



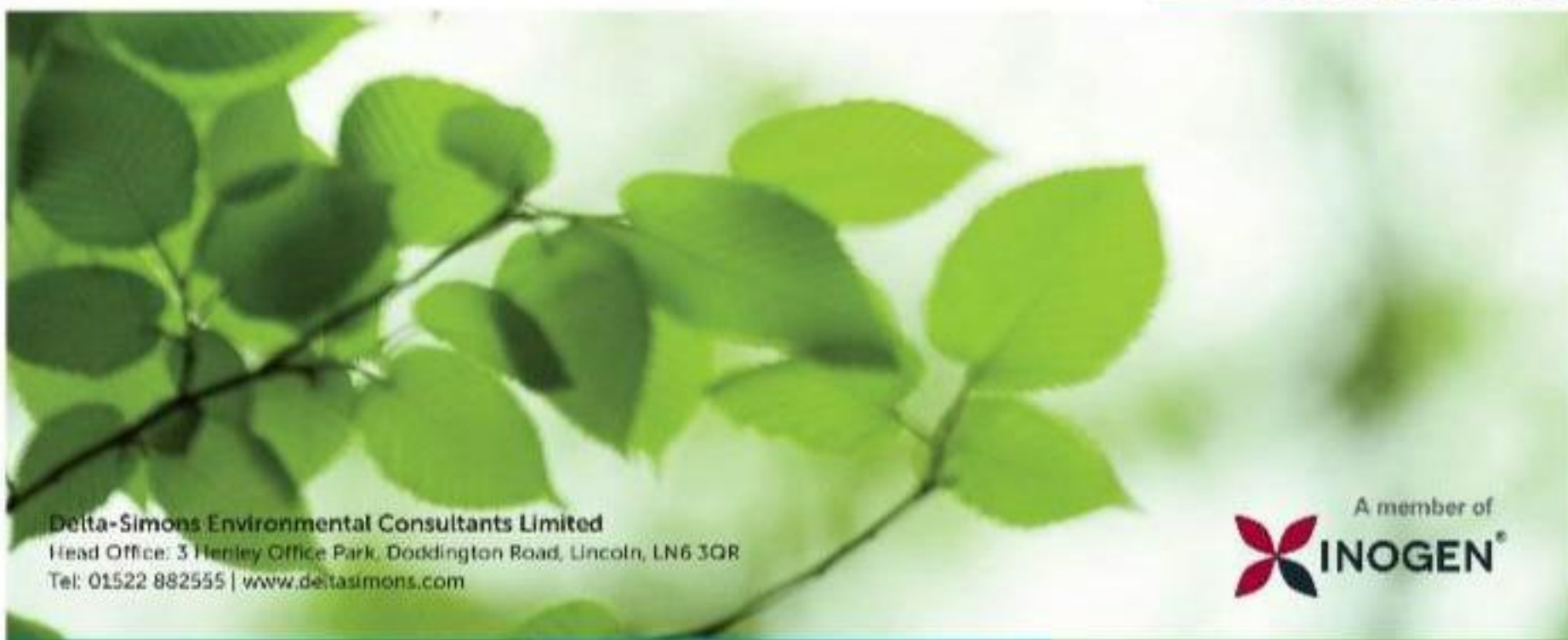
Air Quality Assessment

Former Landfill site, Brockhampton West, Harts Farm Way, Havant

Presented to **Clowes Developments (UK) Ltd**

Issued: February 2021

Delta-Simons Project No. 19-2099.03



Delta-Simons Environmental Consultants Limited
Head Office: 3 Henley Office Park, Doddington Road, Lincoln, LN6 3QR
Tel: 01522 882555 | www.deltasimons.com



Report Details

Client	Clowes Developments (UK) Ltd
Report Title	Air Quality Assessment
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Delta-Simons Contact	Gabor Antony (Gabor.Antony@deltasimons.com)

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				Harry Porter Graduate Consultant	Paul Hayward Principal Consultant	Gabor Antony Unit Manager

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Executive Summary

Site and Report Context	Delta-Simons was instructed by Clowes Developments (UK) Ltd (the 'Client') to undertake an Air Quality Assessment in support of an outline application for the development of new employment units for flexible use across use classes E (light industrial), B2 and B8 with ancillary offices, car parking, service yards, drainage works, landscaping and associated works to prepare the site for development (the 'Proposed Development'), at the Former Landfill site, Brockhampton West, Harts Farm Way, Havant (the 'Site'). The Site is located in an area where air quality is mainly influenced by road traffic emissions along the A27 Havant Bypass, the M3, Harts Farm Way and the local road network; as such, elevated pollutant concentrations may be experienced at this location. A baseline desk survey also indicated that there is a designated Ramsar Site, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and Local Nature Reserve (LNR) within close proximity to the Site and along the affected road network, as such, the Proposed Development has the potential to cause adverse impacts at nearby sensitive receptors. As such, an Air Quality Assessment is required to determine baseline conditions at the Site and to assess potential impacts associated with the Proposed Development, in accordance with the requirements of the National Planning Policy Framework (NPPF). The Air Quality Assessment will therefore consider ambient pollutant concentrations namely nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) in the vicinity of the Site. This report presents the findings of the assessment, which addresses the potential air quality impacts during both the construction and operational phases of the Proposed Development. For both phases, the type, source and significance of potential impacts were identified, and the measures that should be employed to minimise these proposed.
Summary	The assessment of construction phase impacts associated with fugitive dust and fine particulate matter of an aerodynamic diameter of less than 10 and 2.5 microns, respectively (PM₁₀ and PM_{2.5}) emissions has been undertaken in line with the relevant Institute of Air Quality Management (IAQM) guidance. This identified that there is a medium to low risk of dust soiling impacts, a low risk of increases in particulate matter concentrations and a medium to low risk of ecological impacts due to unmitigated construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and particulate matter releases would be significantly reduced. The residual effects of the construction phase on air quality are considered to be not significant. Levels of nitrogen oxides, and nitrogen and acid gas deposition rates were also predicted at the relevant ecological sites. Results indicated that the Proposed Development would not significantly affect existing conditions at any ecological designation. Additionally, the Proposed Development is expected to result in an overall negligible impact associated with the operational phase traffic on nearby receptors and the residual effects are considered to be not significant.
Conclusions and Recommendations	Based on the results of the assessment and the implementation of the proposed mitigation measures, it is considered that, the Proposed Development complies with national and local planning policies and there are no air quality constraints considered to restrict planning consent.
This is intended as a summary only. Further detail and limitations of the assessment is provided within the main body of the report.	

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1.0 Introduction

1.1 Appointment

- 1.1.1 Delta-Simons Environmental Consultants Limited ('Delta-Simons'), was instructed by Clowes Developments (UK) Ltd (the 'Client') to undertake an Air Quality Assessment in support of an outline application for the development of new employment units for flexible use across use classes E (light industrial), B2 and B8 with ancillary offices, car parking, service yards, drainage works, landscaping and associated works to prepare the site for development (the 'Proposed Development'), at the Former Landfill site, Brockhampton West, Harts Farm Way, Havant (the 'Site').
- 1.1.2 Reference should be made to **Figure 1** for a map of the Site and surrounding area.

1.2 Site Location and Context

- 1.2.1 The Site is located in an area where air quality is mainly influenced by road traffic emissions along the local road network, and as such, elevated pollutant concentrations may be experienced at this location. The development therefore has the potential to cause adverse impacts to existing pollution levels at nearby sensitive receptors. Therefore, an Air Quality Assessment was required to determine baseline conditions at the Site, and to assess potential impacts associated with the Proposed Development in accordance with the requirements of the National Planning Policy Framework (NPPF). The Air Quality Assessment will therefore consider ambient pollutant concentrations namely nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) across and in the vicinity of the Site.
- 1.2.2 A baseline desk survey also indicated that there is a designated Ramsar Site, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and Local Nature Reserve (LNR) within close proximity to the Site and along the affected road network, as such, the Proposed Development has the potential to cause adverse impacts at nearby sensitive receptors. As such, an Air Quality Assessment is required to determine baseline conditions at the Site and to assess potential impacts associated with the Proposed Development, in accordance with the requirements of the National Planning Policy Framework (NPPF). The Air Quality Assessment will therefore consider ambient pollutant concentrations namely nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) in the vicinity of the Site.
- 1.2.3 The main potential sources of air pollution were identified as emissions from road transport using the local road network.
- 1.2.4 The report presents the findings of an assessment of the potential air quality impacts of the Proposed Development during both the construction and operational phases. For both phases, the type, source and significance of potential impacts are identified, and the measures that should be employed to minimise these described.
- 1.2.5 The standard limitations associated with this assessment are presented in **Appendix A**.
- 1.2.6 A glossary of terms used in this report is provided in **Appendix B**.

2.0 Legislation and Policy

2.1 Air Quality Legislation and Policy

2.1.1 A summary of the relevant air quality legislation and policy is provided below.

UK Air Quality Strategy (2007)

2.1.2 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)¹. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation.

2.1.3 Under the European Union (Withdrawal) Act 2018 (as amended), domestic legislation derived from EU law, which was in force immediately prior to the end of the transition period on 31st December 2020, continues to form part of UK domestic law thereafter. This new body of law resulting from the Withdrawal Act is referred to as 'retained EU Law'.

2.1.4 The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C₆H₆), 1,3 butadiene (C₄H₆), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), particulate matter (PM₁₀ and PM_{2.5}), sulphur dioxide (SO₂), ozone (O₃), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Appendix C**.

2.1.5 The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

2.1.6 The air quality objectives (AQOs) are medium-term policy-based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.1.7 For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO₂, the short-term standard is for a 1-hour averaging period, whereas for PM₁₀ it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.1.8 The AQS contains a framework for considering the effects of a finer group of particles known as 'PM_{2.5}' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM₁₀. Local authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for PM_{2.5} at this time.

Air Quality Regulations (2016)

2.1.9 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000² and the Air Quality (England) (Amendment) Regulations 2002³ for the purpose of Local Air Quality Management (LAQM).

