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Air Quality Assessment: Bartons Road, Havant

Date: 9 February 2021



Quality Assurance

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Experts in Air Quality, Odour and Climate Change



Executive Summary

The air quality impacts associated with the proposed mixed-use development at the former Electricity Board site, Bartons Road, Havant upon local air quality have been considered. The proposed development will lead to a change in vehicle traffic on the local road network. The impacts of the proposed development have, however, been found to be negligible and it will not lead to any exceedences of the air quality objectives or limit values.

The impacts of existing sources of pollution in the local area upon air quality for future occupants of the proposed development has also been considered. Concentrations of nitrogen dioxide and particulate matter have been predicted at the proposed development. All predicted concentrations are below the air quality objectives and the proposed development is not representative exposure of the limit values.

Overall, the impacts of the proposed development will be 'not significant' and air quality for future occupants will be acceptable. It is thus not considered appropriate to propose further mitigation measures for the proposed development.

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1 Introduction

- 1.1 Air Pollution Services (APS) has been commissioned by Fortitudo (Havant) Ltd to assess the air quality impacts upon human-health associated with the proposed mixed-use development at Bartons Road, Havant (the 'Proposed Development'). The Proposed Development location is shown in Figure 1.

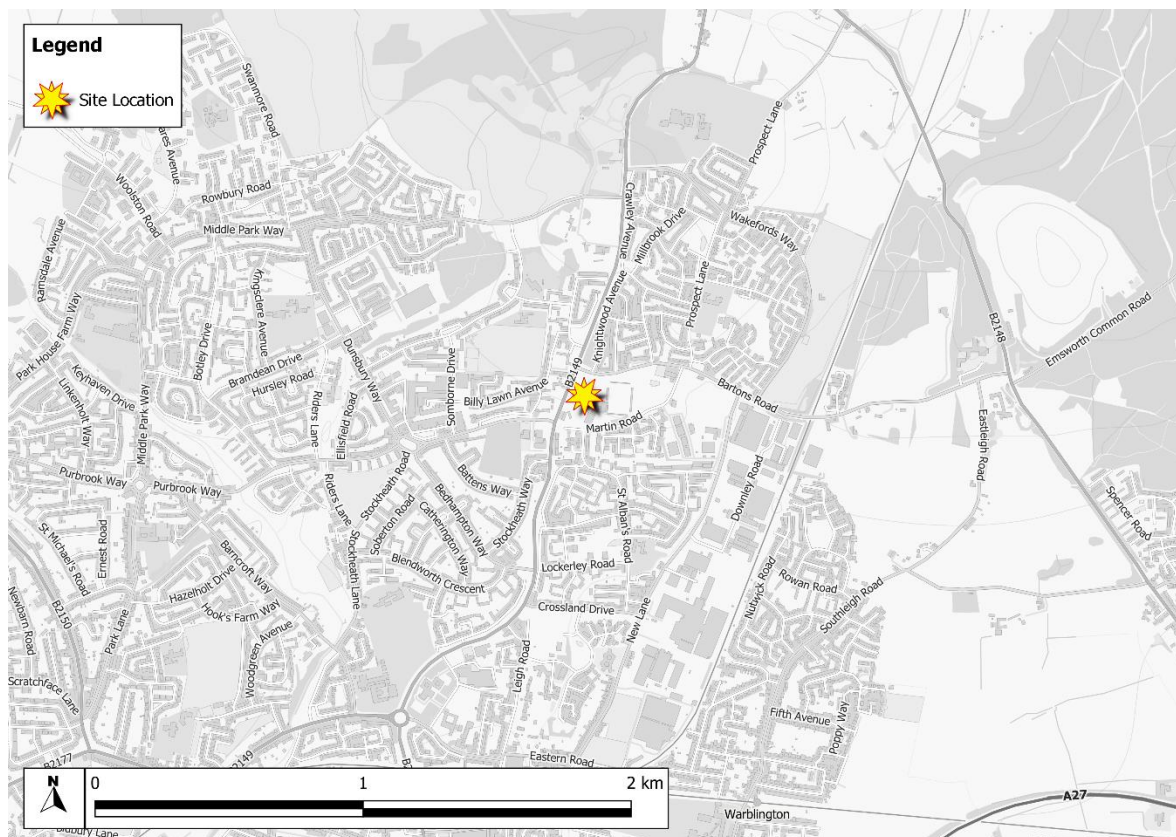


Figure 1: Site location

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Scope of assessment

- 1.2 The Proposed Development is in an urban area close to the B2149, an arterial road through the town of Havant. It is not located near any Air Quality Management Areas (AQMAs). The main concerns relating to air quality are the impact that the Proposed Development might have on sensitive human-health receptors in the local area and the conditions for future occupants and users of the Proposed Development. The Proposed Development will not have an onsite combustion plant and will therefore not lead to any on-site building related combustion emissions.
- 1.3 This assessment describes the existing and future air quality at the Proposed Development and in the local area. Consideration has been given to nitrogen dioxide (NO₂) and particulate matter (both PM₁₀ and PM_{2.5}) as these are the pollutants of most concern in the local area.

2 Legislation, Policy and Guidance Documents

- 2.1 This section sets out the planning policy which is a material consideration in determining planning applications, legislation, guidance documents and other sources of useful information.

Planning Policy

National Planning Policy Framework

- 2.2 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2019a) sets out planning policy for England. It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Paragraph 170: *“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 and water quality”*

Paragraph 180: *“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”.*

Paragraph 181: *“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.”*

Paragraph 183: *“The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”*

Paragraph 54: *“Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.”*

Local Planning Policy

Local Plan

- 2.3 Havant Borough Council (HBC) adopted the Havant Borough Local Plan (Core Strategy) (HBC, 2011) in 2011 and the Havant Borough Local Plan (allocations) (HBC, 2014) in 2014. These include three policies which refer to air quality. Policy L145 on 'SSE Office Site, Bartons Road' (the application site) states:

"Description of Site:

A brownfield site located in a prominent location on the corner of Petersfield Road and Bartons Road. It is currently occupied by a three-storey office building and associated car parking. The former occupiers of the offices have relocated elsewhere in Havant retaining part of the site for operational reasons in the short term.

Known Constraints:

...Potential air quality/noise issues due to proximity of Petersfield Road".

- 2.4 Policy DM10 on 'Pollution' states that:

"Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met...National air quality standards or objectives would not be breached".

- 2.5 Policy CS11 on 'Protecting and Enhancing the Special Environment and Heritage of Havant Borough' states that:

"This Core Strategy has been subject to assessment in relation to Regulation 85 of the Habitats Regulations to ensure that the proposals it contains will not lead to an adverse effect on the integrity of any Natura 2000 or Ramsar sites. This process has influenced the Core Strategy policies, which mitigate recreational pressure and air quality issues on these designated sites".

- 2.6 These local plans are currently in place until the below amendments are adopted.

- 2.7 HBC's Pre-submission Local Plan with amendments (HBC, 2021) was consulted on between 3rd November 2020 – 17th December 2020 and will be adopted in accordance with the Local Development Scheme (HBC, 2020). It sets out the Borough's vision for progression up to 2037 and how it plans to achieve it. It includes three key policies that refer to air quality:

- 2.8 E22 – Amenity and Pollution:

"Development proposals will be permitted where:



a. Projected levels of noise, odour, vibration, light, water or air pollution do not have a likely significant negative effect on the amenity of existing and future users of the site, nearby occupiers or the wider environment; or

b. Measures are provided which are suitable for the purposes intended and will ensure that any likely significant negative effect on receptor(s) are mitigated to an acceptable level.”

2.9 E23 – Air Quality:

“Offsetting emissions

a. Major development proposals will be expected to provide mitigation measures which offset emissions and are proportionate to the scale and nature of the development.

Threshold based assessment

In addition to a., development proposals of 150 or more (gross) residential units, 1,000 sqm or more of commercial floorspace, or which are likely to materially alter the traffic flow on the local highway network will be permitted where:

b. Projected levels of air pollution or emissions associated with the development would not result in a significant deterioration of current air quality at a location where national air quality objectives or limit values apply; or

c. Measures are provided which demonstrably mitigate the impact on air quality to an acceptable level.”

2.10 H36 – Scottish and Southern Energy Offices (the application site):

"Residential development of around 80 dwellings will be permitted where:

a. Sufficient information is submitted to address the site-specific planning considerations. This is to be agreed at the pre-application stage and is expected to include the following:

iv...Air Quality Assessment...

The design and Layout:

i. Provides a high-quality street frontage to Petersfield Road and Bartons Road, with suitable boundary treatment and perimeter landscaping;

ii. Safeguards the amenity of occupants having particular regard to noise from Petersfield Road and the adjacent football stadium;

iii. Addresses the ground quality conditions through remediation measures prior to the occupation of the development in line with Policy E22;

iv. Provides an appropriate easement from existing sewage/waste infrastructure;

v. Provides onsite public open space in line with Policy E9;

vi. Retains and integrates the protected tree on site”.

Air Quality Standards, Critical Levels/Loads, Limit Values and Air Quality Objectives

- 2.11 The Environment Act 1995 (HMSO, 1995) sets out the requirements of the Local Air Quality Management (LAQM) regime and the requirement for the Government to produce an Air Quality Strategy including standards and objectives.
- 2.12 The latest Air Quality Strategy was published in 2007 (Defra, 2007) and sets out the Air Quality Standards (AQS), which consider the effects on human health, and The National Air Quality Objectives (AQOs), which are policy targets for ambient pollution. The AQOs, for use by local authorities when considering human health, were incorporated into UK legislation within the Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).
- 2.13 The Strategy explains that the AQSs for the protection of human health are defined 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 AQS are set for individual pollutants and are made up of a concentration value and an averaging time over which it is to be measured
- 2.14 The AQO's set out the extent to which the Government expects the AQS to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility, and possible timescales. AQO are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedences, within a specified timescale. An exceedence is a breach of the threshold for the concentration for the specific averaging period. The LAQM regime, introduced by the Environment Act 1995, requires local authorities to review air quality within their boundary and work towards achieving and maintaining the AQO.
- 2.15 The Strategy describes the Local Air Quality Management (LAQM) regime that has been established by Part IV of the Environment Act 1995, 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. The strategy also provides the policy framework for air quality management and assessment in the UK.
- 2.16 In addition to the AQOs set within the Air Quality Strategy and relevant regulations, the European Union (EU) has also set limit values and target values for the protection of human health and critical levels for the protection of ecosystems. These were transposed into the Air Quality Standards Regulations (HMSO, 2010), which sets out the UK limit values, target values and critical levels for specific pollutants. Like the AQO, the limit values, target values and critical levels are set for

individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedences allowed per year (if any) and a date by which it must be achieved. Some pollutants have more than one value covering different dates or averaging times. While the AQO are policy targets, the government has the duty to ensure compliance with the legally binding limit values which is a national obligation rather than a local one.

