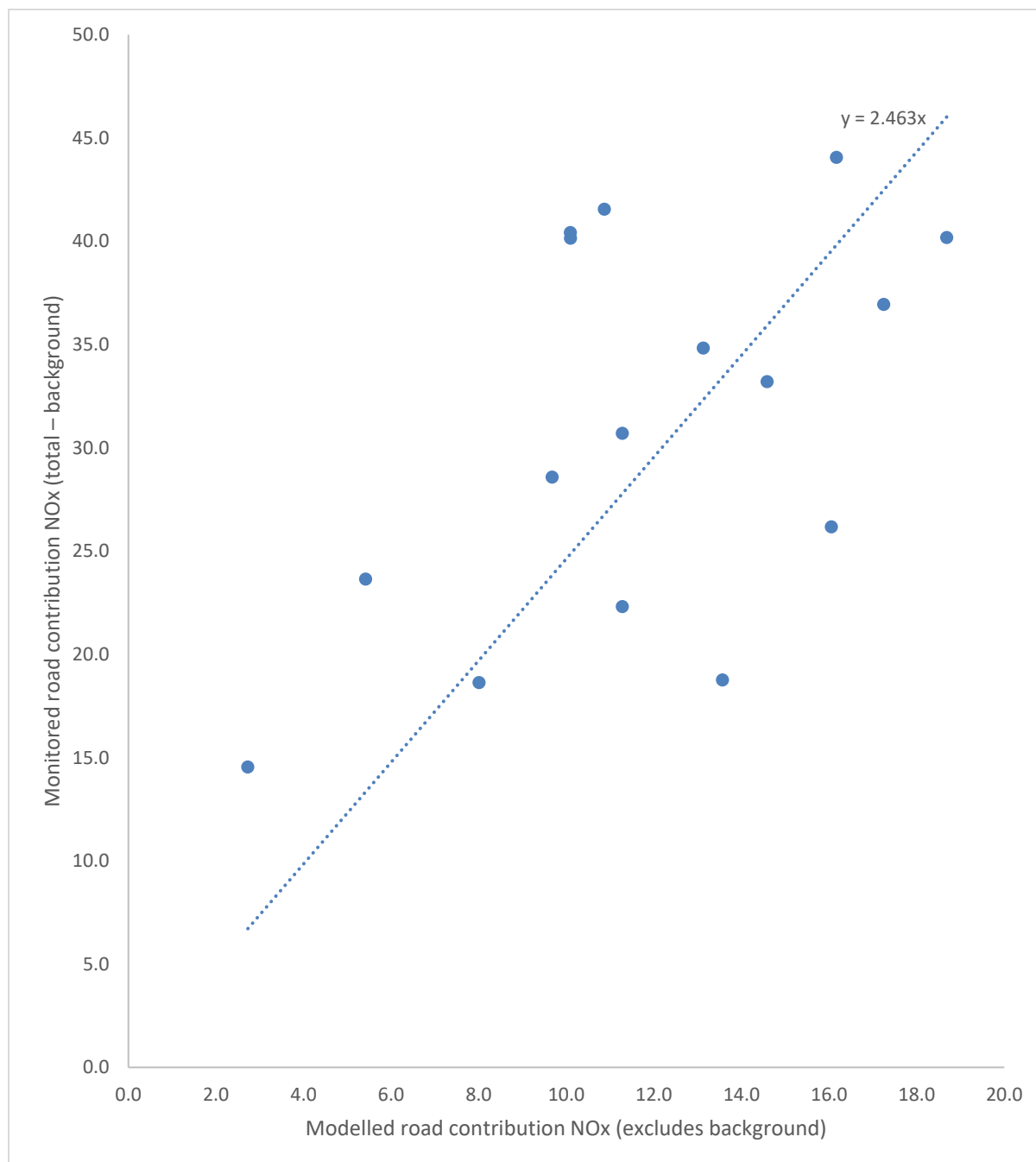


Table 16 – Adjustment of Modelled NO_x Contributions

Site ID	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NO _x	Modelled total NO ₂ (based on empirical NO _x /NO ₂ relationship)	Monitored total NO ₂	% Difference [(modelled – monitored) / monitored] x 100
NH1	2.6609	49.7	29.9	26.5	12.8%
S2/NH45	2.6609	45.9	28.6	25.3	12.8%
S6/NH63	2.6609	38.8	26.6	24.5	8.6%
S10/NH103	2.6609	43.0	27.5	27.9	-1.3%
S11/NH77	2.6609	26.9	22.0	27.2	-19.1%
S12/NH131	2.6609	7.3	12.1	15.4	-21.6%
S13/NH82	2.6609	25.8	21.6	22.7	-5.0%
S19/NH92	2.6609	28.9	22.2	27.0	-17.8%
S29/NH104	2.6609	36.1	25.0	18.0	38.8%
S30/NH105	2.6609	26.9	21.3	26.4	-19.4%
S36/NH114	2.6609	14.4	16.8	20.7	-18.9%
S18/NH91	2.6609	30.0	22.6	19.5	16.1%
S41/NH82, S38	2.6609	30.0	22.6	22.9	-1.2%
S21/NH94	2.6609	21.3	19.7	18.6	6.1%
S31/NH106	2.6609	42.7	27.3	21.0	30.2%
S39	2.6609	34.9	24.5	24.5	0.2%

Several statistical procedures are available to evaluate model performance and assess the uncertainties. Based on the adjusted modelled NO_x contributions the Root Mean Square Error (RMSE) has been derived and is shown in Table 17.



Table 17 – Root Mean Square Error (RMSE)

Observed value	Predicted value	Difference
26.5	28.6	-2.1
25.3	27.3	-2.0
24.5	25.5	-1.0
27.9	26.4	1.5
27.2	21.2	6.0
15.4	11.8	3.6
22.7	20.8	1.9
27.0	21.3	5.7
18.0	24.0	-6.0