2.1.10 These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

'[...] the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present [...]

¹ Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2).

² The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928.

³ The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

- 2.1.11 The Air Quality Standards (Amendment) Regulations 2016⁴ amends the Air Quality Standards Regulations 2010 that transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM₁₀, PM_{2.5} and NO₂. The limit values for NO₂ and PM₁₀ are the same concentration levels as the relevant AQS objectives and the limit value for PM_{2.5} is a concentration of 25µg/m³.

Environmental Protection Act 1990 - Control of Dust and Particulates Associated with Construction

- 2.1.12 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

'Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance'; and

'Any accumulation or deposit which is prejudicial to health or a nuisance'.

- 2.1.13 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

- 2.1.14 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

Environment Act 1995

- 2.1.15 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an AQMA. For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

Clean Air Strategy (2019)

- 2.1.16 In 2019, the UK government released its Clean Air Strategy 2019⁵, part of its 25 Year Environment Plan⁶. The Strategy sets out the comprehensive action that is considered to be required from across all parts of government and society.
- 2.1.17 The primary focus of air quality management has primarily related to NO₂, and its principal source in the UK, road traffic. The 2019 Strategy aims to broaden the focus to other areas, including actions on clean growth, and emissions from domestic wood burning stoves, industry and agriculture.

2.2 Planning Policy

- 2.2.1 A summary of the national and local planning policy relevant to the Proposed Development and air quality is provided below.

National Planning Policy

National Planning Policy Framework (2019)

- 2.2.2 The Government's overall planning policies for England are described in the National Planning Policy Framework⁷. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

⁴ The Air Quality Standards (Amendment) Regulations 2016 - Statutory Instrument 2016 No. 1184.

⁵ Department for Environment, Food and Rural Affairs (Defra) (2019) Clean Air Strategy 2019.

⁶ Department for Environment Food and Rural Affairs (Defra) (2018) A Green Future: Our 25 Year Plan to Improve the Environment.

⁷ Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework.

'[...] meeting the needs of the present without compromising the ability of future generations to meet their own needs.'

2.2.3 One of the three overarching objectives of the NPPF is that planning should 'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'

2.2.4 In relation to air quality, the following paragraphs in the document are relevant:

- ▲ Paragraph 54, which states '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.';
- ▲ Paragraph 103, which states '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.';
- ▲ Paragraph 170, which states 'Planning policies and decisions should contribute to and enhance the natural and local environment by: [...] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.';
- ▲ Paragraph 180, which states 'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.';
- ▲ Paragraph 181, which states '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.'; and
- ▲ Paragraph 183, which states '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'.

Local Planning Policy

- 2.2.5 A summary of relevant local policies is outlined below, however their compliance and soundness in relation to national policy has not been assessed in this instance.

Havant Borough Core Strategy

- 2.2.6 The Havant Borough Core Strategy adopted in March 2011⁸ is the core document within the Havant Borough Local Development Framework. The Core Strategy sets out how Havant Borough Council (HBC) believes the borough should develop. It also identifies the strategic sites that are considered fundamental to achieving the overall vision.

- 2.2.7 Policy DM10 was identified as being relevant to air quality:

'Development that may cause pollution of water, air or soil or pollution through noise [...] will only be permitted where all of the following relevant criteria can be met:

1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.
2. National air quality standards or objectives would not be breached [...].'

Havant Borough Local Plan (Allocations) 2014

- 2.2.8 The Havant Borough Local Plan (Allocations)⁹ follows on from the adopted Havant Borough Local Plan (Core Strategy). It replaces the remaining saved policies for the Havant Borough District-Wide Local Plan and includes a number of policies in addition to those in the Core Strategy. Policy DM18 was identified as being relevant to this assessment:

'Policy DM18: Protecting New Development from Pollution:

Planning permission will be granted for development provided that projected levels of air, noise, vibration, light, water or other pollution do not have significant negative affect on the amenity of future occupiers or users of the proposed development.

This policy complements Policy DM10 of the Core Strategy. It is intended to control the adverse effects which could occur as a result of the inappropriate location of new development close to sources of pollution or other amenity impacts.'

Havant Borough Local Plan 2036 (Draft)

- 2.2.9 The Local Plan¹⁰, when formally adopted, will ultimately seek to meet the development needs for the Borough in a sustainable way and make sure that Havant remains a place where people want to live, work, invest and visit well into the future.

- 2.2.10 Policy E23 was identified as being relevant to air quality:

'[...] It is therefore important that emissions associated with development are mitigated to ensure that compliance with air quality standards can be sustained.

The Council recognises that exposure to pollutants at levels close to, but not exceeding, the statutory limits still cause a degree of harm, and that compliance with statutory limit values is therefore not necessarily an indication of good air quality. The purpose of this policy is therefore at

⁸ Havant Borough Council (2011), Havant Borough Core Strategy [Online] Available at: <https://cdn.havant.gov.uk/public/documents/ADOPTED%20CORE%20STRATEGY%20.pdf> [Accessed 11/01/2021]

⁹ Havant Borough Council (2020), Havant Borough Local Plan (Allocations) July 2014. [Online] Available at: <https://cdn.havant.gov.uk/public/documents/Adopted%20Allocations%20Plan%20July%202014%20-%20Copy.pdf> [Accessed 25/01/21]

¹⁰ Havant Borough Council (2020), Havant Borough Local Plan 2036 (Pre-Submission Draft). [Online] Available at: [https://cdn.havant.gov.uk/public/documents/Pre-Submission%20HBLP2036%20for%20Full%20Council%20-%20FINAL%20POST%20COUNCIL%20\(clean%20for%20use\)%20-%20Copy.pdf](https://cdn.havant.gov.uk/public/documents/Pre-Submission%20HBLP2036%20for%20Full%20Council%20-%20FINAL%20POST%20COUNCIL%20(clean%20for%20use)%20-%20Copy.pdf) [Accessed 11/01/2021]

least to sustain existing levels, and where possible secure improvements in air quality by requiring new development to offset its associated emissions.'

2.2.11 The above policies relating to air quality have been considered within this assessment.

2.3 Guidance

2.3.1 A summary of the publications referred to in the undertaking of this assessment is provided below.

Local Air Quality Management Review and Assessment Technical Guidance (2018)

2.3.2 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their review and assessment work¹¹. This guidance, referred to in this document as LAQM.TG16, has been used where appropriate in the assessment presented herein.

Land-Use Planning & Development Control: Planning for Air Quality (2017)

2.3.3 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance¹² that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

Guidance on the Assessment of Dust from Demolition and Construction (2016)

2.3.4 This document¹³ published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM₁₀ impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

National Planning Practice Guidance - Air Quality (2019)

2.3.5 This guidance¹⁴ provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, it explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by local authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

¹¹ Department for Environment, Food and Rural Affairs (Defra) (2018) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16.

¹² Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017) Land Use Planning & Development Control: Planning for Air Quality.

¹³ Institute of Air Quality Management (Version 1.1 Updated June 2016) Guidance on the Assessment of Dust from Demolition and Construction.

¹⁴ Department of Communities and Local Government (DCLG) (Updated November 2019) National Planning Practice Guidance.

3.0 Scope and Methodology

3.1 Scope

3.1.1 The scope of the assessment has been determined in the following way:

- ▲ Review of HBC's latest available Air Quality Annual Status Report¹⁵ and air quality data for the area surrounding the Site, including data from HBC, Defra¹⁶ and the Environment Agency (EA)¹⁷;
- ▲ Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, as a result of the Proposed Development. This included a review of information on ecological receptors from the Multi-Agency Geographic Information for the Countryside (MAGIC)¹⁸ on-line mapping website and APIS¹⁹; and
- ▲ Review of the traffic data provided by the Project Transport Consultant (the 'PTC'), the Department for Transport's (DfT) Road Traffic Statistics²⁰ and Highways England's WebTRIS²¹ website.

3.1.2 The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- ▲ Dust and particulate matter generated by on-site activities during the construction phase;
- ▲ Increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic and plant; and
- ▲ Increases in pollutant concentrations as a result of exhaust emissions arising from traffic generated by the Proposed Development once operational.

3.2 Methodology

Construction Phase

3.2.1 Dust comprises particles typically in the size range 1-75 micrometres (μm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.2.2 The smaller particles of dust, are known as particulate matter (PM), with less than $10\mu\text{m}$ in aerodynamic diameter (PM_{10}) representing only a small proportion of total dust released; this includes a finer fraction, known as $\text{PM}_{2.5}$ (with an aerodynamic diameter less than $2.5\mu\text{m}$). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, they can therefore be transported by wind over a wider area. PM_{10} and $\text{PM}_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health. However, it is worth noting that, according to the IAQM guidance, the majority of fugitive particulate emissions arising from construction sites are expected to relate to the coarser fractions (i.e. $\text{PM}_{2.5-10}$) with just 10-15% expected to comprise $\text{PM}_{2.5}$. The IAQM guidance therefore focusses on PM_{10} for the purposes of assessment.

¹⁵ HBC (2020) Air Quality Annual Status Report (ASR) [via email on 18/12/2020].

¹⁶ Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management (LAQM) Support Pages [Online] Available at: <http://laqm.defra.gov.uk/> [Accessed on 10/11/2020].

¹⁷ Department for Environment, Food and Rural Affairs (Defra) (2020) Pollution Inventory [Online] Available at: <https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory> [Accessed on 10/11/2020].

¹⁸ Multi-Agency Geographic Information for the Countryside. [Online] Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed on 02/02/2021].

¹⁹ UK Air Pollution Information System (APIS) [Online] Available at: <http://www.apis.ac.uk/> [Accessed on 02/02/2021].

²⁰ Department for Transport (DfT) (2020) Road Traffic Statistics [Online] Available at: <https://roadtraffic.dft.gov.uk/#/6/55.254/-6.064/basemap-regions-countpoints> [Accessed on 02/02/2021].