- 2.17 The 2019 Clean Air Strategy (Defra, 2019) includes a commitment to set a “*new, ambitious, long-term target to reduce people’s exposure to PM_{2.5}*” which the proposed Environment Bill 2019-2021 commits the Secretary of State to setting. The statutory Mayor’s London Environment Strategy (published 31 May 2018) also includes a commitment to meet the World Health Organization’s (WHO) recommended guideline limit for PM_{2.5} by 2030. The WHO acknowledges that current evidence suggests no safe level for PM_{2.5}. However, the WHO set a guideline limit, which is 10 µg/m³ as an annual mean and more stringent than the current AQOs, reflects the level at which increased mortality from exposure to PM_{2.5} is likely. Following the UK leaving the EU the Government have drafted a new Environment Bill which is not currently finalised, however, early indication is that the UK Government also intend to benchmark the PM_{2.5} target against the WHO guideline value.
- 2.18 In addition, the recent coroners court case investigating Ella Abdo Kissi-Debrah’s death in 2013 concluded that air pollution was a significant contributing factor to both the induction of Ella’s asthma and the exacerbation of her symptoms, due to exposure in exceedence of WHO guideline values for pollutants. This set a legal precedence to consider WHO guideline values when determining the significance of air quality and has thus been considered when undertaking this assessment.

Useful Sources of Information

- 2.19 Summaries of relevant documents and useful information have been presented in Appendix A2. The documents cover the following:
- Planning Practice Guidance;
 - The Clean Air Strategy;
 - The Industrial Strategy;
 - The Clean Growth Strategy;
 - Road to Zero;
 - The National Air Quality Action Plans;

Guidance Documents

Guidance on Land-Use Planning & Development Control: Planning For Air Quality

- 2.20 Environmental Protection UK (EPUK) in partnership with The Institute of Air Quality Management (IAQM) have produced guidance on *Land-Use Planning & Development Control: Planning For Air Quality*. EPUK and IAQM have produced this guidance to ensure that air quality is adequately

considered in the land-use planning and development control processes. It provides a means of reaching sound decisions, having regard to the air quality implications of development proposals and provides guidance on how air quality considerations of individual schemes may be considered within the development control process, by suggesting a framework for the assessment of the impacts of developments on local air quality.

LAQM Technical Guidance

- 2.21 Defra and the devolved administrations have published a guidance document on Local Air Quality Management (LAQM) - *Local Air Quality Management Technical Guidance (TG16) April 2018*. This document is designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Northern Ireland) Order 2002, and subsequent regulations. LAQM is the statutory process by which local authorities monitor, assess and take action to improve local air quality. The Technical Guidance provides tools, approaches and technical information related to air quality.

3 Assessment of Significance

Criteria for this Assessment

Air Quality Objectives and Limit Values

- 3.1 The AQOs and limit values for England for the pollutants relevant to this project are detailed in Table 1. The WHO guideline values for NO₂ are the same as those presented in Table 1.

Table 1: AQOs and Limit Values

Pollutant	Time Period	AQO / Limit Value	Concentration, and the number of exceedences allowed per year (if any)	Date AQO / Limit Value to be Achieved From and Maintained After
Nitrogen Dioxide (NO ₂)	1-hour Mean	AQO / Limit Value	200 µg/m ³ not to be exceeded more than 18 times a year	31st December 2005 / 1st January 2010
	Annual Mean	AQO / Limit Value	40 µg/m ³	31st December 2005 / 1st January 2010
Fine Particles (PM ₁₀)	24-hour Mean	AQO / Limit Value	50 µg/m ³ not to be exceeded more than 35 times a year	31st December 2004
	Annual Mean	AQO / Limit Value	40 µg/m ³ ^a	31st December 2004
Fine Particles (PM _{2.5}) ^{b c}	Annual Mean	AQO / Limit Value	25 µg/m ³	2020 / 2015

^a The PM₁₀ limit is 20 µg/m³ and may be adopted soon.

^b The PM_{2.5} objective is not in Regulations and there is no legal requirement for local authorities to meet it.

^c The PM_{2.5} limit is 10 µg/m³ and may be adopted soon.

Relevant exposure

AQO Receptors

- 3.2 The annual mean AQO applies at locations where members of the public might be regularly exposed, such as building façades of residential properties, schools, hospitals, and care homes.
- 3.3 The 24-hour mean AQO applies at the annual mean locations of exposure as well as at hotels and residential gardens.
- 3.4 The 1-hour mean AQO applies at the annual mean locations of exposure and at hotels, residential gardens, and any outdoor location where members of the public might reasonably be expected to spend one hour or longer, such as busy pavements, outdoor bus stations and locations with outdoor seating.
- 3.5 Places of work like factories or offices are not considered places where members of the public might be regularly exposed and therefore the AQO's do not apply at these locations.

Limit Value Receptors

- 3.6 In accordance with Article 2(1), Annex III, Part A, paragraph 2 of Directive 2008/50/EC details locations where compliance with the limit values does not need to be assessed:

"Compliance with the limit values directed at the protection of human health shall not be assessed at the following locations:

a) Any locations situated within areas where members of the public do not have access and there is no fixed habitation;

b) In accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and

c) On the carriageway of roads; and on the central reservation of roads except where there is normally pedestrian access to the central reservation."

- 3.7 The government models compliance with the Directive at locations 4 m from the kerbside, 2 m high, more than 25 m from major road junctions and adjacent to at least 100 m of road length where the limit value applies.

Assessment Approach

- 3.8 Standard practice is to assess the impacts of a proposed development on local air quality using the EPUK and IAQM guidance *on Land-Use Planning & Development Control: Planning For Air Quality*.

- 3.9 The EPUK and IAQM guidance provides a staged approach to considering air quality assessments:

- Stage 1) Initial screening
- Stage 2) Detailed screening
- Stage 3) Simple or Detailed assessment

- 3.10 The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A3.

Impacts of the Development on the Local Area

- 3.11 Table 6.1 of the EPUK and IAQM guidance provides the Stage 1 screening criteria. The approach 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 Stage 2 and in general there is no need to consider the impacts of the development on the local area.

Impacts of Emissions Sources on the Development

- 3.12 The EUPK and IAQM guidance explains that 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”.

Stage 2 Screening Criteria

- 3.13 The EPUK and IAQM guidance provides example criteria and states the following in relation to the criteria:

“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”.

- 3.14 The guidance notes that consideration should still be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

Road Traffic Assessments

- 3.15 The second stage of the EPUK and IAQM guidance then compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. Where these criteria are exceeded, a detailed assessment is 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”*.

- 3.16 The criteria relating to road traffic are:

- A change of Light Duty Vehicle (LDV) flows of:
 - more than 100 AADT within or adjacent to an AQMA
 - more than 500 AADT elsewhere.
- A change of Heavy Duty Vehicle (HDV) flows of:
 - more than 25 AADT within or adjacent to an AQMA

- more than 100 AADT elsewhere.

- Where roads are realigned near to sensitive receptors and the change in alignment is 5 m or more and the road is within an AQMA.
- Applies to junctions that cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights, or roundabouts.
- Where bus flows will change by:

- more than 25 AADT within or adjacent to an AQMA

- more than 100 AADT elsewhere.

Simple or Detailed Assessments

- 3.17 Where an air quality assessment is identified as being required, then this may take the form of either a Simple Assessment or a Detailed Assessment. It is not uncommon for assessments to utilise detailed dispersion models to predict pollutant concentrations and impacts on local air quality (Detailed Assessment), however, it should be noted that exceeding a screening criterion in Table 6.2 of the guidance does not automatically lead to the requirement for a Detailed Assessment and the use of professional judgement and sufficient evidence can be considered appropriate at times (Simple Assessment).
- 3.18 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.

Long-term (Annual Mean) Impacts on Human Health

- 3.19 The approach set out in the EPUK and IAQM guidance provides a method for describing the impacts on local air quality arising from development.
- 3.20 Impact descriptors for individual receptors are used which expresses the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table 2 sets out the matrix for determining the impact descriptor for annual mean concentrations at individual receptors, based on Table 6.3 in the EPUK and IAQM guidance document.
- 3.21 Where the impacts are negligible the overall significance is judged to be '*not significant*'.



Table 2: Annual mean impact descriptors for individual receptors

Annual Mean Concentration with Proposed Development ($\mu\text{g}/\text{m}^3$)	% Change in Concentration relative to the AQO ($\mu\text{g}/\text{m}^3$)			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76-94% of AQO	Negligible	Slight	Moderate	Moderate
95-102% of AQO	Slight	Moderate	Moderate	Substantial
103-109% of AQO	Moderate	Moderate	Substantial	Substantial
75% or less of AQO	Moderate	Substantial	Substantial	Substantial

Short-term Impacts on Human Health

- 3.22 Previous research carried out on behalf of Defra and the devolved administrations identified that exceedences of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean is below $60 \mu\text{g}/\text{m}^3$ (Defra, 2018). Similarly, exceedences of the 24-hour mean PM_{10} AQO are unlikely to occur where the annual mean is below $32 \mu\text{g}/\text{m}^3$. Where annual mean concentrations are below these levels the short-term impacts are considered to be negligible.

Significance

- 3.23 The approach developed by EPUK and IAQM (2017) has been used. The guidance is 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”.
- 3.24 If none of the criteria in Stage 1 and 2 are met, then there should be no requirement to carry out an air quality assessment for the impact of the development on the local area, and the impacts can be considered as having a not significant effect.
- 3.25 Where a Simple or Detailed assessment is carried out, in drawing the determination of significance, 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. 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; i.e. 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.

- 3.26 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the users of any new development where the air quality is such that an air quality objective is not met will be judged as significant.



4 The Proposed Development

- 4.1 The Proposed Development involves the construction of three residential blocks comprising of a total of 175 apartments, as well as two drive-through restaurants. The Proposed Development will also comprise a new access road off Bartons Road as well as associated parking for 182 vehicles. The Proposed Development is shown in Figure 2.
- 4.2 The land is currently occupied by a five-storey building, the Scottish and Southern Energy Offices. Traffic associated with the Proposed Development is likely to lead to changes of vehicle movements on local roads, resulting in potential changes to local air quality.



Figure 2: The Proposed Development

Drawing provided by ARC Architecture Ltd.

Traffic Generation

- 4.3 Traffic associated with use the Proposed Development have been provided by Paul Basham Associates. Details of the average 24-hour daily trip rates (AADT) along the proposed site access road both the existing and proposed uses are given in Table 3, along with the net change.

Table 3: Trip Rates

Use	Existing	Proposed	Net Change
Number of vehicles as an annual average daily traffic (AADT) flow	0	2748	+2748

Mitigation Included by Design

- 4.4 The EPUK and IAQM guidance (2017) is clear that it is important that Proposed Development incorporate good design and best practice measures to ensure any impacts are minimised as far as practicable, even where pollutant concentrations are predicted to be below the AQOs/limit values. This Proposed Development includes the following good design and best practice measures by design:

- the Proposed Development includes 245 cycle parking spaces for residents, to help promote cycling, which will help to minimise air pollution in the local area;
- the McDonald's site within the Proposed Development includes 4 Sheffield stands for the public, providing 8 short-stay cycle parking spaces, as well as 2 cycle lockers for staff, providing 4 secure long-stay spaces. These will also help to promote cycling, which will help to minimise air pollution in the local area;
- the Proposed Development is situated within 200 m of several bus stops which provide services to Havant Town Centre, Havant Railway Station, and Portsmouth, allowing easy access to sustainable modes of transport;
- the Proposed Development has been designed such that the most sensitive locations are set back over 20 m from nearby roads, where pollutant concentrations will be lower;
- the Proposed Development includes walls and planting to help shield the development from vehicle emissions from local roads;
- the site benefits from a good level of pedestrian and cycle infrastructure in the vicinity, including National Cycle Network (NCN) Route 22 which provides a direct link between the site and Havant Town Centre; and
- The Proposed Development includes a Framework Travel Plan, setting out measures to promote sustainable modes of transport and minimise air quality impacts.