26.4	20.5	5.9
20.7	16.3	4.4
19.5	21.7	-2.2
22.9	21.7	1.2
18.6	19.1	-0.5
21.0	26.2	-5.2
24.5	23.5	1.0
$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^N (Obs_i - Pred_i)^2}$		RMSE = 3.7 (9.3% of the AQ objective)

The RMSE has been calculated as 9.3%. As per Technical Guidance (TG22), an RMSE within 10% of the air quality objective should be derived.



5.2.3 Nitrogen Dioxide

Predicted annual mean concentrations for NO₂ at existing receptors using all future scenarios (2029) are provided in Table 18 (Proposed Development flows only) and Table 19 (Proposed & Committed flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

When comparing the predicted NO₂ concentrations in 2029 with and without the proposed development the impact is overall considered negligible at all modelled receptors.

When considering the proposed and committed development flows the impact is also considered negligible at all modelled receptors.

Nitrogen dioxide also has an hourly objective of 200 µg/m³ not to be exceeded more than 18 times in one year. Given that predicted NO₂ concentrations in 2023 and 2029 are well below 60 µg/m³ at all modelled receptors the likelihood of the short-term objective for NO₂ being exceeded is considered low.



Table 18 – Comparison of Predicted Annual Mean NO₂ Concentrations (µg/m³), Proposed Development Flows Only (2029)