²¹ Highways England (2020) WebTRIS [Online] Available at: <https://webtris.highwaysengland.co.uk/> [Accessed on 02/02/2021]

- 3.2.3 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM₁₀ during the construction phase has been undertaken using: the relevant assessment methodology published by the IAQM, the available information for this phase of the Proposed Development provided by the Client and Project Team, and professional judgement.
- 3.2.4 The IAQM methodology assesses the risk of potential dust and PM₁₀ impacts from the following four sources: demolition, earthworks, general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM₁₀ levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in **Appendix D**.
- 3.2.5 In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the application Site and in the vicinity of the application Site itself. As information on the number of vehicles and plant associated with the construction phase was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:
- ▲ The number and type of construction traffic and plant likely to be generated by this phase of the development;
 - ▲ The number and proximity of sensitive receptors to the application Site and along the likely routes to be used by construction vehicles; and
 - ▲ The likely duration of the construction phase and the nature of the construction activities undertaken.

Operational Phase Assessment

- 3.2.6 Of the pollutants included in the AQS, concentrations of NO₂, PM₁₀ and PM_{2.5} have been considered in this assessment as road traffic is a major source of these pollutants and their concentrations tend to be close to, or in exceedance of, the objectives in urban locations.
- 3.2.7 In order to predict NO₂ and PM concentrations across the Site, the advanced dispersion model ADMS-Roads (version 5.0.0.1) has been used. This model uses detailed information regarding traffic flows on the local road network, surface roughness and local meteorological conditions to predict pollutant concentrations. Details of the model input parameters are presented in **Appendix E**.

Meteorological Data

- 3.2.8 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model were obtained from the observing station at Thorney Island in 2019. This station is considered to provide representative data for the assessment. A wind rose generated from the meteorological data used for the dispersion modelling of operational phase impacts is provided in **Appendix F**.

Traffic Data

Traffic Flows

- 3.2.9 A summary of traffic data and pollutant emission factors used in the assessment can be found in **Appendix E**. It includes details of the AADT flows, vehicle speeds (km/h) and the percentage of HDVs for the local road network in all assessment years considered. Traffic speeds were reduced at junctions in line with guidance provided in LAQM.TG16, and using professional judgement.
- 3.2.10 For the assessment, three scenarios were modelled, as follows:
- ▲ 2019 - Model Verification;
 - ▲ 2023 - Assumed Opening Year Without Development; and
 - ▲ 2023 - Assumed Opening Year With Development.

- 3.2.11 Reference should be made to **Figure 1** for a graphical representation of the modelled road link locations.

Vehicle Emission Factors

- 3.2.12 Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factors Toolkit (EFT) (version 10.1). This has been produced by Defra and incorporates COPERT 5.3 vehicle emission factors and fleet information.
- 3.2.13 There is current uncertainty over NO₂ concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the Site development year in order to provide robust concentration predictions. As predictions for 2019 were verified, it is considered results are an indication of worst-case concentrations during the operation of the proposal.

Selection of Background Concentrations

Human Receptors

- 3.2.14 Background pollutant data for the operational phase assessment have been taken from the national maps provided on the Defra website²², where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated background concentrations are available for all years between 2018 and 2030, with previous years still accessible for assessment purposes utilising older resources. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions, and emissions from other sources. Due to the uncertainty discussed above, and in line with the findings of many local authorities that measured concentrations have not reduced as anticipated, 2019 background concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} have been utilised in this assessment for 2023.

Ecological Receptors

- 3.2.15 The predicted background deposition fluxes have been determined from the APIS website¹⁹.

Model Verification and Result Processing

- 3.2.16 The ADMS-Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the Proposed Development.
- 3.2.17 To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results, and was carried out following the methodology specified in Chapter 7, Section 4, of LAQM.TG16.
- 3.2.18 Details of the verification factor calculations are presented in **Appendix E**. A factor of **1.70** was obtained during the verification process, indicating that the model was under-predicting. This factor was applied to the model road-NO_x (oxides of nitrogen) outputs prior to conversion to annual mean NO₂ concentrations utilising the NO_x to NO₂ Calculator (version 8.1, 26th June 2020) provided by Defra²³. The NO₂ diffusion tube monitoring results recorded by HBC were subsequently used to derive an indicative baseline annual mean NO₂ concentration for each site in the vicinity of the Proposed Development. Reference should be made to **Figure 1**, which shows the diffusion tube monitoring locations within the assessment extents.
- 3.2.19 As local roadside monitoring data within the assessment extents are not available for PM₁₀ or PM_{2.5}, the modelled road-PM₁₀ and road-PM_{2.5} components have been adjusted by the verification factor obtained for NO_x before adding to the appropriate background concentration. The number of days with PM₁₀ concentrations greater than 50µg/m³ was then estimated using the relationship with the annual mean concentration described in LAQM.TG16.

²² Department for Environment, Food and Rural Affairs (Defra) (2020) Background Concentrations [Online] Available at <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018> [Accessed on 19/01/2021].

²³ Department for Environment, Food and Rural Affairs (Defra) NO_x to NO₂ Calculator. 26/06/2020. Available at https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v8.1.xlsm [Accessed on 19/01/2021].

- 3.2.20 Once processed, the predicted concentrations were compared against the relevant AQS objective levels for NO₂, PM₁₀ and PM_{2.5} set out in **Appendix C**.
- 3.2.21 The air quality modelling generates pollutant estimates of road source contributed NO_x, PM₁₀ and PM_{2.5} at specified receptors. To permit comparison with the relevant air quality objectives for NO₂, PM₁₀ and PM_{2.5} it has been necessary to combine the model outputs data with the background concentrations.
- 3.2.22 To consider compliance with the 1-hour mean air quality objective for NO₂, Defra's guidance suggests that in locations where the annual mean NO₂ concentration exceeds 60µg/m³ then the 1-hour mean objective may be exceeded. Where annual mean concentrations are less than 60µg/m³ then exceedance of the 1-hour mean objective is considered unlikely. The risk of non-compliance with the 1-hour mean objective, where up to 18 exceedances of a 1-hour mean concentration of 200µg/m³ are allowed in a calendar year, is therefore considered likely when the annual mean concentration is greater than 60µg/m³ but unlikely when not. This approach has been adopted for this assessment.
- 3.2.23 To estimate total annual mean concentrations for PM₁₀ and PM_{2.5}, for comparison with the annual mean air quality objectives (40 and 25µg/m³ respectively) the model output concentrations are simply added to the background concentrations for these pollutants.
- 3.2.24 To consider compliance with the 24-hour mean air quality objective for PM₁₀, Defra's guidance gives the following equation that relates the annual mean concentration to the number of exceedances of the 24-hour mean concentration of 50µg/m³, where up to 35 exceedances are allowed:
- ▲ No. 24-hour mean exceedances = $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$.
- 3.2.25 This approach has been adopted for 24-hour mean PM₁₀ for this assessment.

3.3 Selection of Sensitive Receptors

- 3.3.1 Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These will include locations sensitive to an increase in dust deposition and PM₁₀ exposure as a result of on-site construction activities, and locations sensitive to exposure to gaseous pollutants emitted from the exhausts of construction and operational traffic associated with the Proposed Development.

Construction Phase

- 3.3.2 The IAQM assessment is undertaken where there are: 'human receptors' within 350m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or 'ecological receptors' within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

Operational Phase

- 3.3.3 In terms of locations that are sensitive to pollutants emitted from engine exhausts, these will include places where members of the public are likely to be regularly present over the period of time prescribed in the AQS. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24-hour mean or annual mean) may be more appropriate. Box 1.1 of LAQM.TG16 provides examples of the locations where the air quality objectives should/should not apply.

Human Receptors

- 3.3.4 To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollution concentrations were predicted.
- 3.3.5 Receptors have been located adjacent to the roads that are likely to experience the greatest change in traffic flows or composition, and therefore NO₂ and particulate matter concentrations, as a result of the Proposed Development.
- 3.3.6 The locations of the assessment receptors are shown on **Figure 1** and listed in **Table 1**.

Table 1 - Receptor Locations Used in the Assessment

Receptor	Description / Address	Grid Reference		Height above Ground Level (m)
		X (m)	Y (m)	
R1	Manor Court	470954.7	106118.4	1.5
R2	76 Lower Road	469792.9	106152.7	1.5
R3	54 Bedhampton Hill Road	469565.1	106163.9	1.5
R4	48 Auriol Drive	469284.3	105973.2	1.5
R5	330 Highbury Grove	466641.5	104349.5	1.5

Ecological Receptors

- 3.3.7 Traffic emissions along the local road network have the potential to impact on sensitive ecological receptors within the vicinity of the Site. The study was completed using the MAGIC web-based interactive mapping service¹⁸, which draws together information on key environmental schemes and designations. A summary of the identified ecological receptors is provided in **Table 2**. It should be noted that a number of receptors have been identified on each designation to provide consideration of impacts throughout the relevant site. Reference should be made to **Figure 1** for a graphical representation of sensitive receptor locations.

Table 2 - Ecological Receptor Locations Used in the Assessment

Receptor	Description / Address	Grid Reference	
		X (m)	Y (m)
ER1	Langstone Harbour SSSI	470349.1	105370.3
ER2	Langstone Harbour SSSI	469930.7	105372.9
ER3	Langstone Harbour SSSI	469515.0	105442.0
ER4	Langstone Harbour SSSI	468974.8	105240.1
ER5	Langstone Harbour SSSI	468648.8	105047.9
ER6	Langstone Harbour SSSI	467991.7	104477.6
ER7	Langstone Harbour SSSI	467621.8	104323.2
ER8	Langstone Harbour SSSI	467468.0	104247.3

3.4 Significance criteria

Construction Phase

- 3.4.1 The IAQM assessment methodology recommends that significance criteria is only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.
- 3.4.2 For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Site on local concentrations of NO₂ and particulate matter, the significance of residual effects has been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance, which are described below.