5 Methodology

5.1 The following section details the methodology of the assessment. The process consists of:

1. Defining baseline conditions.
2. Considering the impact of the emissions from the development.
3. Evaluating the significance of any impacts in relation to both the AQO receptors, using EPUK & IAQM and Environment Agency guidance, and the compliance receptors.

Existing Conditions

5.2 Consideration of the baseline conditions within the area of the Proposed Development have made based on the following:

- Industrial and waste management sources that may affect the area have been identified using the European Pollutant Release and Transfer Register (European Environment Agency, 2019). Local sources have also been identified through examination of maps and the Council's Air Quality Review and Assessment reports.
- Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority and where available other monitoring networks. This covers both the proposed site and the surrounding area, the latter being used to provide context to the assessment.
- Background concentrations of NO₂, PM₁₀ and PM_{2.5} have been defined using the national pollution maps published by Defra (Defra, 2021a). These cover the whole of the country on a 1x1 km grid of average concentrations.
- Predicted roadside concentrations of NO₂ in the study area have been identified using the maps of roadside concentrations published by Defra (2021c) as part of its 2017 Air Quality Plan for the baseline year 2017 and for the future years 2019 to 2030. These maps are used by the UK Government, to report exceedances of the limit value to the EU. The national maps of roadside PM₁₀ and PM_{2.5} concentrations (Defra, 2021b), which are available for the years 2017, 2020, 2025 and 2025, show no exceedances of the limit values anywhere in the UK in 2017.

Impacts of road traffic on the local area

5.3 The first step in considering the road traffic impacts of the Proposed Development has been to screen the Proposed Development and its traffic generation against the criteria set out in the EPUK and IAQM guidance, as described in Paragraph 3.15 to 3.26. Where impacts can be screened out there is no need to progress to a more detailed assessment.

Impacts of emissions sources on sensitive receptors both within the Proposed Development and local area

5.4 The following section sets out the approach taken to the assessment of pollutant emissions upon air quality at the Proposed Development and impacts in the local area.



Modelling approach overview

- 5.5 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted for:
- the existing year of 2019; and
 - the current year of 2021 (the earliest possible year that the Proposed Development may first be operational) both with and without the Proposed Development.
- 5.6 It should be noted that the Proposed Development might not be operational until later years and the year of 2021 provides a worst-case assessment as concentrations of NO₂ are anticipated to reduce with the improvements in vehicle emissions, such as the increasing uptake of electric vehicles.
- 5.7 Concentrations have been predicted using the ADMS-Roads atmospheric dispersion model (v5) with the latest vehicle emission factors available from Defra's Emission Factor Toolkit (EFT) (v10.1). ADMS-Roads was developed and validated by Cambridge Environmental Research Consultants (CERC). The model is used extensively throughout the UK for dispersion modelling and is accepted as an appropriate tool by local authorities. The model requires a range of input parameters which are discussed below.

Modelled Receptors

- 5.8 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted using the ADMS-Roads dispersion model at ten receptor locations representing existing sensitive exposure along Barton Road, the B2149, and at the nearby pub adjacent to the Proposed Development, which are the likely worst-case locations that may be affected by changes local traffic resulting from the Proposed Development. These receptor locations are shown in Figure 3.

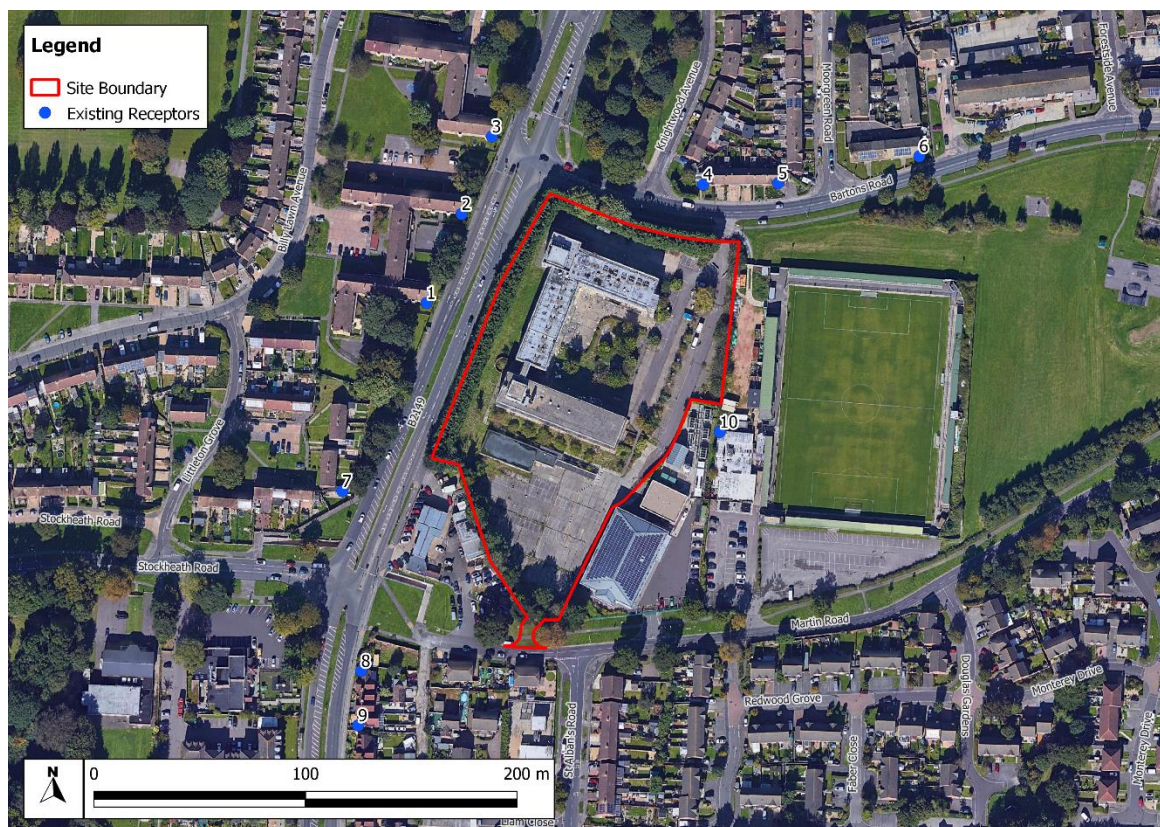


Figure 3: Existing Receptor locations in the local area

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- 5.9 Concentrations have also been predicted at 33 receptor locations within the Proposed Development, representing locations of worst-case exposure at the Proposed Development. The receptor locations are shown in Figure 4. An additional local cartesian grid of receptors with a 2x2 m resolution covering the Proposed Development was modelled to review the risk of potentially missing the worst-case impacts.

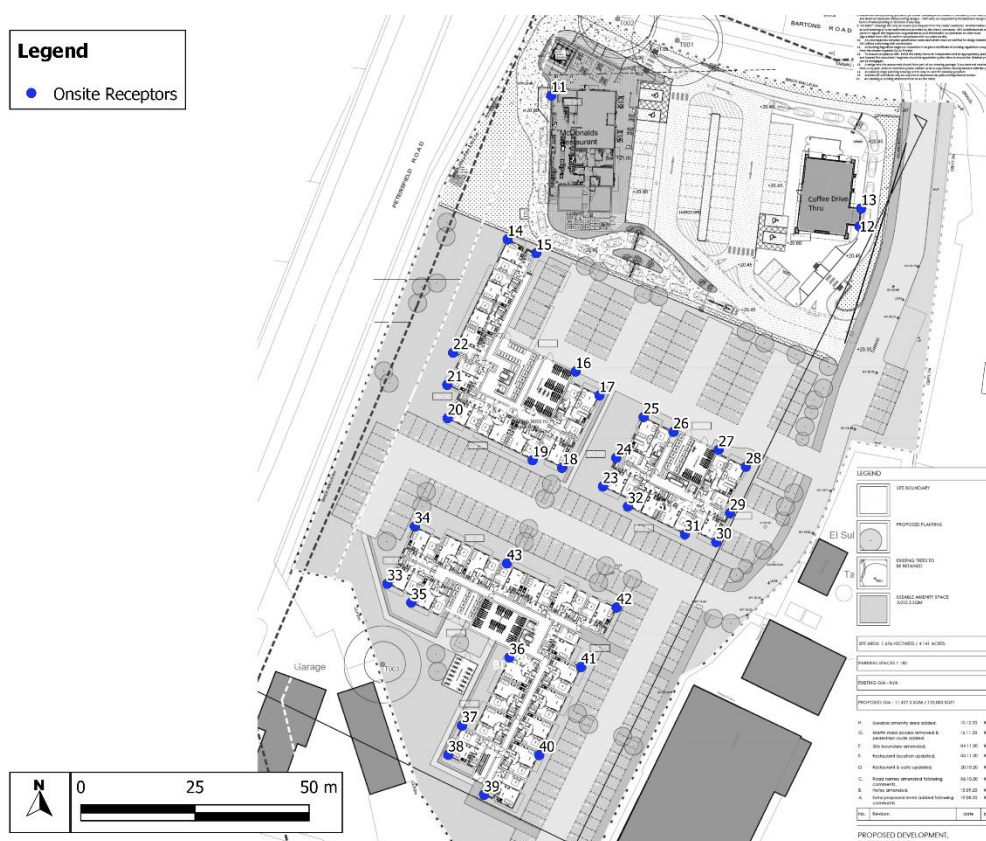


Figure 4: Receptor locations within the Proposed Development

Drawing provided by ARC Architecture Ltd.

- 5.10 In addition, concentrations have also been predicted at the monitoring site located along New Road, in order to verify the model (see paragraph A4.27).

Modelled Roads

- 5.11 The road links, widths, heights, and street canyons included in the dispersion model have been aligned with data from Ordinance Survey maps, google maps and considering distances based on a range of mapping sources ensuring relative distances from the roadsides to receptors and monitoring sites are carefully set. The modelled road links, speeds and street canyons are shown in Figure 5. This includes roads near to the Proposed Development and those close to local monitoring sites. To model the likely impacts of the Proposed Development, the onsite roads and drive-through roads have also been modelled, see Figure 6.



Figure 5: Modelled roads links, Speeds, and Street Canyons

Imagery © 2021 Google, Map data © 2021.



Figure 6: Modelled roads links and Speeds within the Proposed Development

Drawing provided by ARC Architecture Ltd.