Receptor	Future Baseline	Future Baseline + Development	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	7.5	7.5	18.8%	0.0	0.00%	Negligible
2	7.6	7.6	19.0%	0.0	0.00%	Negligible
3	8.5	8.5	21.3%	0.0	0.00%	Negligible
4	8.3	8.3	20.8%	0.0	0.00%	Negligible
5	8.5	8.5	21.3%	0.0	0.00%	Negligible
6	8.2	8.2	20.5%	0.0	0.00%	Negligible
7	7.5	7.5	18.8%	0.0	0.00%	Negligible
8	7.5	7.5	18.8%	0.0	0.00%	Negligible
9	7.6	7.6	19.0%	0.0	0.00%	Negligible
10	8.1	8.1	20.3%	0.0	0.00%	Negligible
11	8.3	8.3	20.8%	0.0	0.00%	Negligible
12	7.8	7.8	19.5%	0.0	0.00%	Negligible
13	8.6	8.7	21.8%	0.1	0.25%	Negligible
14	8.7	8.7	21.8%	0.0	0.00%	Negligible
15	8.8	8.8	22.0%	0.0	0.00%	Negligible
16	8.9	9.0	22.5%	0.1	0.25%	Negligible
17	8.4	8.4	21.0%	0.0	0.00%	Negligible
18	11.3	11.4	28.5%	0.1	0.25%	Negligible
19	10.4	10.5	26.3%	0.1	0.25%	Negligible
20	10.7	10.7	26.8%	0.0	0.00%	Negligible
21	10.4	10.4	26.0%	0.0	0.00%	Negligible
22	9.7	9.7	24.3%	0.0	0.00%	Negligible
23	10.8	10.8	27.0%	0.0	0.00%	Negligible
24	10.8	10.8	27.0%	0.0	0.00%	Negligible
25	11.3	11.3	28.3%	0.0	0.00%	Negligible
26	10.7	10.7	26.8%	0.0	0.00%	Negligible
27	10.7	10.7	26.8%	0.0	0.00%	Negligible
28	11.9	11.9	29.8%	0.0	0.00%	Negligible
29	12.2	12.2	30.5%	0.0	0.00%	Negligible
30	11.0	11.0	27.5%	0.0	0.00%	Negligible
31	13.0	13.0	32.5%	0.0	0.00%	Negligible
32	12.5	12.5	31.3%	0.0	0.00%	Negligible
33	11.8	11.8	29.5%	0.0	0.00%	Negligible
34	11.6	11.6	29.0%	0.0	0.00%	Negligible
35	14.6	14.6	36.5%	0.0	0.00%	Negligible
36	13.3	13.3	33.3%	0.0	0.00%	Negligible
37	12.6	12.6	31.5%	0.0	0.00%	Negligible
38	12.2	12.2	30.5%	0.0	0.00%	Negligible
39	12.8	12.8	32.0%	0.0	0.00%	Negligible
40	13.0	13.0	32.5%	0.0	0.00%	Negligible
Objective	40.0					



Table 19 – Comparison of Predicted Annual Mean NO₂ Concentrations (µg/m³), Proposed & Committed Development Flows (2029)

Receptor	Future Baseline	Future Baseline + Proposed & Committed Developments	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	7.5	7.5	18.8%	0.0	0.00%	Negligible
2	7.6	7.6	19.0%	0.0	0.00%	Negligible
3	8.5	8.6	21.5%	0.1	0.25%	Negligible
4	8.3	8.4	21.0%	0.1	0.25%	Negligible
5	8.5	8.5	21.3%	0.0	0.00%	Negligible
6	8.2	8.2	20.5%	0.0	0.00%	Negligible
7	7.5	7.5	18.8%	0.0	0.00%	Negligible
8	7.5	7.5	18.8%	0.0	0.00%	Negligible
9	7.6	7.6	19.0%	0.0	0.00%	Negligible
10	8.1	8.1	20.3%	0.0	0.00%	Negligible
11	8.3	8.3	20.8%	0.0	0.00%	Negligible
12	7.8	7.8	19.5%	0.0	0.00%	Negligible
13	8.6	8.7	21.8%	0.1	0.25%	Negligible
14	8.7	8.7	21.8%	0.0	0.00%	Negligible
15	8.8	8.8	22.0%	0.0	0.00%	Negligible
16	8.9	9.0	22.5%	0.1	0.25%	Negligible
17	8.4	8.5	21.3%	0.1	0.25%	Negligible
18	11.3	11.4	28.5%	0.1	0.25%	Negligible
19	10.4	10.5	26.3%	0.1	0.25%	Negligible
20	10.7	10.7	26.8%	0.0	0.00%	Negligible
21	10.4	10.4	26.0%	0.0	0.00%	Negligible
22	9.7	9.7	24.3%	0.0	0.00%	Negligible
23	10.8	10.8	27.0%	0.0	0.00%	Negligible
24	10.8	10.8	27.0%	0.0	0.00%	Negligible
25	11.3	11.3	28.3%	0.0	0.00%	Negligible
26	10.7	10.8	27.0%	0.1	0.25%	Negligible
27	10.7	10.8	27.0%	0.1	0.25%	Negligible
28	11.9	11.9	29.8%	0.0	0.00%	Negligible
29	12.2	12.3	30.8%	0.1	0.25%	Negligible
30	11.0	11.1	27.8%	0.1	0.25%	Negligible
31	13.0	13.1	32.8%	0.1	0.25%	Negligible
32	12.5	12.6	31.5%	0.1	0.25%	Negligible
33	11.8	11.9	29.8%	0.1	0.25%	Negligible
34	11.6	11.6	29.0%	0.0	0.00%	Negligible
35	14.6	14.7	36.8%	0.1	0.25%	Negligible
36	13.3	13.4	33.5%	0.1	0.25%	Negligible
37	12.6	12.7	31.8%	0.1	0.25%	Negligible
38	12.2	12.2	30.5%	0.0	0.00%	Negligible
39	12.8	12.9	32.3%	0.1	0.25%	Negligible
40	13.0	13.0	32.5%	0.0	0.00%	Negligible
Objective	40.0					