Operational Phase

Human Receptors

- 3.4.3 The approach provided in the EPUK/IAQM guidance has been used within this assessment to assist in describing the air quality effects of additional emissions from traffic generated by the Proposed Development once operational.
- 3.4.4 This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table 3**.

Table 3 - Road Vehicle Exhaust Emissions - Significance of Impact

Long Term Average Concentration at Receptors in Assessment Year	% Change in Concentration Relative to air quality assessment Level (AQAL)			
	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
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

Notes

AQAL = air quality assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme,' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

- 3.4.5 The matrix shown in **Table 3** is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as negligible.
- 3.4.6 Following the prediction of impacts at discrete receptor locations, the EPUK/IAQM document provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:
- ▲ The existing and future air quality in the absence of the development;
 - ▲ The extent of current and future population exposure to the impacts; and
 - ▲ The influence and validity of any assumptions adopted when undertaking the prediction of impacts.
- 3.4.7 The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on hourly mean NO₂ concentrations or daily mean PM₁₀ concentrations. The significance of effects of hourly mean NO₂ and daily mean PM₁₀ concentrations arising from the operational phase have therefore been determined qualitatively using professional judgement and the principles described above.
- 3.4.8 The EPUK/IAQM guidance says that 'Where the air quality is such that an air quality objective at the building facade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.'
- 3.4.9 The EPUK/IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. It should be noted that this is a binary judgement of either it is significant or it is not significant.

Ecological Receptors

Critical Loads and Levels

3.4.10 A critical load is defined by the UK APIS as:

'A quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load.'

3.4.11 A critical level is defined as:

'Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedance of a critical level is defined as the atmospheric concentration of the pollutant above the critical level.'

3.4.12 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

3.4.13 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedance. A larger exceedance is often considered to represent a greater risk of damage.

3.4.14 Maps of critical loads and levels and their exceedances have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedance may infer that less damage will occur.

3.4.15 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been reviewed for the purpose of this assessment.

3.4.16 Site relevant critical loads and levels are presented in **Table 4**.

Table 4 - Critical Loads and Levels

Parameter		Langstone Harbour SSSI
Nitrogen Deposition Critical Load (CL) (kg N/ha/yr)		15 - 30 (Rich Fens)
Acidity CL (keq/ha/yr)	CLminN	0.438
	CLmaxN	4.558
	CLmaxS	4.160
NO_x Critical Level (µg/m³)	Annual mean	30
	24-hour mean	75

3.4.17 Guidance on national or European sites by the EA states that, regardless of the baseline environmental conditions, a process can be considered as insignificant if:

- ▲ the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
- ▲ the short-term (15-minute, 1-hour, 24-hour mean) process contribution is <10% of the short-term environmental standard.

3.4.18 It should be noted that these criteria determine when an impact can be screened out as being insignificant. They do not imply that impacts will necessarily be significant above one or both of these criteria, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology, such as this detailed dispersion modelling assessment.

3.4.19 The second stage in the EA's screening process for long-term contributions is to add the PC to the local background concentration to calculate the predicted environmental concentration (PEC). For short-term contributions the PC is compared against the short-term environmental standard minus twice the long-term background concentration. The emissions are considered to be insignificant if:

- ▲ the long-term PEC is less than 70% of the long-term environmental standard; and
- ▲ the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.

3.4.20 The EA guidance also states that, no further action is required if resulting PECs do not exceed environmental standards.

3.4.21 The 1% (long-term) and 10% (short-term) criteria are thus routinely used to screen out the potential for significant impacts on sensitive habitats from a range of sources. For the purposes of this assessment, wherever the detailed modelling shows that concentrations are below the critical level or critical load, it is considered that there will be no significant impacts. Additionally, where the operation of a site will increase concentrations by less than 1% (long-term) or 10% (short-term) of the relevant critical level or critical load, the potential for significant impacts can be discounted.

4.0 Baseline

4.1 Introduction

- 4.1.1 Existing air quality conditions in the vicinity of the Site were identified in order to provide a baseline for consideration. These are detailed in the following sections.

4.2 Local Air Quality Management

- 4.2.1 According to the latest Air Quality Annual Status Report from HBC¹⁵ and Defra, there are currently no AQMAs declared within Havant Borough.

4.3 Local Emission Sources

- 4.3.1 The Site is located in an area where air quality is mainly influenced by emissions from road transport using the local road network.

4.4 Air Quality Monitoring

- 4.4.1 Monitoring of pollutant concentrations is undertaken by HBC throughout their area of jurisdiction utilising passive methods. Recent diffusion tube monitoring results recorded in the vicinity of the development are shown in **Table 5**. The closest monitoring locations to the Site are diffusion tubes T3 and 7(B), however diffusion tubes W10, 22 and 28 were used for the model verification due to available traffic data. HBC no longer undertakes any automatic (continuous) monitoring.

Table 5 - Diffusion Tube Monitoring Results

Monitoring Site			Monitored NO ₂ Concentration (µg/m ³)*				
ID	Location	Type	2015	2016	2017	2018	2019
14	Elm Park Road	Suburban	18.6	20.8	20.6	20.3	18.1
W10	Compton Court	Roadside	26.4	30.1	27.8	29.1	27.2
23	Park Road South (Elm Lane)	Other	40.0	43.3	41.8	-	-
27	Havant Precinct	Urban Background	-	-	25.7	25.2	24.1
6(B)	Park Road South (West Street)	Roadside	31.5	33.8	31.9	-	-
5	South Street	Urban Centre	22.3	25.9	21.0	20.8	-
13	Grove Road	Suburban	18.8	19.8	19.2	-	-
22	Park Road South (Bulbeck Road)	Roadside	29.7	35.8	31.4	33.0	31.0
21	Park Road South (Solent Road)	Other	38.5	40.9	40.4	-	-
28	Park Road South (West Street)	Roadside	-	-	30.6	34.9	33.7
T3	Bedhampton Hill	Suburban	-	-	-	22.9	25.0
7(B)	Brockhampton Lane	Urban Centre	25.3	28.1	26.7	25.3	24.8

* Exceedances of the AQO are highlighted in **bold**.

- 4.4.2 As shown in **Table 5**, the annual mean NO₂ concentrations did not exceed the relevant AQO at any of the nearby monitoring sites during the most recent monitoring year, 2019, where data were available. However, exceedances were recorded at diffusion tubes 21 and 23 during the period of 2015 - 2017. Reference should be made to **Figure 1** for a map of the diffusion tube positions.

4.5 Background Pollutant Concentrations

- 4.5.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by Defra for the entire of the UK to assist Local Authorities in their Review and Assessment of air quality. The data for the assessment extents were downloaded from the Defra website²² for the purposes of the project. These data are summarised in **Table 6**.

Table 6 - Predicted Background Pollutant Concentrations (2019)

OS Grid Reference (X, Y; m)	NO ₂	NO _x	PM ₁₀	PM _{2.5}
470500, 106500	17.8	25.0	15.7	11.0
469500, 106500	20.4	29.2	16.0	11.0
466500, 104500	24.7	37.0	17.7	12.2
470500, 105500	20.6	30.1	14.7	10.1
469500, 105500	25.1	37.2	17.0	11.3
468500, 105500	21.0	30.3	16.4	11.4
467500, 104500	26.8	41.1	17.6	12.0

4.5.2 As shown in **Table 6**, predicted background NO₂, PM₁₀ and PM_{2.5} concentrations are below the relevant AQOs across the assessment extents.

Ecological Receptors

4.5.3 Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website¹⁹ was undertaken in order to identify the most suitable habitat description and associated critical load for the area of each designation considered within the model. This was undertaken using the 'site relevant critical load search function' and 'habitat/pollutant impacts' functions within APIS.

4.5.4 The habitat types within each designation are listed in accordance with the UK Biodiversity Action Plan (BAP) criteria, which are then split further by the European Nature Information System (EUNIS) habitat type. These were reviewed, along with the habitat maps available through MAGIC, to define the relevant classification at each of the receptor locations. It should be noted that separate habitat types are often listed for European and National designations, although the geographical areas covered are the same. When this was the case the most suitable classification for the area of interest was selected.

4.5.5 As all ecological receptors are located within the Langstone Harbour SSSI, which is considered to be the most sensitive to changes in pollutant concentrations, the critical loads and levels for this designation have been utilised for all specified locations.

4.5.6 Site relevant Critical Loads and Levels and background deposition rates are presented in **Table 7**.

Table 7 - Critical Loads and Levels and Background Deposition Rates

Parameter		Severn Estuary SSSI
Nitrogen Deposition (kg N/ha/yr)		14.1
Acid Deposition (keq/ha/yr)	Nitrogen	1.0
	Sulphur	0.2
NO _x Concentration (µg/m ³)	Maximum	45.7
	Minimum	16.9
	Average	22.9

5.0 Assessment

5.1 Introduction

- 5.1.1 There is the potential for air quality impacts as a result of the construction and operation of the Proposed Development. These are assessed in the following sections.

5.2 Construction Phase Assessment

Dust and PM₁₀ Arising from On-Site Activities

- 5.2.1 Construction activities that have the potential to generate and/or re-suspend dust and PM₁₀. Include:
- ▲ Site clearance and preparation including demolition activities;
 - ▲ Preparation of temporary access/egress to the Site and haulage routes;
 - ▲ Earthworks;
 - ▲ Materials handling, storage, stockpiling, spillage and disposal;
 - ▲ Movement of vehicles and construction traffic within the Site (including excavators and dumper trucks);
 - ▲ Use of crushing and screening equipment/plant;
 - ▲ Exhaust emissions from plant, especially when used at the extremes of their capacity and during mechanical breakdown;
 - ▲ Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
 - ▲ Internal and external finishing and refurbishment;
 - ▲ Trackout, whereby earth is carried from the Site on vehicle tyres, deposited on roads and may later become suspended in the air as a result of vehicle movements; and
 - ▲ Site landscaping after completion.
- 5.2.2 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

Assessment of Potential Dust Emission Magnitude

- 5.2.3 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM₁₀ sources: demolition, earthworks, construction, and trackout. The findings of the assessment are presented below.