Traffic Data

- 5.12 Traffic data have been provided by Paul Basham Ltd for roads close to the Proposed Development. For roads near to the verification site, data have been taken from the Department for Transport.
- A1.1 Where appropriate, the vehicle speeds have been reduced to take account of slower speeds at junctions and queuing. A summary of the traffic data used in the model is presented in Traffic data for the roads close to the Proposed Development have been provided by Paul Basham Ltd for the baseline year of 2018 and forecasted year of 2025, including local committed developments, and with and without the Proposed Development. The data provided included AM and PM peak traffic flow data along the B2149 and Barton Road, along with a peak to AADT conversion factor of 5.024. The data included flows for both all vehicles and those that are HDVs. The 2018 and 2025 data have been assumed to be representative for the model years of 2019 and 2021, respectively. Since the 2025 data includes committed developments, the assumption therefore assumes no committed developments in 2019 and all committed developments in 2021. This causes the growth in local traffic to be assumed over a shorter timescale and thus provides a conservative assessment.
- A1.2 Traffic data the roads close to the model verification site have been obtained from the DfT. Data for New Road and Petersfield Road have been taken from count site data for 2018 and 2019 respectively. Traffic volumes in 2018 along New Road are considered to be representative of those in 2019. As the traffic data along Park Road North and Elmleigh Road are unknown, for the purpose of model verification the AADT and percentage of HDVs along Elmleigh Road have been assumed to be identical to those along New Road. The Council's 2018 ASR states that traffic volumes along New Road are 60% of that along Park Road North. The assumption is therefore likely to represent a worst-case scenario.
- A1.3 Paul Basham Ltd has also provided forecasted traffic data for the Site Access Road for the year 2025. It is unknown how traffic will be split between the various routes around the Proposed Development, such as the drive-throughs and the residential car parks. Therefore, it has been assumed that all onsite routes have flows equal to that of the Site Access road, as this will provide a worst-case assessment.
- 5.13 Table A1 in Appendix A4.

Additional Model Setup Parameters and Post-processing

- 5.14 Further details on additional model setup parameters and post-processing approaches are set out in Appendix A4. These include the vehicles emission factors, meteorology, model verification and other key modelling considerations.

Uncertainty and limitations

- 5.15 The assessment involves a range of uncertainties, including the model inputs, assumptions, the model, model verification and post-processing of model results. A brief overview of the key uncertainties is discussed below.

- 5.16 There are inherent uncertainties associated with the traffic data which has been provided as peak hour turn flows and the percentage of heavy-duty vehicles. These flows provide estimated vehicle trips as an average, but the specific timing, daily count, driving conditions, and driving behavior of vehicles will vary and potentially lead to different emission levels.
- 5.17 The emission factors also involve a considerable amount of uncertainty. Emissions from the EFT are link averages and do not explicitly take account of acceleration or deceleration. Modelled speeds have been adjusted to account for this where possible. Future year vehicle emission rates are also based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is therefore possible that the expected future emission rates in the EFT may differ from reality. Historically, evidence had suggested that Defra's EFT exaggerated reductions in NO_x emissions as expectations of reductions from diesel vehicles were included which were not seen in practice. However, analyses of recent NO_x measurements now provide evidence that vehicle controls are working and as a result Defra's EFT (v9.0) is reflecting the rate of observed reductions and can be relied upon to give the most likely emissions. The approach of this assessment has been to utilise the EFT as recommended by Defra in the LAQM.TG(16) guidance (Defra, 2018).
- 5.18 The model itself is based on assumptions of a range of parameters, including road geometries, road widths, street canyons and meteorological related parameters. There is uncertainty in all these parameters, but the modelling has been setup in a robust way based on professional experience to best represent the conditions. One of the main uncertainties in the model is meteorological data; this has been based on measurements made at a representative meteorological station, and although meteorological conditions will remain similar, it is entirely likely that meteorological conditions will vary in subsequent years and lead to marginally different concentrations.
- 5.19 The ambient background concentrations are also uncertain. While these are provided by Defra, the 1x1 km resolution is coarse, and the maps do not include all sources of pollution. Given the urban fringe location of the proposed development, it is considered likely that the background maps for this area are likely to be reasonable. To minimise uncertainty in the spatial resolution of the maps, the background concentrations have been interpolated to each receptor; essentially smoothing out the coarseness of the maps.
- 5.20 Emerging evidence (Grange, S, et al., 2017) suggests that the f-NO₂ has been decreasing in recent years, which is not taken into account within Defra's EFT or NO_x to NO₂ Calculator. If lower f-NO₂ values were assumed, then the predicted concentrations would likely be slightly lower throughout the development and local area. Until more detailed scientific analysis is undertaken to understand the full extent of why f-NO₂ is decreasing and how it will behave in the future, it remains an uncertainty.
- 5.21 A model verification exercise has been undertaken to adjust the predicted concentrations from the model so that they match local conditions as best as possible. This has adjusted concentrations to match average conditions; some locations will remain underpredicted and some overpredicted.

- 5.22 This report does not consider the impacts of air quality on the health implications associated with Covid-19, as there remains too much uncertainty at this stage to consider this explicitly. In addition, the potential long-term implications of the pandemic on transport practices has not been considered, as it is too uncertain at this stage.
- 5.23 Although there is a wide range of uncertainty associated with air quality modelling, the predictions made by this assessment have been carried out in a robust manner to minimise uncertainties where possible.

6 Baseline Conditions

AQMAs

- 6.1 HBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. The Council have not declared any Air Quality Management Areas (AQMA) for the borough.

Baseline Concentrations

LAQM Monitoring

- 6.2 HBC monitors concentrations of NO₂ at 29 sites within the borough using passive monitors (diffusion tubes). The Council do not operate any automatic monitoring sites. The nearest monitoring site is located approximately 1.3 km to the southwest of the Proposed Development. The monitoring locations within 2 km of the Proposed Development are shown in Figure 5. Data for 2014 to 2018 have been taken from HBC's Air Quality Annual Status Report for 2019 (HBC, 2019). Data for 2019 has been provided by the Council. There are no monitoring sites in the Borough that measure PM₁₀ or PM_{2.5}.

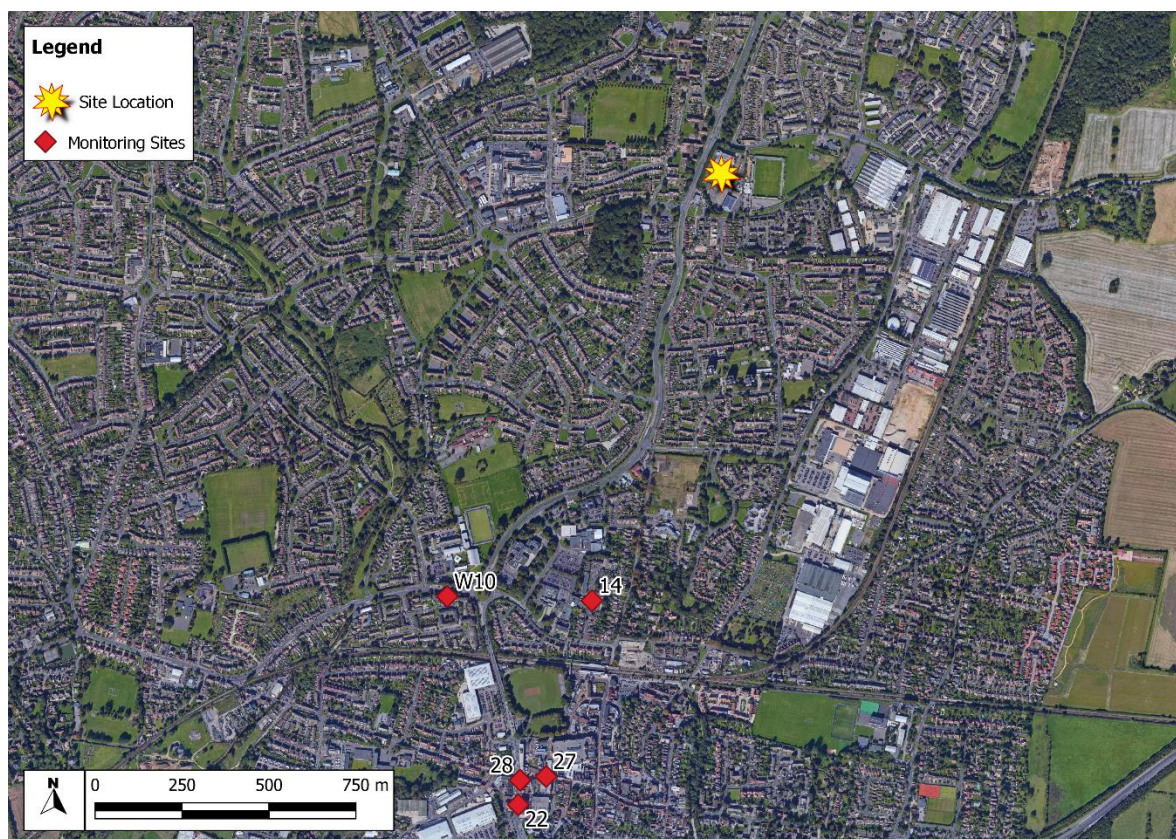


Figure 7: Monitoring Sites and the Location of the Proposed Development

Imagery © 2021 Google, Map data © 2021.

Annual Mean NO₂

- 6.3 Measured annual mean NO₂ concentrations for the monitoring sites within 2 km of the Proposed Development are presented in Table 4. Measured NO₂ concentrations were well below the annual mean AQO of 40 µg/m³ at all monitoring sites.

Table 4: Measured NO₂ Annual Mean Concentrations (µg/m³)

Site Name (Site ID - Type)	2014	2015	2016	2017	2018	2019
Compton Court (W10 – Roadside)	30.7	26.4	30.1	27.8	29.1	27.2
Elm Park Road (14 – Suburban)	21.0	18.6	20.8	20.6	20.3	18.1
Havant Precinct (27 – Urban Background)	n/a	n/a	n/a	25.8	25.2	27.3
West Street (28 – Roadside)	n/a	n/a	n/a	30.6	34.9	34.6
Bulbeck Road (22 – Roadside)	34.7	29.7	35.8	31.4	33.0	31.0
AQO	40					

AURN Monitoring

- 6.4 There are no National Government monitoring sites, operated as part of the AURN regime, within the vicinity of the site.

Predicted Background Concentrations

- 6.5 Ambient background concentrations of NO₂, PM₁₀ and PM_{2.5} have been defined using the national pollution maps published by Defra (Defra, 2021a). These cover the whole of the country on a 1x1 km grid for each year from 2017 until 2030. Concentrations for 2019 and 2021 have been extracted for the grid cells that surround the receptor locations. The values are presented in Table 5. These concentrations have been bilinearly interpolated to give specific background concentrations at each receptor location. Predicted NO₂, PM₁₀, and PM_{2.5} background concentrations are well below the annual mean AQO.

Table 5: Mapped Background Concentrations (µg/m³)

Year	NO ₂	PM ₁₀	PM _{2.5}
2019	13.9 – 17.1	15.4 – 16.0	11.1 – 11.6
2021	13.0 – 16.0	15.0 – 15.5	10.8 – 11.2

Predicted roadside concentration

- 6.6 Defra has predicted roadside concentrations of NO₂, PM₁₀, and PM_{2.5} for the main roads in the UK (Defra, 2021c) for the years 2017 to 2030 as part of Defra's commitment to report exceedences of the limit values. There are, however, no main roads with Defra predicted roadside concentrations within 2 km of the Proposed Development.