5.2.4 Particulate Matter

Predicted annual mean concentrations for PM₁₀ at existing receptors using all future scenarios (2029) are provided in Table 20 (Proposed Development flows only) and Table 21 (Proposed & Committed flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

When comparing the predicted PM₁₀ concentrations in 2029 with and without the proposed development the impact is overall considered negligible at all modelled receptors.

When considering the proposed and committed development flows the impact is also considered negligible at all modelled receptors.

Based on the predicted annual mean PM₁₀ concentrations across all receptors the maximum number of days when the short term PM₁₀ objective is exceeded is 0. This is well below the objective of 35 days.

Predicted annual mean concentrations for PM_{2.5} at existing receptors using all future scenarios (2029) are provided in Table 22 (Proposed Development flows only) and Table 23 (Proposed & Committed flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

When comparing the predicted PM_{2.5} concentrations in 2029 with and without the proposed development the impact is overall considered negligible at all modelled receptors.

When considering the proposed and committed development flows the impact is also considered negligible at all modelled receptors.



Table 20 – Comparison of Predicted Annual Mean PM₁₀ Concentrations (µg/m³), Proposed Development Flows Only (2029)

Receptor	Future Baseline	Future Baseline + Development	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	13.1	13.1	32.8%	0.0	0.0%	Negligible
2	13.1	13.1	32.8%	0.0	0.0%	Negligible
3	13.3	13.3	33.3%	0.0	0.0%	Negligible
4	13.3	13.3	33.3%	0.0	0.0%	Negligible
5	13.3	13.3	33.3%	0.0	0.0%	Negligible
6	13.3	13.3	33.3%	0.0	0.0%	Negligible
7	13.1	13.1	32.8%	0.0	0.0%	Negligible
8	13.1	13.1	32.8%	0.0	0.0%	Negligible
9	13.2	13.2	33.0%	0.0	0.0%	Negligible
10	13.3	13.3	33.3%	0.0	0.0%	Negligible
11	12.3	12.3	30.8%	0.0	0.0%	Negligible
12	12.2	12.2	30.5%	0.0	0.0%	Negligible
13	12.4	12.4	31.0%	0.0	0.0%	Negligible
14	12.4	12.4	31.0%	0.0	0.0%	Negligible
15	12.4	12.4	31.0%	0.0	0.0%	Negligible
16	12.4	12.4	31.0%	0.0	0.0%	Negligible
17	12.3	12.3	30.8%	0.0	0.0%	Negligible
18	14.3	14.3	35.8%	0.0	0.0%	Negligible
19	12.7	12.7	31.8%	0.0	0.0%	Negligible
20	12.8	12.8	32.0%	0.0	0.0%	Negligible
21	12.7	12.7	31.8%	0.0	0.0%	Negligible
22	12.5	12.5	31.3%	0.0	0.0%	Negligible
23	12.7	12.7	31.8%	0.0	0.0%	Negligible
24	12.8	12.8	32.0%	0.0	0.0%	Negligible