Demolition

- 5.2.4 The Site was previously part of the historic Harts Farm Way Landfill site and is currently vacant. As such, the associated demolition activities are considered to be minimal. Therefore, potential dust emission magnitude for demolition activities is not considered further within this assessment.

Earthworks

- 5.2.5 The total area of the Site is greater than 10,000m². Although it is assumed that between 5-10 heavy earth moving vehicles will be active at any one time, the potential dust emission magnitude is considered to be **large** for earthwork activities, based on the size of the Site.

Construction

- 5.2.6 The total volume of buildings to be constructed on the Site is greater than 100,000m³. Therefore, the potential dust emission magnitude is considered to be **large** for construction activities.

Trackout

- 5.2.7 Information on the number of HDVs associated with this phase of the Proposed Development, has been assumed based on the size of the development area, there are likely to be a maximum of 10 - 50 HDV outward movements in any one day. Furthermore, as the unpaved road length on the Site is expected to be less than 100m, it is considered that the potential dust emission magnitude is **medium** for trackout.
- 5.2.8 **Table 8** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 8 - Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	N/A
Earthworks	Large
Construction Activities	Large
Trackout	Medium

Assessment of Sensitivity of the Study Area

- 5.2.9 A wind rose generated using the meteorological data used for the dispersion modelling of operational phase impacts is provided in **Appendix F**. This shows that the prevailing wind direction is predominantly from the south-west. Therefore, receptors located to the north-east of the Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.
- 5.2.10 Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. Receptors to the north-east of the Site are expected to be affected the most as a result of the prevailing wind direction. It has been assumed that the construction traffic will access the Site through existing access roads.
- 5.2.11 The Chichester and Langstone Harbours Special Protection Area (SPA) & Ramsar Site, Solent Maritime Special Area of Conservation (SAC), Langstone Harbour Site of Special Scientific Interest (SSSI), Solent & Isle of Wight Lagoons SAC, and Farlington Marshes Local Nature Reserve (LNR) are within close proximity to the A27 Havant Bypass, M3 junction and Harts Farm Way, routes that will be used by construction vehicles, and is likely to be considered sensitive to dust or PM, and as such these effects are considered within this assessment.
- 5.2.12 Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM₁₀ has been derived for each of the construction activities considered. The results are shown in **Table 9**.

Table 9 - Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium	Medium	Medium
Human Health	N/A	Low	Low	Low
Ecological	N/A	Medium	Medium	Low

Risk of Impacts

- 5.2.13 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 10** below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 10 - Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Medium	Medium	Low
Human Health	N/A	Low	Low	Low
Ecological	N/A	Medium	Medium	Low

Construction Vehicles and Plant

- 5.2.14 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the Site access road. Construction traffic will access the Site via the local road network. Due to the size of the Site, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.
- 5.2.15 Final details of the exact plant and equipment likely to be used on-site will be determined by the appointed contractor, it is considered likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the Site are likely to be variable over the construction period.
- 5.2.16 Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used, the impacts are therefore considered to be **negligible** according to the assessment significance criteria.

5.3 Operational Phase Assessment

Human Receptors

- 5.3.1 Vehicle movements on the local road network will generate exhaust emissions which have the potential to affect future users of the Site. An assessment was therefore undertaken using dispersion modelling in order to quantify pollutant concentrations at proposed sensitive locations in order to determine the suitability of the Site for the proposed end use.
- 5.3.2 The assessment considered the following three scenarios:
- ▲ 2019 - Model Verification;
 - ▲ 2023 - Assumed Opening Year Without Development; and
 - ▲ 2023 - Assumed Opening Year With Development.
- 5.3.3 The 2023 'With Development' scenario included anticipated baseline traffic data, inclusive of anticipated growth for the relevant assessment year, calculated using the UK Government's Trip End Model Presentation Program (TEMPro) version 7.2b.
- 5.3.4 For the purposes of the assessment, traffic data for 2023 was utilised as the development opening year. Air quality is predicted to improve in the future based on expected reduction in roadside levels as a result of technological advancements as stated in Section 3.2.13. However, in order to provide a robust assessment, emission factors and background concentrations for 2019 were utilised within the dispersion model. The use of 2023 traffic data and 2019 emission factors and background concentrations is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Road Vehicle Exhaust Emission Impacts

- 5.3.5 Full results of the dispersion modelling are presented in **Appendix G** and a summary is provided below.
- 5.3.6 It should be noted that all presented results have been verified in accordance with the methodology outlined within **Appendix E**.

Nitrogen Dioxide

Annual Mean

- 5.3.7 Annual mean NO₂ concentrations were predicted to be below the AQO of 40µg/m³ at all sensitive receptor locations in each of the modelled 2023 scenarios. The highest concentrations predicted at receptor R2 '76 Lower Road', with 38.1µg/m³ in both the 'Without Development' and 'With Development' scenarios, resulting in a **negligible** impact from the additional traffic associated with the operation of the Proposed Development.
- 5.3.8 The maximum predicted increase as a result of the Proposed Development is 0.1µg/m³, at receptor R1 'Manor Court', with an overall predicted concentration of 26.5µg/m³ in the 'With Development' scenario, resulting in a **negligible** impact on annual mean NO₂ concentrations.
- 5.3.9 Based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean NO₂ concentrations is considered to be **negligible** and no exceedances of the AQO have been predicted at any of the sensitive receptor locations.
- 5.3.10 Based on the extent of predicted population exposure to the impacts on annual mean NO₂ concentrations, and the guidance provided by the IAQM, the overall effect of the Proposed Development is considered to be **not significant**.

1-hour Mean

- 5.3.11 The annual mean NO₂ concentrations predicted by the model were all below 60µg/m³, and therefore hourly mean NO₂ concentrations are unlikely to cause a breach of the hourly mean AQS objective. The impact of the Proposed Development on hourly mean NO₂ concentrations at existing sensitive receptors is considered to be **negligible**, with the resulting effect considered to be **not significant**.

Particulate Matter (PM₁₀)

Annual Mean

- 5.3.12 Annual mean PM₁₀ concentrations were predicted to be below the AQO of 40µg/m³ at all receptor locations in the 2023 'With Development' scenario. The highest concentrations are predicted at receptor R5 '330 Highbury Grove', with 19.4µg/m³ in both the 'Without Development' and 'With Development' scenarios, resulting in a **negligible** impact from the additional traffic associated with the operation of the Proposed Development.
- 5.3.13 The maximum predicted increase as a result of the Proposed Development is <0.1µg/m³ at all receptor locations, resulting in a **negligible** impact on annual mean PM₁₀ concentrations.
- 5.3.14 The predicted changes in annual mean PM₁₀ concentrations are all less than 0.5% of the relevant AQS objective. Based on the EPUK/IAQM guidance, the impact of the increased emissions associated with the Proposed Development on annual mean PM₁₀ concentrations is considered to be **negligible**, and the resulting effect **not significant**.

24-hour Mean

- 5.3.15 There has been no predicted increase in the number of days exceeding the daily PM₁₀ limit in the 'With Development' scenario, without the risk of exceedance of the AQS objective. As such, the impacts of increased emissions associated with the operational phase of the Proposed Development are **negligible**, with the resulting effect considered to be **not significant**.

Particulate Matter (PM_{2.5})

- 5.3.16 Annual mean PM_{2.5} concentrations were predicted to be below the AQO of 25µg/m³ across the Site in the 2023 'With Development' scenario. The highest modelled concentrations are predicted at receptor R5 '330 Highbury Grove', with concentrations of 13.2µg/m³ in both the 'Without Development' and 'With Development' scenarios, resulting in a **negligible** impact on annual PM_{2.5} concentrations.

- 5.3.17 The maximum predicted increase as a result of the Proposed Development is $0.01\mu\text{g}/\text{m}^3$ at receptors R1 'Manor Grove', R2 '76 Lower Road', R3 '54 Bedhampton Hill Road', and R4 '48 Auriol Drive', with overall predicted concentrations of $11.9\mu\text{g}/\text{m}^3$, $13.0\mu\text{g}/\text{m}^3$, $12.3\mu\text{g}/\text{m}^3$, and $12.3\mu\text{g}/\text{m}^3$ respectively, resulting in a **negligible** impact on annual mean $\text{PM}_{2.5}$ concentrations.
- 5.3.18 All changes in $\text{PM}_{2.5}$ as a result of increased traffic associated with the Proposed Development are all less than 0.5% of the relevant AQS objective and therefore, based on the EPUK/IAQM guidance, the Proposed Development is considered to have a **negligible** impact on annual mean $\text{PM}_{2.5}$ concentrations, with the resulting effect considered to be **not significant**.

Ecological Receptors

- 5.3.19 Full results of the dispersion modelling are presented in **Appendix G** and a summary is provided below.
- 5.3.20 It should be noted that all presented results have been verified in accordance with the methodology outlined within **Appendix E**.

Nitrogen Oxides

- 5.3.21 Predicted annual and 24-hour mean NO_x concentrations are summarised in **Table G4** in **Appendix G**.
- 5.3.22 As presented in **Table G4**, the predicted annual mean NO_x PC for the Langstone Harbour SSSI is below the screening criteria of 1% for SSSIs, at all ecological receptors and as such, no further assessment is required. The resulting effects are therefore considered to be **not significant**.
- 5.3.23 The 24-hour mean NO_x PCs are also below the relevant assessment criteria of 10% of the short-term environmental standard, resulting in a not significant effect and therefore no further assessment is required.

Annual Mean Nitrogen Deposition

- 5.3.24 Predicted annual mean nitrogen deposition rates are summarised in **Table G5** in **Appendix G**.
- 5.3.25 As shown in **Table G5** the predicted maximum annual mean nutrient nitrogen deposition rates are below the screening criteria of 1% for SSSIs, at all ecological receptors and as such, no further assessment is required. The resulting effects are therefore considered to be **not significant**.