Other Sources of Air Pollution

- 6.7 The Environment Agency regulates sites which are at risk of contributing significantly to pollutant concentrations and maintains a database of these sites called the UK Pollutant Release and Transfer

Register (PRTR). The UK PRTR data has been used to fulfil the reporting requirements of the European Pollutant Release and Transfer Register (E-PRTR) which provides details of all regulated sites in the UK (European Environment Agency, 2019). The 2017 database has not identified any regulated sites within 1 km of the application site.

7 Impact Assessment

Impacts of the Proposed Development on the Air Quality Objectives

- 7.1 The Proposed Development involves more than 10 residential properties, thus based on the EPUK and IAQM guidance there is a need to consider the impacts on local air quality. Pollutant emissions from road traffic associated with the Proposed Development have thus been considered.
- 7.2 The screening criteria set out in the EPUK and IAQM guidance states that the impacts are likely to be negligible where the change in LDV AADT flow is less than 500 outside an AQMA and the change in HDV AADT flow is less than 100 outside an AQMA. Since the Proposed Development will lead to a net increase of around 2,700 movements per day, the AADT changes will be above the EPUK/IAQM criteria, and the impacts on local air quality therefore need to be assessed.
- 7.3 Concentrations of annual mean NO₂, PM₁₀ and PM_{2.5} have been predicted at ten existing receptors representing the likely worst-case sensitive exposure near to the Proposed Development. The predicted concentrations are presented in Table 6 to Table 8, along with the impact descriptors.
- 7.4 The maximum predicted annual mean NO₂ concentration at any of the receptors has been predicted to be 27.5 µg/m³, well below the AQO. Since the road traffic is the predominant source of emissions and the maximum annual mean NO₂ concentration is below 60 µg/m³, it is considered unlikely that the 1-hour mean NO₂ AQO will be exceeded.

Table 6: Predicted NO₂ Concentrations (µg/m³) and Impact Descriptors

Receptor (Height)	Without Development	With Development	Impact Descriptor
1 (1.5 m)	21.1	21.9	Negligible
2 (1.5 m)	23.3	24.1	Negligible
3 (1.5 m)	22.4	22.9	Negligible
4 (1.5 m)	20.9	22.7	Negligible
5 (1.5 m)	24.1	26.1	Negligible
6 (1.5 m)	25.9	27.5	Negligible
7 (1.5 m)	20.9	21.4	Negligible
8 (1.5 m)	23.3	23.7	Negligible
9 (1.5 m)	21.0	21.4	Negligible
10 (1.5 m)	15.9	17.4	Negligible
AQO	40.0	40.0	-

- 7.5 The maximum annual mean PM₁₀ and PM_{2.5} concentrations are predicted to be 18.3 µg/m³ and 12.8 µg/m³ respectively, well below the AQOs. Since the road traffic is the predominant source of emissions and the maximum annual mean PM₁₀ concentration is below 32 µg/m³, it is considered unlikely that the 24-hour mean PM₁₀ AQO will be exceeded.
- 7.6 For NO₂, PM₁₀ and PM_{2.5} impacts are described as negligible at all receptor locations.

Table 7: Predicted PM₁₀ Concentrations (µg/m³) and Impact Descriptors

Receptor (Height)	Without Development	With Development	Impact Descriptor
1 (1.5 m)	17.1	17.2	Negligible
2 (1.5 m)	17.3	17.5	Negligible
3 (1.5 m)	17.1	17.2	Negligible
4 (1.5 m)	16.7	17.0	Negligible
5 (1.5 m)	17.6	17.9	Negligible
6 (1.5 m)	18.0	18.3	Negligible
7 (1.5 m)	17.0	17.1	Negligible
8 (1.5 m)	17.6	17.7	Negligible
9 (1.5 m)	17.1	17.1	Negligible
10 (1.5 m)	15.7	15.9	Negligible
AQO	40.0	40.0	-

Table 8: Predicted PM_{2.5} Concentrations (µg/m³) and Impact Descriptors

Receptor (Height)	Without Development	With Development	Impact Descriptor
1 (1.5 m)	12.1	12.2	Negligible
2 (1.5 m)	12.3	12.3	Negligible
3 (1.5 m)	12.1	12.2	Negligible
4 (1.5 m)	11.9	12.1	Negligible
5 (1.5 m)	12.4	12.6	Negligible
6 (1.5 m)	12.6	12.8	Negligible
7 (1.5 m)	12.1	12.2	Negligible
8 (1.5 m)	12.4	12.5	Negligible
9 (1.5 m)	12.1	12.2	Negligible
10 (1.5 m)	11.3	11.5	Negligible
AQO	25.0	25.0	-

Impacts of the Proposed Development on Limit Value Compliance

- 7.7 Without the Proposed Development, existing levels of air pollution are predicted by Defra to be below the limit values in 2021. As demonstrated in Table 6, the Proposed Development is not expected to be detrimental to air quality in the local area and will therefore not delay compliance with the limit values in Havant.

Impacts on the Proposed Development

- 7.8 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted for the current year of 2021 at the Proposed Development. The maximum concentrations are predicted at the ground floor, nearest to the road emission sources. The maximum concentrations at each receptor (i.e. ground floor) are presented in Table 9. Air quality for receptors located at higher floors is cleaner, since emissions from roads fall off rapidly with distance away from roads (Defra, 2018).

- 7.9 All predicted concentrations of NO₂ and PM₁₀, are below 40 µg/m³, and all predicted concentrations of PM_{2.5} are below 25 µg/m³. It is thus considered unlikely that annual mean AQOs will be exceeded.
- 7.10 Since the road traffic is the predominant source of emissions and the maximum annual mean NO₂ and PM₁₀ concentrations are below 60 µg/m³ and 32 µg/m³ respectively, it is considered unlikely that the short-term AQOs will be exceeded. Air quality for future users of the Proposed Development will thus be acceptable.

Table 9: Maximum Predicted Annual Mean Concentrations at Locations within the Proposed Development (µg/m³)^a

Receptor	NO ₂	PM ₁₀	PM _{2.5}
11	27.3	17.8	12.5
12	26.8	17.4	12.3
13	26.2	17.3	12.3
14	22.4	17.0	12.1
15	22.9	17.0	12.1
16	19.1	16.3	11.7
17	18.7	16.2	11.6
18	17.9	16.1	11.6
19	18.2	16.2	11.6
20	19.4	16.5	11.8
21	19.8	16.6	11.9
22	20.2	16.7	11.9
23	17.7	16.0	11.5
24	18.0	16.1	11.6
25	18.6	16.2	11.6
26	18.5	16.1	11.6
27	18.4	16.1	11.6
28	18.3	16.1	11.6
29	17.6	16.0	11.5
30	17.3	15.9	11.5
31	17.3	15.9	11.5
32	17.5	16.0	11.5
33	19.4	16.6	11.8
34	18.3	16.3	11.7
35	17.4	16.1	11.6
36	16.8	15.9	11.5
37	16.7	15.9	11.5
38	16.7	15.9	11.5
39	16.5	15.9	11.4

40	16.4	15.8	11.4
41	16.6	15.9	11.4
42	16.9	15.9	11.4
43	17.3	16.0	11.5
AQO	40.0	40.0	25.0

Significance of Operational Air Quality Effects

- 7.11 The operational air quality effects without mitigation are judged to be '*not significant*'. This professional judgement is made in accordance with the methodology and assessment criteria set out earlier in this report.
- 7.12 The judgement that the operational air quality effects will be '*not significant*' without mitigation takes account of the assessment that:
- the traffic generated by the Proposed Development will not lead to any significant impacts on sensitive receptors in the local area are therefore described as *negligible*;
 - predicted concentrations of NO₂, PM₁₀ and PM_{2.5} are likely to be below the AQOs throughout the Proposed Development and air quality for the future users of the Proposed Development will be acceptable.



8 Mitigation

Mitigation Included by Design

- 8.1 Mitigation measures included by design are set out in Section 4.
- 8.2 Although the overall effect of the Proposed Development will be “not significant”, it should be acknowledged that recent evidence suggests there are no safe levels to some pollutants (such as PM₁₀ and PM_{2.5}) and those with underlying health conditions may experience distress, even if the levels are below the AQOs.

Recommended Mitigation

Operational Phase

- 8.3 The assessment has demonstrated that the Proposed Development will not cause any exceedences of the AQOs in the local area. Furthermore, the future users of the Proposed Development will not be exposed to unacceptable air quality conditions. The overall effect of the Proposed Development will be “not significant”. It is, therefore, not considered appropriate to propose further mitigation measures.
- 8.4 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 was transposed into UK law). Furthermore, the government and the local authority are working on improving air quality under the relevant air quality Strategies and LAQM regime.

Optional Further Mitigation

- 8.5 Although the overall effect of the Proposed Development will be “not significant”, given the nature of the Proposed Development, further mitigation measures could be considered to help minimise health effects for future users. This may include pollutant filtration within the ventilation system, carefully placed screening barriers and no idling signs.

9 Summary and Conclusions

- 9.1 The emissions from traffic generated associated with the Proposed Development have been assessed. Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted at sensitive locations in the local area, with and without the Proposed Development. All predicted concentrations are well below the AQOs and the impacts will all be negligible.
- 9.2 The impacts of existing sources of pollution in the local area upon air quality for future users of the Proposed Development have also been considered. Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted within the Proposed Development. All predicted concentrations are well below the AQOs.
- 9.3 The operational air quality effects of the Proposed Development are judged to be '*not significant*'. This conclusion is based on the concentrations that future occupants of the Proposed Development will be exposed to being well below the objectives, and the operational impacts of the Proposed Development being *negligible*.
- 9.4 Overall, the impacts of the Proposed Development will be '*not significant*', air quality for future users will be acceptable and it is considered suitable for the application site.

10 Glossary, References and Appendices

Glossary

AADT	Annual Average Daily Traffic
Air Quality Standards	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment.
An exceedence	A period of time (defined for each standard) where the concentration is higher than that set out in the Standard.
An objective	The target date on which exceedances of a Standard must not exceed a specified number.
APS	Air Pollution Services
AQO	Air Quality Objective
AQMA	Air Quality Management Area
COPERT	Computer Programme to calculate Emissions from Road Transport
DfT	Department for Transport
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HBC	Havant Borough Council
HDV	Heavy Duty Vehicle (which comprise of heavy goods vehicles, buses and coaches)
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
Limit Values	Legally binding EU parameters that must not be exceeded. Limit values are set for individual pollutants and are made up of a concentration value, an averaging time over which it is to be measured, the number of exceedances allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one limit value covering different endpoints or averaging times.
NO₂	Nitrogen Dioxide
NOx	Nitrogen Oxides

NPPF	National Planning Policy Framework
µg/m³	Microgrammes per cubic metre
PM₁₀	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM_{2.5}	Small airborne particles, more specifically particulate matter less than 2.5 micrometres in aerodynamic diameter
WHO	World Health Organization

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A2 Legislation, Policy and Guidance

- A2.1 There are a large number of policy, guidance, and strategy documents published regarding air quality at a national, regional and local level. The documents all provide useful context, information, and justification in support of the approaches in this assessment. Details of relevant documents are provided below.