25	12.9	12.9	32.3%	0.0	0.0%	Negligible
26	12.8	12.8	32.0%	0.0	0.0%	Negligible
27	12.8	12.8	32.0%	0.0	0.0%	Negligible
28	13.1	13.1	32.8%	0.0	0.0%	Negligible
29	13.0	13.0	32.5%	0.0	0.0%	Negligible
30	12.8	12.8	32.0%	0.0	0.0%	Negligible
31	13.1	13.2	33.0%	0.1	0.2%	Negligible
32	13.1	13.1	32.8%	0.0	0.0%	Negligible
33	12.8	12.8	32.0%	0.0	0.0%	Negligible
34	12.8	12.8	32.0%	0.0	0.0%	Negligible
35	14.0	14.0	35.0%	0.0	0.0%	Negligible
36	13.7	13.7	34.3%	0.0	0.0%	Negligible
37	13.5	13.5	33.8%	0.0	0.0%	Negligible
38	13.1	13.1	32.8%	0.0	0.0%	Negligible
39	13.3	13.3	33.3%	0.0	0.0%	Negligible
40	13.1	13.2	33.0%	0.1	0.2%	Negligible
Objective	40.0					



Table 21 – Comparison of Predicted Annual Mean PM₁₀ Concentrations (µg/m³), Proposed & Committed Development Flows (2029)

Receptor	Future Baseline	Future Baseline + Proposed & Committed Developments	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	13.1	13.1	32.8%	0.0	0.0%	Negligible
2	13.1	13.1	32.8%	0.0	0.0%	Negligible
3	13.3	13.3	33.3%	0.0	0.0%	Negligible
4	13.3	13.3	33.3%	0.0	0.0%	Negligible
5	13.3	13.3	33.3%	0.0	0.0%	Negligible
6	13.3	13.3	33.3%	0.0	0.0%	Negligible
7	13.1	13.1	32.8%	0.0	0.0%	Negligible
8	13.1	13.1	32.8%	0.0	0.0%	Negligible
9	13.2	13.2	33.0%	0.0	0.0%	Negligible
10	13.3	13.3	33.3%	0.0	0.0%	Negligible
11	12.3	12.3	30.8%	0.0	0.0%	Negligible
12	12.2	12.2	30.5%	0.0	0.0%	Negligible
13	12.4	12.4	31.0%	0.0	0.0%	Negligible
14	12.4	12.4	31.0%	0.0	0.0%	Negligible
15	12.4	12.4	31.0%	0.0	0.0%	Negligible
16	12.4	12.4	31.0%	0.0	0.0%	Negligible
17	12.3	12.3	30.8%	0.0	0.0%	Negligible
18	14.3	14.3	35.8%	0.0	0.0%	Negligible
19	12.7	12.7	31.8%	0.0	0.0%	Negligible
20	12.8	12.8	32.0%	0.0	0.0%	Negligible
21	12.7	12.7	31.8%	0.0	0.0%	Negligible
22	12.5	12.5	31.3%	0.0	0.0%	Negligible
23	12.7	12.7	31.8%	0.0	0.0%	Negligible
24	12.8	12.8	32.0%	0.0	0.0%	Negligible
25	12.9	12.9	32.3%	0.0	0.0%	Negligible
26	12.8	12.8	32.0%	0.0	0.0%	Negligible
27	12.8	12.8	32.0%	0.0	0.0%	Negligible
28	13.1	13.1	32.8%	0.0	0.0%	Negligible
29	13.0	13.0	32.5%	0.0	0.0%	Negligible
30	12.8	12.8	32.0%	0.0	0.0%	Negligible
31	13.1	13.2	33.0%	0.1	0.2%	Negligible
32	13.1	13.1	32.8%	0.0	0.0%	Negligible
33	12.8	12.8	32.0%	0.0	0.0%	Negligible
34	12.8	12.8	32.0%	0.0	0.0%	Negligible
35	14.0	14.0	35.0%	0.0	0.0%	Negligible
36	13.7	13.7	34.3%	0.0	0.0%	Negligible
37	13.5	13.6	34.0%	0.1	0.2%	Negligible
38	13.1	13.1	32.8%	0.0	0.0%	Negligible
39	13.3	13.3	33.3%	0.0	0.0%	Negligible
40	13.1	13.2	33.0%	0.1	0.2%	Negligible
Objective	40.0					