Annual Mean Acid Deposition

- 5.3.26 Predicted annual mean acid deposition rates at relevant receptor locations are summarised in **Table G6** in **Appendix G**.
- 5.3.27 As shown in **Table G6**, the predicted maximum annual mean nutrient nitrogen deposition rates are below the screening criteria of 1% for SSSIs, at all ecological receptors and as such, no further assessment is required. As such, it is considered, that the operation of the Proposed Development would result in a **not significant** effect on the integrity of the SSSI.

Summary

- 5.3.28 Based on the extent of predicted exposure to the impacts on pollutant concentrations and the guidance provided by the IAQM, the overall effect of the Proposed Development is considered to be **not significant**.
- 5.3.29 Based on the assessment results, the Site is considered suitable for the Proposed Development without the implementation of mitigation measures.

6.0 Mitigation and Residual Effects

6.1 Construction Phase

Mitigation

- 6.1.1 Based on the assessment results, mitigation will be required during the construction phase of the Proposed Development. Recommended mitigation measures are given below.

General Communication

- ▲ A stakeholder communications plan that includes community engagement before work commences on-site should be developed and implemented.
- ▲ The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the Site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

Site Management

- ▲ All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.
- ▲ The complaints log should be made available to the Local Authority on request.
- ▲ Any exceptional incidents that cause dust and/or air emissions, either on or off-site should be recorded, and then the action taken to resolve the situation recorded in the log book.

Monitoring

- ▲ Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made available to the Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the Site boundary, with cleaning to be provided if necessary.
- ▲ The frequency of Site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Site

- ▲ Plan the Site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- ▲ Where practicable, erect solid screens or barriers around dusty activities or the Site boundary that are at least as high as any stockpiles on-site.
- ▲ Where practicable, 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 appropriately.

Operating Vehicle/Machinery and Sustainable Travel

- ▲ A Construction Logistics Plan should be produced 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.
- ▲ Make sure an adequate water supply on the Site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- ▲ Use enclosed chutes and 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.
- ▲ Make sure equipment is readily available on-site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- ▲ Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- ▲ Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- ▲ Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Site and the surroundings.
- ▲ Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- ▲ During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

Measures Specific to Construction

- ▲ Make sure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case make sure that appropriate additional control measures are in place.
- ▲ For smaller supplies of fine powder materials make sure bags are sealed after use and stored appropriately to prevent dust.
- ▲ All construction plant and equipment should be maintained in good working order and not left running when not in use.

Measures Specific to Trackout

- ▲ Make sure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- ▲ Record all inspections of haul routes and any subsequent action in a site log book.

- 6.1.2 Detailed mitigation measures to control construction traffic should be discussed with the Local Authority to establish the most suitable access and haul routes for the Site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

Residual Effects

- 6.1.3 The residual effects of dust and PM₁₀ generated by construction activities following the application of the mitigation measures described above and good site practice is considered to be **not significant**.
- 6.1.4 The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **not significant**.

6.2 Operational Phase

Mitigation

- 6.2.1 The changes in pollutant concentrations attributable to traffic emissions associated with the operational phase of the Proposed Development (i.e. impacts on local air quality) are **negligible**. Furthermore, the Proposed Development will not expose future users to poor air quality, and therefore, in accordance with the assessment criteria, mitigation is not required.

Residual Effects

- 6.2.2 The residual effects of dust and PM₁₀ generated by construction activities following the application of the mitigation measures described above and good site practice is considered to be **not significant**.
- 6.2.3 The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **not significant**.

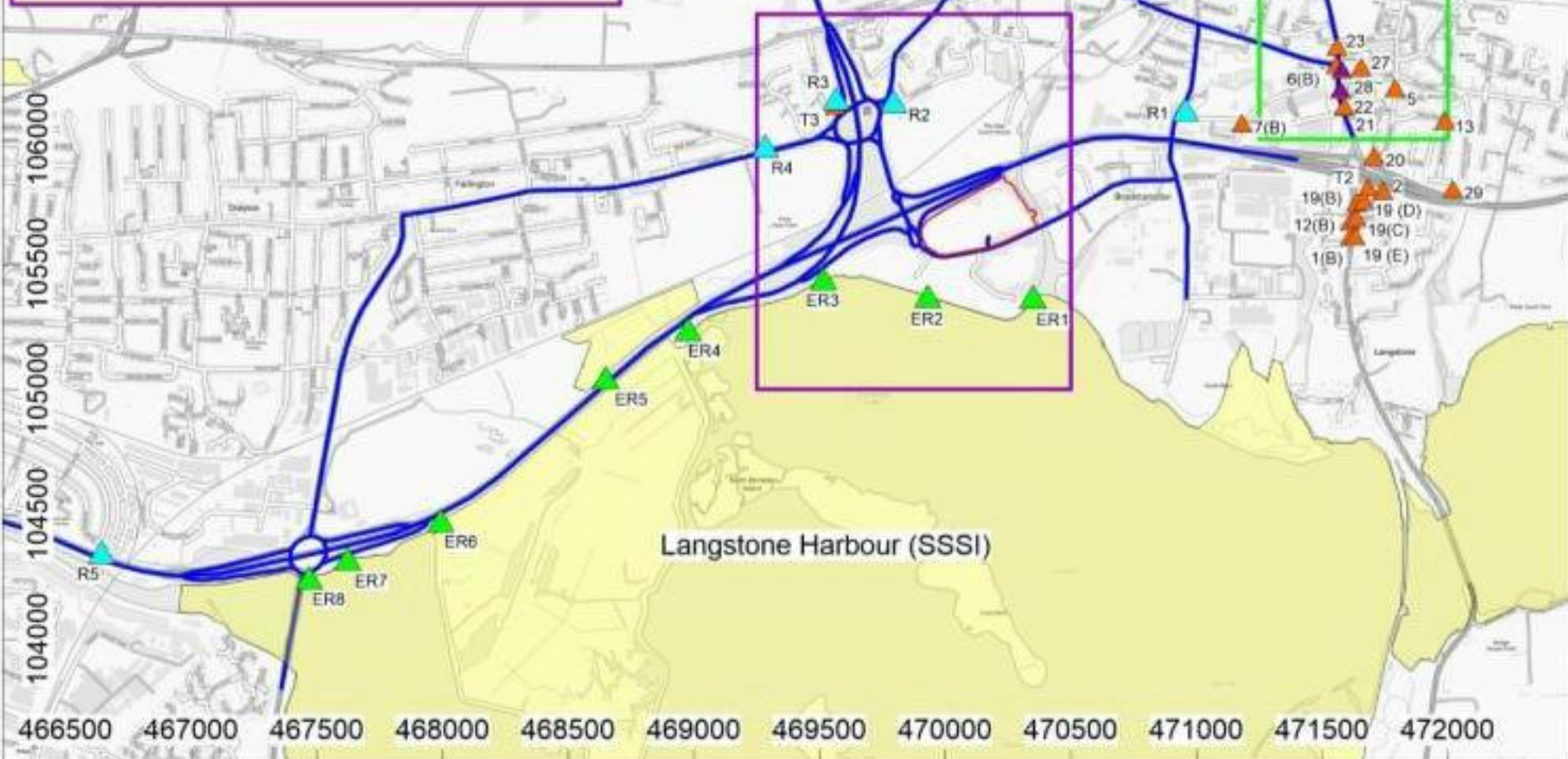
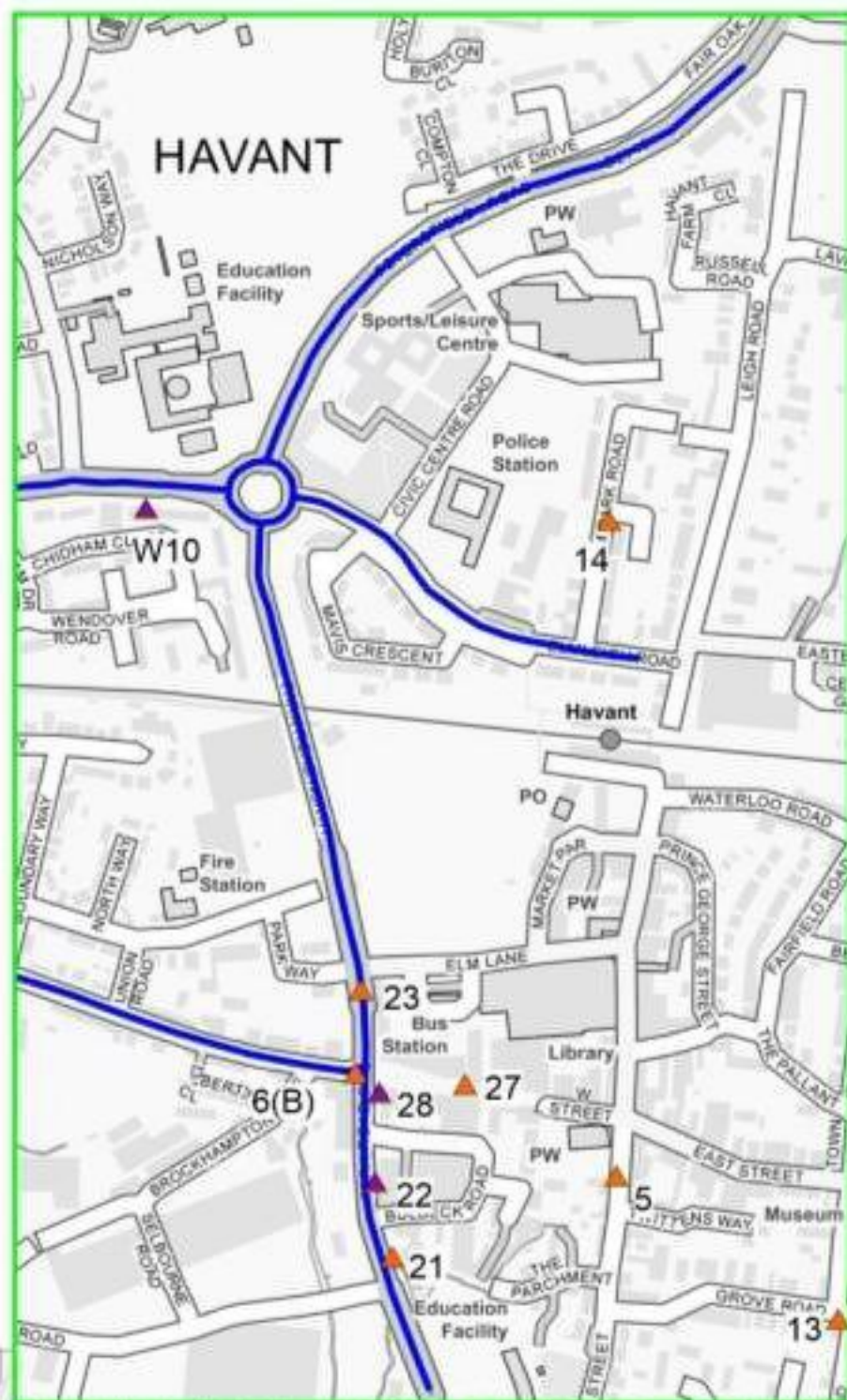
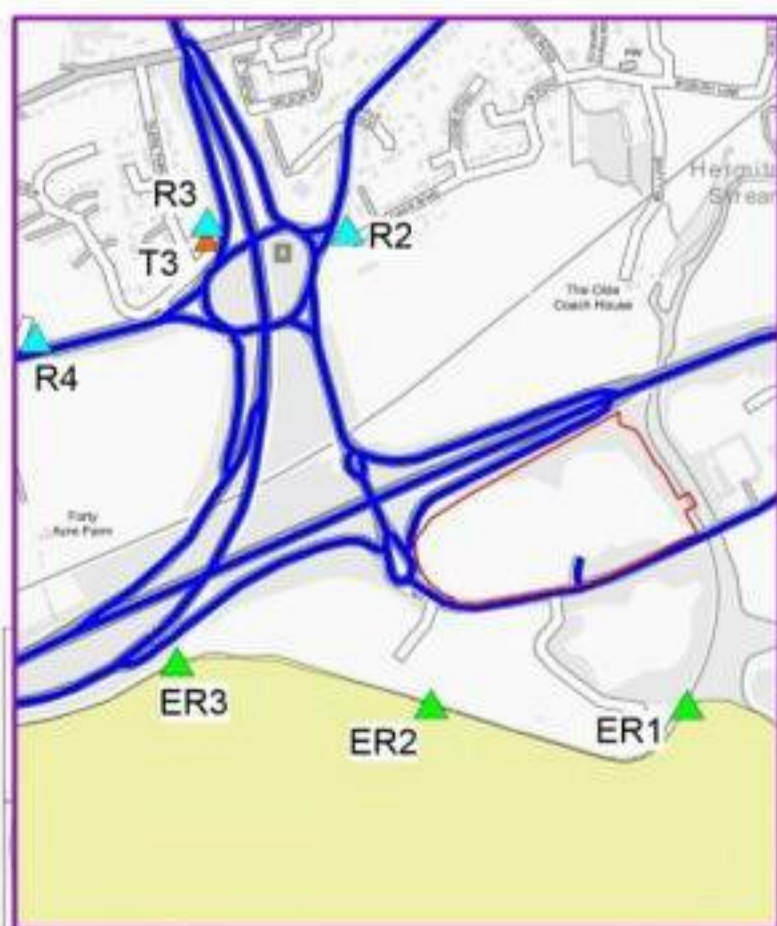
7.0 Summary and Conclusions