National

Planning Practice Guidance

- A2.2 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019b). The PPG on air quality published in November 2019 states:

Paragraph: 001 Reference ID: 32-001-20191101: *“The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning 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.”*

Paragraph: 002 Reference ID: 32-002-20191101: *“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”.*

Paragraph: 005 Reference ID: 32-005-20191101: *“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.*

Where air quality is a relevant consideration the local planning authority may need to establish:

- *the ‘baseline’ local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality”.*

Paragraph: 007 Reference ID: 32-007-20191101: *“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”.*

Paragraph: 008 Reference ID: 32-008-20191101: *“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”.*

Clean Air Strategy

A2.3 Defra published the Clean Air Strategy in January 2019 (Defra, 2019). The strategy focuses on exposure to toxic pollutants like nitrogen oxides, ammonia, particulate matter, non-methane volatile organic compounds and sulphur dioxide. The strategy aims to reduce emissions of pollutants including the aim to reduce particulate matter emissions by 30% by 2020, and by 46% by 2030.

A2.4 This strategy sets out the aim for new enforcement powers at a national and local level, across all sectors of society and sets out the comprehensive action that is required from government and society to meet these targets. The strategy includes actions to reduce emissions from transport (including road, maritime, rail, aviation and NRM), homes, farming and industry.

A2.5 The strategy states that:

“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.”

The Industrial Strategy

A2.6 The Government has published a white paper that sets out a long-term ‘Industrial Strategy’ for the UK (HM Government, 2017). It includes a key policy to *“support electric vehicles through a £400m charging infrastructure investment and an extra £100m to extend the plug-in car grant”* and states *“the UK’s road and rail network could dramatically reduce carbon emissions and other pollutants”*. Unlike their fossil fuel counterparts, electric vehicles do not release nitrogen oxides (NOx) emissions; if the strategy is fulfilled then NOx emissions will reduce significantly over the coming decades.

The Clean Growth Strategy

A2.7 An ambitious blueprint for Britain’s low carbon future was set out by the Government in a Policy paper (HM Government, 2018) in April 2018. Although this strategy focuses on reducing the UK’s carbon footprint, it contains several policies and proposals that relate to air quality, including:

22. *“End the sale of new conventional petrol and diesel cars and vans by 2040*

23. *Spend £1 billion supporting the take-up of ultra low emission vehicles (ULEV), including helping consumers to overcome the upfront cost of an electric car*
24. *Develop one of the best electric vehicle charging networks in the world by:*
 - *Investing an additional £80 million, alongside £15 million from Highways England, to support charging infrastructure deployment*
 - *Taking new powers under the Automated and Electric Vehicles Bill, allowing the Government to set requirements for the provision of charging points*
25. *Accelerate the uptake of low emission taxis and buses by:*
 - *Providing £50 million for the Plug-in Taxi programme, which gives taxi drivers up to £7,500 off the purchase price of a new ULEV taxi, alongside £14 million to support 10 local areas to deliver dedicated charge points for taxis*
 - *Providing £100 million for a national programme of support for retrofitting and new low emission buses in England and Wales*
26. *Work with industry as they develop an Automotive Sector Deal to accelerate the transition to zero emission vehicles*
27. *Announce plans for the public sector to lead the way in transitioning to zero emissions vehicles*
28. *Invest £1.2 billion to make cycling and walking the natural choice for shorter journeys*
29. *Work to enable cost-effective options for shifting more freight from road to rail, including using low emission rail freight for deliveries into urban areas, with zero emission last mile deliveries*
30. *Position the UK at the forefront of research, development and demonstration of Connected and Autonomous Vehicle technologies, including through the establishment of the Centre for Connected and Autonomous Vehicles and investment of over £250 million, matched by industry The Clean Growth Strategy 15*
31. *Innovation: Invest around £841 million of public funds in innovation in low carbon transport technology and fuels including:*
 - *Ensuring the UK builds on its strengths and leads the world in the design, development and manufacture of electric batteries through investment of up to £246 million in the Faraday Challenge*
 - *Delivering trials of Heavy Goods Vehicle (HGV) platoons, which could deliver significant fuel and emissions savings”.*

The 25 Year Environment Plan

A2.8 The Government has published a Policy paper called the '25 Year Environment Plan' (HM Government, 2019) which set out what the government will do to improve the environment within a generation. This includes the first goal 'Clean air' where the government states *"we will achieve clean air by:*

- *Meeting legally binding targets to reduce emissions of five damaging air pollutants. This should halve the effects of air pollution on health by 2030.*
- *Ending the sale of new conventional petrol and diesel cars and vans by 2040.*
- *Maintaining the continuous improvement in industrial emissions by building on existing good practice and the successful regulatory framework".*

Road to Zero

A2.9 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.

A2.10 This paper confirms 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 2040, 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.

A2.11 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. If these ambitions are realised then road traffic-related NO_x emissions can be expected to reduce significantly over the coming decades.

Air Quality Plan

A2.12 Defra has produced an Air Quality Plan to tackle roadside NO₂ concentrations in the UK (Defra, 2017). Alongside a package of national measures, the Plan requires those English Local Authorities (or the GLA in the case of London Authorities) that are predicted to have exceedances of the limit values beyond 2020 to produce local plans by December 2018. These plans are undertaken in stages and must have measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a charging Clean Air Zone (CAZ).

A3 Professional Experience

[Dr Austin Cogan, MPhys \(Hons\) PhD MEnvSc MIAQM](#)

Dr Cogan is a Director of APS and has over twelve years' experience in environmental sciences. Austin has extensive experience of air quality, dust and odour assessments for a range of industries as well as services for local authorities, including Clean Air Zone and micro-simulation modelling. He is also an international expert in the field of climate change, having monitored greenhouse gases globally, published numerous scientific papers and presented at conferences internationally.

[Lotte Gleeson, BA \(Hons\)](#)

Ms Gleeson is a graduate consultant at APS. She completed her BA Physics at the University of Oxford and previously worked as a junior environmental consultant at Aether. She is now gaining experience in undertaking air quality assessments for planning applications and providing support on a wide range of projects, including impacts on ecological habitats, environmental permitting, indoor air quality and policy development. She is also involved in air pollution monitoring, data assimilation and research in the field of air quality.

A4 Modelling

The model

- A4.1 Parameters and data relating to the detailed dispersion modelling approach are set out below.

Vehicle Emissions

- A4.2 Emissions of road-NO_x (i.e. the contribution from vehicles using roads), road-PM₁₀ and road-PM_{2.5} have been derived from the latest version of Defra's Emission Factor Toolkit (EFT) (v10.1) using the traffic data presented in Table 4. The EFT is based on the COPERT 5 (Computer Programme to calculate Emissions from Road Transport) vehicle emission model and provides speed-average based emission rates. The EFT provides vehicle emission rates for the years 2017 – 2030; future years are based on a range of factors, such as expected vehicle fleet release dates, anticipated improvements in emission reduction technologies, expected uptake rates of different vehicles based on government policies, etc. It is therefore possible that the expected future emission rates in the EFT may differ from reality.

Fraction of Primary NO₂

- A4.3 In addition to emission rates, the fraction of primary NO₂ (f-NO₂) has been obtained from the EFT. This represents the amount of NO₂ released from vehicle exhausts, before any further chemical reactions in the atmosphere, which becomes an important variable when post-processing the model predictions. In order to obtain the f-NO₂ value at each receptor location, the NO_x emission rates have been multiplied by f-NO₂ values to derive NO₂ emission rates. These NO₂ emissions have been included in the model and primary NO₂ concentrations have been predicted at the receptors. The predicted NO_x concentrations have been divided by the predicted primary NO₂ concentrations to calculate the f-NO₂ values at the receptor locations. The f-NO₂ values have then been used in the model post-processing (see paragraph A4.32).

Time-Based Profiles

- A4.4 Vehicle emissions vary over time depending on the volume of traffic, this includes hourly, daily and seasonal variations. Seasonal (monthly) and diurnal (hourly) traffic flow profiles have been taken from DfT national statistics (DfT, 2019). Both the profiles have been assumed to follow an urban traffic profile for all modelled roads. These have been used in the model to adjust the emissions for each hour of the year modelled. These profiles are shown in Figure A1 and Figure A2.

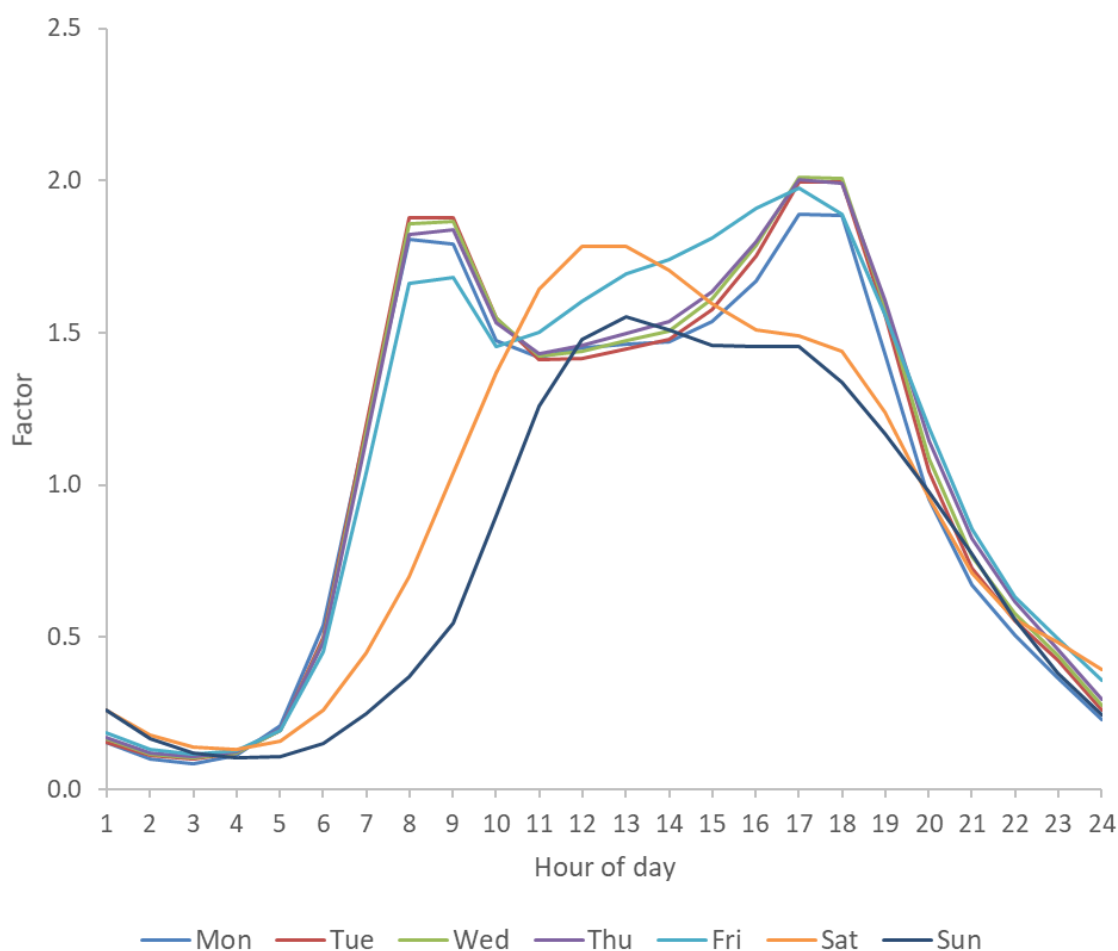


Figure A1: Urban diurnal profile for each day of the week used in the model, where the factor is the value that the average daily emissions are multiplied by in the model