Table 22 – Comparison of Predicted Annual Mean PM_{2.5} Concentrations (µg/m³), Proposed Development Flows Only (2029)

Receptor	Future Baseline	Future Baseline + Development	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	6.8	6.8	34.0%	0.0	0.0%	Negligible
2	6.8	6.8	34.0%	0.0	0.0%	Negligible
3	6.9	6.9	34.5%	0.0	0.0%	Negligible
4	6.9	6.9	34.5%	0.0	0.0%	Negligible
5	6.9	6.9	34.5%	0.0	0.0%	Negligible
6	6.9	6.9	34.5%	0.0	0.0%	Negligible
7	6.8	6.8	34.0%	0.0	0.0%	Negligible
8	6.8	6.8	34.0%	0.0	0.0%	Negligible
9	6.8	6.8	34.0%	0.0	0.0%	Negligible
10	6.9	6.9	34.5%	0.0	0.0%	Negligible
11	7.2	7.2	36.0%	0.0	0.0%	Negligible
12	7.1	7.1	35.5%	0.0	0.0%	Negligible
13	7.2	7.2	36.0%	0.0	0.0%	Negligible
14	7.2	7.2	36.0%	0.0	0.0%	Negligible
15	7.2	7.2	36.0%	0.0	0.0%	Negligible
16	7.2	7.2	36.0%	0.0	0.0%	Negligible
17	7.2	7.2	36.0%	0.0	0.0%	Negligible
18	9.3	9.3	46.5%	0.0	0.0%	Negligible
19	7.5	7.5	37.5%	0.0	0.0%	Negligible
20	7.5	7.5	37.5%	0.0	0.0%	Negligible
21	7.5	7.5	37.5%	0.0	0.0%	Negligible
22	7.4	7.4	37.0%	0.0	0.0%	Negligible
23	7.5	7.5	37.5%	0.0	0.0%	Negligible
24	7.5	7.5	37.5%	0.0	0.0%	Negligible
25	7.6	7.6	38.0%	0.0	0.0%	Negligible
26	7.5	7.5	37.5%	0.0	0.0%	Negligible
27	7.5	7.5	37.5%	0.0	0.0%	Negligible
28	7.7	7.7	38.5%	0.0	0.0%	Negligible
29	7.6	7.6	38.0%	0.0	0.0%	Negligible
30	7.5	7.5	37.5%	0.0	0.0%	Negligible
31	7.7	7.7	38.5%	0.0	0.0%	Negligible
32	7.7	7.7	38.5%	0.0	0.0%	Negligible
33	7.5	7.5	37.5%	0.0	0.0%	Negligible
34	7.5	7.5	37.5%	0.0	0.0%	Negligible
35	7.8	7.8	39.0%	0.0	0.0%	Negligible
36	7.7	7.7	38.5%	0.0	0.0%	Negligible
37	7.6	7.6	38.0%	0.0	0.0%	Negligible
38	7.7	7.7	38.5%	0.0	0.0%	Negligible
39	7.8	7.8	39.0%	0.0	0.0%	Negligible
40	7.7	7.7	38.5%	0.0	0.0%	Negligible
Objective	20.0					



Table 23 – Comparison of Predicted Annual Mean PM_{2.5} Concentrations (µg/m³), Proposed & Committed Development Flows (2029)