- 7.1.1 Delta-Simons Environmental Consultants Limited ('Delta-Simons'), was instructed to undertake an Air Quality Assessment in support of an outline application for the development of new employment units for flexible use across use classes E (light industrial), B2 and B8 with ancillary offices, car parking, service yards, drainage works, landscaping and associated works to prepare the site for development (the 'Proposed Development'), at the Former Landfill site, Brockhampton West, Harts Farm Way, Havant (the 'Site').
- 7.1.2 A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This identified that there is a **medium to low risk** of dust soiling impacts, a **low risk** of increases in particulate matter concentrations and a **medium to low risk** of ecological impacts due to unmitigated construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM₁₀ releases would be significantly reduced. The residual effects of dust and PM₁₀ generated by construction activities on air quality are therefore considered to be **not significant**. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **not significant**.
- 7.1.3 The Site lies within an area where air quality is mainly influenced by emissions associated with traffic along the local road network. Pollutants considered in this assessment were NO₂, PM₁₀ and PM_{2.5}.
- 7.1.4 The Proposed Development is expected to result in an overall **negligible** impact associated with the operational phase traffic on nearby receptors and based on the extent of population exposure to the predicted impacts the residual effects are considered to be **not significant**.
- 7.1.5 Additionally, pollutant concentrations within the assessment extents are predicted to be below the relevant AQOs without the risk of exceedance.
- 7.1.6 NO_x levels, and nitrogen and acid gas deposition rates were also predicted at the relevant ecological sites. Results indicated that emissions associated with additional traffic generated by the Proposed Development would not significantly affect existing conditions at ecological designation within the assessment extents.
- 7.1.7 Based on the assessment significance criteria, the residual effects of the Proposed Development are considered to be **not significant** for all pollutants assessed.
- 7.1.8 Furthermore, it is considered that the Proposed Development complies with national and local policy for air quality.
- 7.1.9 Based on the assessment results, air quality issues are not considered a constraint to planning consent.

Figures

LEGEND

- Site Boundary
- Modelled Road Link
- ▲ HBC Diffusion Tube Location
- ▲ Model Verification Location
- ▲ Modelled Existing Receptor
- ▲ Modelled Ecological Receptor
- SSSI Location



Appendices

Appendix A - Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B - Glossary

Glossary

Term	Definition
AADT Annual Average Daily Traffic	A daily total traffic flow (24hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modelled results to account for uncertainties in the model
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area.
AQO	Air Quality Objective.
AURN	Automatic Urban and Rural (air quality monitoring) Network, managed by contractors on behalf of Defra.
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
EFT	Emissions Factor Toolkit.
Emission rate	The quantity of a pollutant released from a source over a given period of time.
EPUK	Environmental Protection (UK).
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
HBC	Havant Borough Council
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO ₂	Nitrogen dioxide.
NO _x	Nitrogen oxides.
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Road link	A length of road which is considered to have the same flow of traffic along it. Usually, a link is the road from one junction to the next.
SPD	Supplementary Planning Document
µg/m ³ microgrammes per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m ³ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Term	Definition
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix C - Relevant UK Air Quality Strategy Objectives

Relevant UK Air Quality Strategy Objectives

National Air Quality Objectives and European Directive Limit Values for the Protection of Human Health						
Pollutant	Applies To	Objective	Measured As	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO ₂)	UK	40µg/m ³	annual mean	31.12.2005	40µg/m ³	01.01.2010
	UK	200µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005	200µg/m ³ not to be exceeded more than 18 times a year	01.01.2010
Particulate Matter (PM ₁₀) (gravimetric) ^A	UK (except Scotland)	40µg/m ³	annual mean	31.12.2005	40µg/m ³	01.01.2010
	UK (except Scotland)	50µg/m ³ not to be exceeded more than 35 times a year	24-hour mean	31.12.2004	50µg/m ³ not to be exceeded more than 35 times a year	01.01.2005
Particulate Matter (PM _{2.5})	UK (except Scotland)	25µg/m ³	annual mean	2020	Target value 25µg/m ³	2010

^A Measured using the European gravimetric transfer sampler or equivalent

µg/m³ = microgram per cubic metre

Appendix D - IAQM Construction Assessment Methodology

IAQM Construction Assessment Methodology

Step 1 - Screening the Need for a Detailed Assessment

An assessment will normally be required where there are:

- ▲ 'human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- ▲ 'ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is 'negligible'.

Step 2a - Define the Potential Dust Emission Magnitude

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table D1 - Examples of Potential Dust Emission Magnitude

Magnitude	Activity	Criteria
Large	Demolition	>50,000m ³ building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks	Total site area greater than 10,000m ² Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) More than 10 heavy earth moving vehicles active at any one time Formation of bunds greater than 8m in height More than 100,000 tonnes of material moved
	Construction	Total building volume greater than 100,000m ³ On-site concrete batching Sandblasting
	Trackout	More than 50 Heavy Duty Vehicle (HDV) trips per day Potentially dusty surface material (e.g. high clay content) Unpaved road length greater than 100m
Medium	Demolition	20,000 - 50,000m ³ building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks	Total site area 2,500m ² to 10,000m ² ; Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one times Formation of bunds 4m to 8m in height Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	Total building volume 25,000m ³ to 100,000m ³ Potentially dusty construction material (e.g. concrete) On-site concrete batching
	Trackout	10 to 50 HDV trips per day Moderately dusty surface material (e.g. high clay content) Unpaved road length 50m to 100m
Small	Demolition	<20,000m ³ building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months

Magnitude	Activity	Criteria
Small	Earthworks	Total site area less than 2,500m ² ; Soil type with large grain size (e.g. sand) Less than 5 heavy earth moving vehicles active at any one time Formation of bunds less than 4m in height Total material moved less than 20,000 tonnes Earthworks during wetter months
	Construction	Total building volume less than 25,000m ³ Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	Less than 10 HDV trips per day Surface material with low potential for dust release Unpaved road length less than 50m

Step 2b - Define the Sensitivity of the Area

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table D2- 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 D3 - Sensitivity of the Area to Human Health Impacts

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

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

Table D4 - Sensitivity of the Area to Ecological Impacts

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

Step 2c - Define the Risk of Impacts

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table D5 - Risk of Dust Impacts

Sensitivity of Surrounding 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 and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 - Site Specific Mitigation

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

Step 4 - Determine Significant Effects

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix E - Dispersion Model Details

Model Input Parameters

Traffic Flow Data

2019 is the most recent year for which monitoring data and meteorological data are available to enable verification of the model results, and so this year has been used as the baseline year for this assessment. 2023 is the assumed opening year of the Proposed Development.