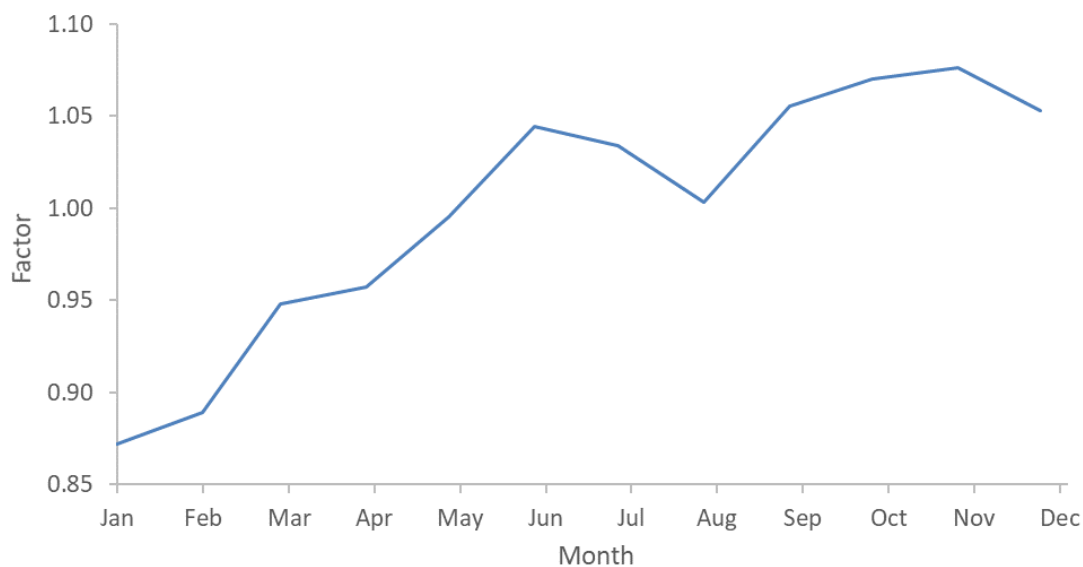


Figure A2: Urban seasonal profile for each month of the year used in the model

Traffic Flows

- A4.5 Traffic data for the roads close to the Proposed Development have been provided by Paul Basham Ltd for the baseline year of 2018 and forecasted year of 2025, including local committed developments, and with and without the Proposed Development. The data provided included AM and PM peak traffic flow data along the B2149 and Barton Road, along with a peak to AADT conversion factor of 5.024. The data included flows for both all vehicles and those that are HDVs. The 2018 and 2025 data have been assumed to be representative for the model years of 2019 and 2021, respectively. Since the 2025 data includes committed developments, the assumption therefore assumes no committed developments in 2019 and all committed developments in 2021. This causes the growth in local traffic to be assumed over a shorter timescale and thus provides a conservative assessment.
- A4.6 Traffic data the roads close to the model verification site have been obtained from the DfT. Data for New Road and Petersfield Road have been taken from count site data for 2018 and 2019 respectively. Traffic volumes in 2018 along New Road are considered to be representative of those in 2019. As the traffic data along Park Road North and Elmleigh Road are unknown, for the purpose of model verification the AADT and percentage of HDVs along Elmleigh Road have been assumed to be identical to those along New Road. The Council's 2018 ASR (HBC, 2018) states that traffic volumes along New Road are 60% of that along Park Road North. The assumption is therefore likely to represent a worst-case scenario.
- A4.7 Paul Basham Ltd has also provided forecasted traffic data for the Site Access Road for the year 2025. It is unknown how traffic will be split between the various routes around the Proposed Development, such as the drive-throughs and the residential car parks. Therefore, it has been assumed that all onsite routes have flows equal to that of the Site Access road, as this will provide a worst-case assessment.

Table A1: Traffic data used in the model

Link	2019		2021 ^a		2021 ^a	
	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
B1249 south of junction with Barton Road, traffic heading north	7,652	2.5	8,717	2.4	9,058	2.3
B1249 south of junction with Barton Road, traffic heading south	7,787	2.5	8,892	2.5	9,279	2.4
B1249 north of junction with Barton Road, traffic heading north	5,109	3.0	5,752	2.9	5,918	2.8
B1249 north of junction with Barton Road, traffic heading south	4,733	3.6	5,325	3.6	5,491	3.5
Barton Road West	10,701	2.3	12,560	2.1	14,142	1.9
Barton Road East	10,701	2.3	12,575	2.2	12,967	2.1
Site Access	0	0	0	0	2,748	0.0
New Road	14,398	2.0	n/a	n/a	n/a	n/a
Elmleigh Road	14,398	2.0	n/a	n/a	n/a	n/a

B1249 north of junction with New Road	18,643	3.6	n/a	n/a	n/a	n/a
B1249 south of junction with New Road	23,997	3.6	n/a	n/a	n/a	n/a

^a Roads with n/a values have only been included to verify the model against 2019 measured concentrations and are not relevant for the future year of 2021 within the assessment.

Wake effects

- A4.8 As vehicles travel along a road a wake is left behind the vehicles as air in the path of travel is forced around the vehicle. The wake can be considered the turbulence induced by the movement of the vehicle, which affects the dispersion of pollution away from roads. The AADT traffic flows have been entered into the ADMS-roads dispersion modeling in order to account for vehicle wake effects which will vary on each link depending on the proportion of large vehicles to small vehicles.

Street Canyons

- A4.9 Roads in the local area are enclosed by buildings and vegetation, leading to restricted dispersion of pollution away from the roads and higher pollutant concentrations close to the roads. This is known as a 'street canyon' effect. The roads have therefore been modelled as asymmetric street canyons using the Advanced Street Canyon Module in network mode, within the ADMS-Roads model, accounting for the fraction of covered 'canyons'. Details of the street canyons are provided in Figure 5.

Meteorology

- A4.10 Meteorological data has been taken from the Thorney Island Meteorological Station for the year of 2019. This station is located approximately 7 km southeast of the application site and is considered to be representative of meteorological conditions in Havant; both the station and application site are located a similar distance to the south coast and will experience very similar meteorological conditions. Meteorological data for the year of 2019 is considered to provide typical conditions. Illustrations of wind speed and direction for 2019 and other recent years are presented in Figure A3.

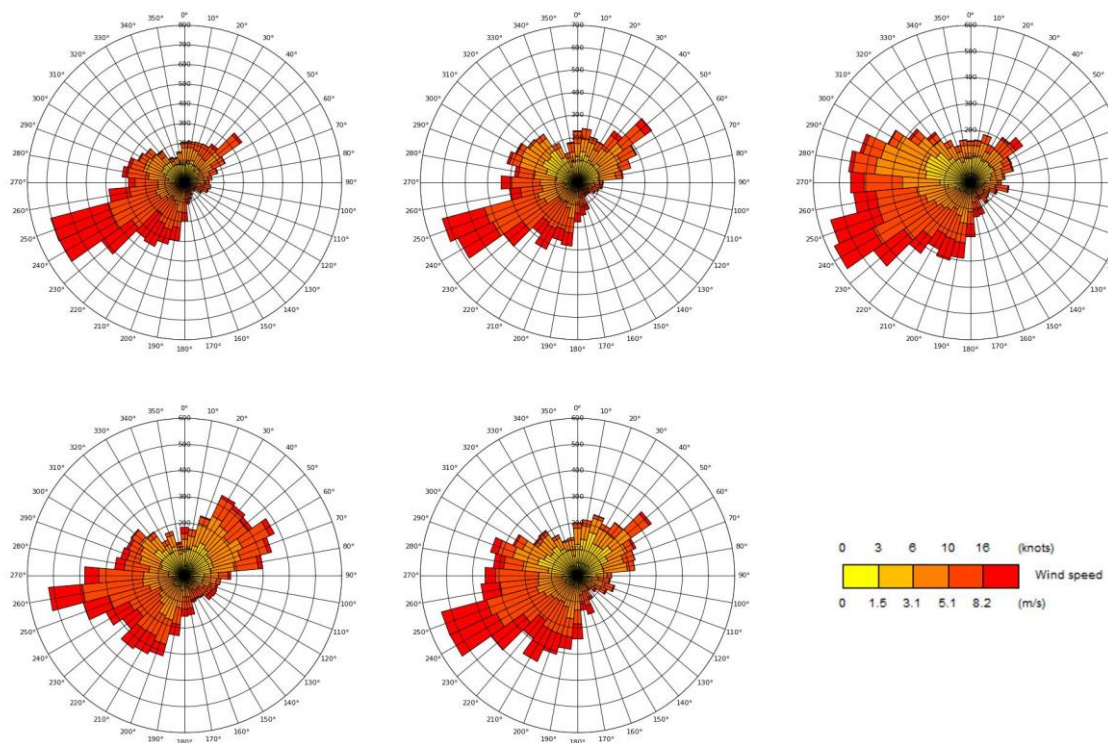


Figure A3: Windrose of wind speed and direction for each year from 2015 (top left) to 2019 (bottom right) at the Thorney Island Meteorological Station

Meteorological Parameters

- A4.11 In addition to the meteorological data, the model requires values to be set for a number of meteorological related parameters, for both the meteorological station and the dispersion site (the development). Details of the parameter values used in the modelling are provided in Table A2 below.
- A4.12 Land-use and surface characteristics have an important influence in determining turbulent fluxes and, hence, the stability of the boundary layer and atmospheric dispersion.
- A4.13 Surface roughness length used within the model represents the aerodynamic effects of surface friction and is defined as the height at which the extrapolated surface layer wind profile tends to zero. This value is an important parameter used by the built-in meteorological pre-processor of ADMS to interpret the vertical profile of wind speed and estimate friction velocities which are, in turn, used to define heat and momentum fluxes and, consequently, the degree of turbulent mixing. Surface roughness values for different land-use classifications are provided in the 2018 Corine Land Use dataset (Copernicus, 2018). A surface roughness file has been used within the model based on the spatially variable land-uses and the equivalent roughness values from the dataset. Figure A4 shows the surface roughness for the local area.