Receptor	Future Baseline	Future Baseline + Proposed & Committed Developments	% of AQ Objective	Change	% Change Relative to AQO	Impact Descriptor
1	6.8	6.8	34.0%	0.0	0.0%	Negligible
2	6.8	6.8	34.0%	0.0	0.0%	Negligible
3	6.9	6.9	34.5%	0.0	0.0%	Negligible
4	6.9	6.9	34.5%	0.0	0.0%	Negligible
5	6.9	6.9	34.5%	0.0	0.0%	Negligible
6	6.9	6.9	34.5%	0.0	0.0%	Negligible
7	6.8	6.8	34.0%	0.0	0.0%	Negligible
8	6.8	6.8	34.0%	0.0	0.0%	Negligible
9	6.8	6.8	34.0%	0.0	0.0%	Negligible
10	6.9	6.9	34.5%	0.0	0.0%	Negligible
11	7.2	7.2	36.0%	0.0	0.0%	Negligible
12	7.1	7.1	35.5%	0.0	0.0%	Negligible
13	7.2	7.2	36.0%	0.0	0.0%	Negligible
14	7.2	7.2	36.0%	0.0	0.0%	Negligible
15	7.2	7.2	36.0%	0.0	0.0%	Negligible
16	7.2	7.2	36.0%	0.0	0.0%	Negligible
17	7.2	7.2	36.0%	0.0	0.0%	Negligible
18	9.3	9.3	46.5%	0.0	0.0%	Negligible
19	7.5	7.5	37.5%	0.0	0.0%	Negligible
20	7.5	7.5	37.5%	0.0	0.0%	Negligible
21	7.5	7.5	37.5%	0.0	0.0%	Negligible
22	7.4	7.4	37.0%	0.0	0.0%	Negligible
23	7.5	7.5	37.5%	0.0	0.0%	Negligible
24	7.5	7.5	37.5%	0.0	0.0%	Negligible
25	7.6	7.6	38.0%	0.0	0.0%	Negligible
26	7.5	7.5	37.5%	0.0	0.0%	Negligible
27	7.5	7.5	37.5%	0.0	0.0%	Negligible
28	7.7	7.7	38.5%	0.0	0.0%	Negligible
29	7.6	7.6	38.0%	0.0	0.0%	Negligible
30	7.5	7.5	37.5%	0.0	0.0%	Negligible
31	7.7	7.7	38.5%	0.0	0.0%	Negligible
32	7.7	7.7	38.5%	0.0	0.0%	Negligible
33	7.5	7.6	38.0%	0.1	0.5%	Negligible
34	7.5	7.5	37.5%	0.0	0.0%	Negligible
35	7.8	7.8	39.0%	0.0	0.0%	Negligible
36	7.7	7.7	38.5%	0.0	0.0%	Negligible
37	7.6	7.6	38.0%	0.0	0.0%	Negligible
38	7.7	7.7	38.5%	0.0	0.0%	Negligible
39	7.8	7.8	39.0%	0.0	0.0%	Negligible
40	7.7	7.7	38.5%	0.0	0.0%	Negligible
Objective	20.0					



6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Impact from Construction Activities

A qualitative assessment of dust levels associated with the proposed development has been carried out. The impact of dust soiling and PM₁₀ can be reduced to negligible through appropriate mitigation measures, which are listed in Table 24 and are applicable to a medium risk site. Implementation of these Best Practice Measures will help reduce the impact of the construction activities to an acceptable level.

With these mitigation measures enforced, the likelihood of nuisance dust episodes occurring at those receptors adjacent to the development are considered low.

6.2 Impact of Vehicle Emissions

The change in predicted PM and NO₂ concentrations at existing receptors in 2029 following completion of the proposed and committed development is considered negligible. Overall, using the flow chart presented in Figure 7, air quality is a low priority consideration with regards to the impact of the proposed development.



Table 24 – Mitigation of Construction Activities

Construction Activity	Mitigation Measures
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
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 a complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
Monitoring	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully 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	Ensure all non-road mobile machinery (NRMM) comply with standards.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.