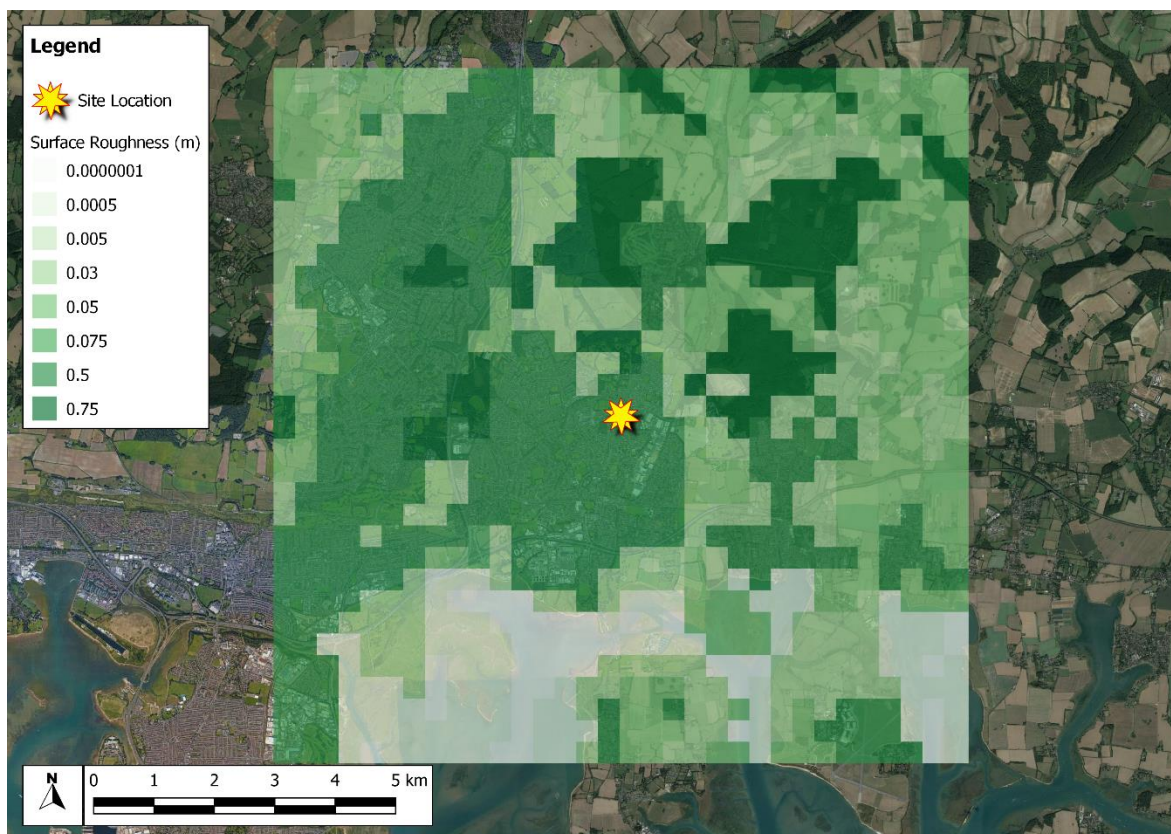


Figure A4: Surface Roughness

Imagery © 2021 Google, Map data © 2021

- A4.14 The surface albedo is the ratio of reflected to incident shortwave solar radiation at the surface of the earth. This varies depending on the land use, and thus area-weighted average albedos have been derived for the meteorological and dispersion sites and used in the models. Albedo values have been taken from US Environmental Protection Agency (EPA) guidance (2018) and associated with the different land uses in the 2018 Corine Land Use dataset (Copernicus, 2018).
- A4.15 The Priestley-Taylor parameter is a parameter representing the surface moisture available for evaporation. A Priestley-Taylor parameter of 1 has been set in the model.
- A4.16 The CERC user guide explains that “the Monin-Obukhov length provides a measure of the stability of the atmosphere. In very stable conditions in a rural area its value would typically be 2 to 20 m. In urban areas, there is a significant amount of heat generated from buildings and traffic, which warms the air above the town/city”. For large urban areas this is known as the urban heat island. It has the effect of preventing the atmosphere from ever becoming very stable. The model has the ability to define the minimum Monin-Obukhov length to account for the urban heat island effect which is not represented by the meteorological data. This varies depending on the land use, and thus area-weighted average minimum Monin-Obukhov lengths have been derived for the meteorological and dispersion sites and used in the models.

Table A2: Meteorological parameters values used in the model

Parameter	Meteorological Site Value	Dispersion Site Value
Latitude (°)	n/a	50.87
Surface roughness (m)	0.44	n/a
Surface albedo	0.17	0.17
Minimum Monin-Obukhov length (m)	27.61	26.52
Priestley-Taylor parameter	1	1

A4.17 The meteorological parameters alter the meteorological data inputted into the model to reflect conditions at the dispersion site. For example, if the dispersion site has a marginally lower surface roughness value than the meteorological site, then the model will increase the wind speed at the dispersion site to reflect this. Figure A5 shows the frequency of wind speeds and directions measured at the meteorological station in 2019 (left), which has been inputted into the model, as well as the frequency of wind speeds and directions processed by the ADMS-roads model for the dispersion site (right). These illustrate that wind predominantly comes from the southwest and that the model has marginally higher wind speed at the dispersion site.

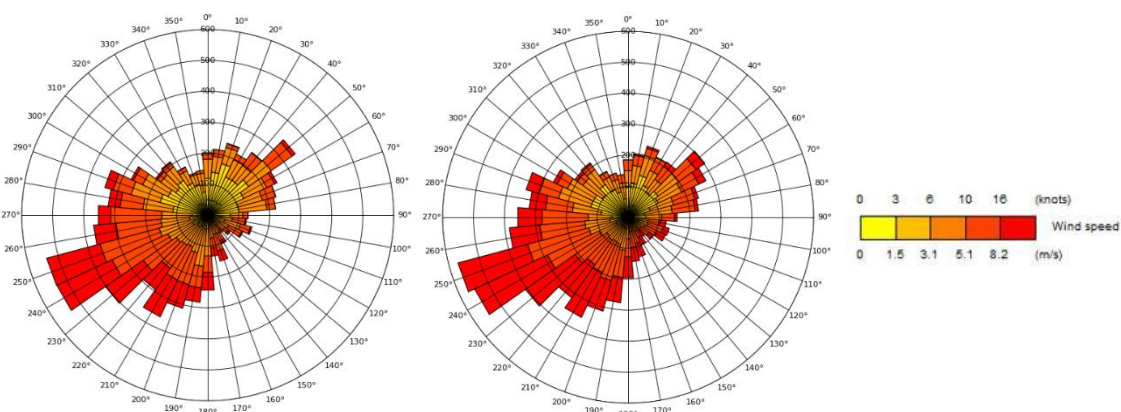


Figure A5: Wind Rose showing the frequency of wind speed and wind direction for the meteorological station (Left) and the modelled dispersion site (Right) for the year of 2019

Model Performance

- A4.18 The modelling will inherently have some uncertainties and may not reflect real conditions in the local area. An important part of modelling is reviewing the model results carefully and checking the model setup parameters and input data to minimise uncertainties.
- A4.19 LAQM.TG.16 (Defra, 2018), provides local authorities with advice on good practice for modelling air quality. This advice is widely applied for air quality assessments of proposed developments, although it is specifically aimed at local authority's duties to review and assess air quality. LAQM.TG.16 states that model verification, defined as a comparison of modelled results with monitoring results at relevant locations, is necessary (paragraph 7.520).
- A4.20 There are many reasons why there may be a difference between modelled and monitored concentrations and LAQM.TG.16 states "Model verification is the process by which these and other

uncertainties are investigated and where possible minimised.” (paragraph 7.512). It provides a list of the factors that may explain the differences including meteorological data, source activity data (e.g. traffic flow and speed), emission factors, model input parameters such as roughness length, and monitoring data.

- A4.21 The advice in LAQM.TG.16 is generic for all dispersion models. ADMS has been shown to predict concentrations well given sufficiently accurate data inputs.
- A4.22 It is important to review the results of the modelling carefully and check the model setup parameters and input data. Once reasonable efforts have been made to reduce the uncertainties of input data for a model, further comparison of modelled and monitored results should be undertaken. Where discrepancies remain, consideration may be given to adjusting the model.
- A4.23 Using good modelling techniques provides confidence that the model is performing as well as possible everywhere in the modelling area in the base year, not just at the monitoring locations. Modelling is often an iterative process of improving the model setup and evaluating the impact on model performance. The same principles need to be applied to the entire modelling study area to ensure the model performs well throughout the study area.
- A4.24 All reasonable efforts have been made to improve the model inputs. The model has gone through several modelling iterations to consider whether the performance of the modelled inputs can be improved. Improvements are based on comparison with the measured concentrations at specific monitoring locations and where improvements have been made, they have been applied as a wholistic approach with systematic updates to the entire model study area to ensure that the model is not performing well exclusively at the monitoring locations.
- A4.25 A final model verification exercise has been undertaken to determine whether there are any remaining discrepancies and to derive a factor with which to adjust the predicted concentrations from the model so that they match local conditions as closely as possible.

[Final Model Verification](#)

- A4.26 A final model verification exercise has been undertaken, following the guidance set out by Defra in Box 7.14 and Box 7.15 of LAQM.TG(16) (Defra, 2018).
- A4.27 Concentrations of road-NO_x and primary NO₂ have been predicted for the year of 2019 using the ADMS-roads dispersion model at the New Road diffusion tube monitoring site (W10). Predictions have been made at the height of the monitor inlet.

[NO₂](#)

- A4.28 Initially, the measured NO₂ concentration at the monitoring site has been inputted into Defra's NO_x to NO₂ Calculator, along with the background NO₂ concentration and f-NO₂ value, in order to obtain 'measured' road-NO_x concentration at the monitoring site. The primary NO₂ emission factor (f-NO₂) at the monitoring site was calculated by taking the ratio of predicted primary NO₂ concentration to predicted road-NO_x concentration.

- A4.29 The predicted road-NO_x concentration has then been compared to the 'measured' road-NO_x concentration. An adjustment factor of 3.676 has been derived from the ratio of these two concentrations. This factor indicates that the model is underpredicting concentrations at the monitoring site. The adjustment factor has been applied to all predicted road-NO_x concentrations to uplift the values to match the real measured 2019 concentration at the monitoring site.
- A4.30 Since the model is underpredicting it is important to consider whether this can be improved further and what the possible reasons are for the underprediction. The Council's 2018 ASR (HBC, 2018) assumes traffic along New Road to have an AADT of approximately 18,000. However, the DfT recorded a value of 14,398 in 2018, which was used in the modelling. This suggests that the AADT along New Road may be underestimated within the modelling, and should a higher flow have been modelled it would have resulted in higher concentrations at the monitoring site, reducing the underprediction.

PM₁₀ and PM_{2.5}

- A4.31 The Council do not operate any monitoring sites that measure roadside concentrations of PM₁₀ or PM_{2.5}. In the absence of relevant monitoring sites with which to verify the model predictions of PM₁₀ and PM_{2.5} against, the model adjustment factor for road-NO₂ has been used to uplift all predicted road-PM_{2.5} and road-PM₁₀ concentrations.

Post Processing

- A4.32 Concentrations of road-NO_x and primary NO₂ have been predicted at each receptor using the ADMS-Roads model. The primary NO₂ emission factor (f-NO₂) at each receptor has been calculated by taking the ratio of predicted primary NO₂ concentration to road-NO_x concentration.
- A4.33 The f-NO₂ values along with the adjusted modelled road-NO_x concentrations and background NO₂ concentrations have been inputted into Defra's NO_x to NO₂ calculator (v8.1) in order to obtain predicted road-NO₂ concentrations at each receptor. This tool has been run assuming the traffic is described as 'All other urban UK traffic', which is considered appropriate for the traffic associated with Havant.
- A4.34 The road-NO₂ concentrations have then been added to the background NO₂ concentrations to obtain total NO₂ concentrations at the receptors. Similarly, the adjusted road-PM₁₀ and road-PM_{2.5} concentrations have been added to the background PM₁₀ and PM_{2.5} concentrations to obtain total PM₁₀ and PM_{2.5} concentrations at the receptors.



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