Baseline traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion, were obtained from the Department for Transport (DfT)²⁴. The DfT web tool enables the user to view and download available traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 2000 to 2019. It should be noted that the DfT web tool is referenced in Defra's LAQM.TG16 guidance as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the Site.

Traffic data were converted to the anticipated operational year utilising factors obtained from TEMPro (version 7.2b). This software package has been developed by the DfT to calculate future traffic growth throughout the UK.

Table E1 - 2019 Verification Traffic Data

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
1	Elmleigh Road	5,890	5.90	40	0.027464	0.002679	0.001562
2	Elmleigh Road (roundabout approach)	5,890	5.90	30	0.031809	0.002728	0.001611
3	Park Road North	20,016	2.80	60	0.071615	0.008210	0.004720
4	Park Road North (roundabout approach)	20,016	2.80	30	0.094467	0.008488	0.004997
5	New Road	20,016	2.80	40	0.083246	0.008351	0.004860
6	New Road (roundabout approach)	20,016	2.80	30	0.094467	0.008488	0.004997
7	Petersfield Road (A)	20,016	2.80	60	0.071615	0.008210	0.004720
8	Petersfield Road (roundabout approach)	20,016	2.80	30	0.094467	0.008488	0.004997
9	Roundabout	5,004	2.80	20	0.028112	0.002176	0.001304
10	Harts Farm Way (roundabout approach)	17,538	2.00	30	0.079691	0.007260	0.004271
11	Harts Farm Way east	17,538	2.00	48	0.065722	0.007086	0.004098
12	Harts Farm Way west	17,538	2.00	48	0.065722	0.007086	0.004098
13	Harts Farm Way east (junction approach)	17,538	2.00	30	0.079691	0.007260	0.004271
14	Brockhampton Road (south junction)	4,407	1.72	40	0.017554	0.001781	0.001036
15	Brockhampton Road	4,407	1.72	40	0.017554	0.001781	0.001036
16	Brockhampton Road (north junction)	4,407	1.72	40	0.017554	0.001781	0.001036
17	A27 South Junction	26,141	2.00	48	0.097961	0.010563	0.006108

²⁴ Department for Transport. Road Traffic Statistics [Online] Available at: <https://roadtraffic.dft.gov.uk/manualcountpoints> [Accessed on 12/01/2021].

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
18	A27 Havant Bypass Westbound Off Ramp (elevated) (a) (junction approach)	11,046	4.10	20	0.066733	0.004998	0.003001
19	A27 Havant Bypass Westbound Off Ramp (elevated) (a)	11,046	4.10	20	0.066733	0.004998	0.003001
20	A27 Havant Bypass Westbound On Ramp (elevated) (a) (junction approach)	8,289	2.00	20	0.044406	0.003515	0.002103
21	A27 Havant Bypass Westbound On Ramp (elevated) (a)	8,289	2.00	20	0.044406	0.003515	0.002103
22	M3 Southbound A27 exit (elevated)	7,741	2.00	20	0.041470	0.003283	0.001964
23	A27 Havant Bypass Eastbound M3 exit	7,741	2.00	20	0.041470	0.003283	0.001964
24	A27 Havant Bypass Bedhampton Roundabout exit	7,741	2.00	20	0.041470	0.003283	0.001964
25	A27 Havant Bypass Bedhampton Roundabout exit (approach)	7,741	2.00	20	0.041470	0.003283	0.001964
26	A27 Havant Bypass Eastbound On Ramp (elevated) (a)	11,183	2.00	20	0.059910	0.004743	0.002837
27	A27 North Junction	36,848	2.00	48	0.138084	0.014889	0.008609
28	A27 bridge (elevated)	26,141	2.00	48	0.097961	0.010563	0.006108
29	A27 Havant Bypass towards Bedhampton Roundabout	36,848	2.00	48	0.138084	0.014889	0.008609
30	A27 Havant Bypass towards Bedhampton Roundabout (approach)	36,848	2.00	48	0.138084	0.014889	0.008609
31	M3 Northbound (elevated)	94,055	3.76	112	0.489499	0.041249	0.024403
32	A27 Havant Bypass (a)	82,908	3.68	112	0.431159	0.036285	0.021469
33	A2030 Havant Road	19,082	2.00	48	0.071508	0.007710	0.004458
34	A2030 Havant Road (roundabout approach)	19,082	2.00	48	0.071508	0.007710	0.004458
35	Bedhampton Roundabout (exit A2030)	7,741	2.00	20	0.041470	0.003283	0.001964
36	Bedhampton Roundabout (exit M3)	11,996	4.80	20	0.075208	0.005541	0.003331
37	M3 Northbound On Ramp	11,996	4.80	20	0.075208	0.005541	0.003331
38	Bedhampton Roundabout from M3 Off Ramp	15,585	2.00	20	0.083492	0.006609	0.003953
39	M3 Off Ramp (Roundabout)	15,585	2.00	20	0.083492	0.006609	0.003953
40	Bedhampton Hill	20,016	2.00	48	0.075008	0.008088	0.004677
41	Bedhampton Roundabout (exit Bedhampton Hill)	20,016	2.00	40	0.080643	0.008156	0.004745
42	Bedhampton Roundabout	27,198	2.25	20	0.147941	0.011627	0.006958

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
43	Bedhampton Road	20,016	2.00	40	0.080643	0.008156	0.004745
44	West Street (east junction)	3,305	1.72	40	0.013166	0.001336	0.000777
45	West Street	3,305	1.72	40	0.013166	0.001336	0.000777
46	West Street (west junction)	3,305	1.72	40	0.013166	0.001336	0.000777
47	Southmoor Lane	1,102	1.75	40	0.004394	0.000446	0.000259
48	Eastern Road North (junction)	20,975	1.97	48	0.078515	0.008467	0.004896
49	Eastern Road North	20,975	1.97	48	0.078515	0.008467	0.004896
50	Eastern Road North (roundabout)	20,975	1.97	48	0.078515	0.008467	0.004896
51	Eastern Road South (roundabout)	31,436	1.20	80	0.108326	0.012345	0.007112
52	Eastern Road South	31,436	1.20	80	0.108326	0.012345	0.007112
53	A27 Havant Bypass (elevated) (b)	151,303	4.39	112	0.792124	0.067434	0.039864
54	A27 Havant Bypass Roundabout (b)	27,253	4.06	30	0.136193	0.011991	0.007069
55	A27 Havant Bypass Eastbound Off Ramp (elevated)	10,194	8.10	30	0.059978	0.005004	0.002960
56	A27 Havant Bypass Westbound Off Ramp (elevated) (b)	16,963	4.80	30	0.087510	0.007621	0.004495
57	M3 Northbound	94,055	3.76	112	0.489499	0.041249	0.024403
58	A27 Havant Bypass (elevated) (c)	151,303	4.39	112	0.792124	0.067434	0.039864
59	M3 Southbound A27 exit	7,741	2.00	20	0.041470	0.003283	0.001964
60	A27 Havant Bypass Westbound On Ramp (a)	8,289	2.00	20	0.044406	0.003515	0.002103
61	A27 Havant Bypass Eastbound On Ramp (a)	11,183	2.00	20	0.059910	0.004743	0.002837
62	A27 Havant Bypass Westbound Off Ramp(a)	11,046	4.10	20	0.066733	0.004998	0.003001
63	A27 Havant Bypass Eastbound Off Ramp	10,194	8.10	30	0.059978	0.005004	0.002960
64	A27 Havant Bypass Westbound Off Ramp (b)	16,963	4.80	30	0.087510	0.007621	0.004495
65	A27 Havant Bypass Eastbound On Ramp (b)	10,194	8.10	30	0.059978	0.005004	0.002960
66	A27 Havant Bypass Eastbound On Ramp (elevated) (b)	10,194	8.10	30	0.059978	0.005004	0.002960
67	A27 Havant Bypass Westbound On Ramp (b)	16,963	4.80	30	0.087510	0.007621	0.004495
68	A27 Havant Bypass Westbound On Ramp (elevated) (b)	16,963	4.80	30	0.087510	0.007621	0.004495
69	Site Access	-	-	10	-	-	-

Table E2 - 2023 Without Development Traffic Data

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
1	Elmleigh Road	6,253	5.90	40	0.029156	0.002844	0.001658
2	Elmleigh Road (roundabout approach)	6,253	5.90	30	0.033769	0.002896	0.001710
3	Park Road North	21,249	2.80	60	0.076027	0.008715	0.005010
4	Park Road North (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
5	New Road	21,249	2.80	40	0.088374	0.008865	0.005160
6	New Road (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
7	Petersfield Road (A)	21,249	2.80	60	0.076027	0.008715	0.005010
8	Petersfield Road (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
9	Roundabout	5,312	2.80	20	0.029842	0.002310	0.001384
10	Harts Farm Way (roundabout approach)	18,619	2.00	30	0.084603	0.007707	0.004534
11	Harts Farm Way east	18,619	2.00	48	0.069773	0.007523	0.004350
12	Harts Farm Way west	18,619	2.00	48	0.069773	0.007523	0.004350
13	Harts Farm Way east (junction approach)	18,619	2.00	30	0.084603	0.007707	0.004534
14	Brockhampton Road (south junction)	4,678	1.72	40	0.018635	0.001890	0.001100
15	Brockhampton Road	4,678	1.72	40	0.018635	0.001890	0.001100
16	Brockhampton Road (north junction)	4,678	1.72	40	0.018635	0.001890	0.001100
17	A27 South Junction	27,752	2.00	48	0.103998	0.011214	0.006484
18	A27 Havant Bypass Westbound Off Ramp (elevated) (a) (junction approach)	11,726	4.10	20	0.070841	0.005305	0.003185
19	A27 Havant Bypass Westbound Off Ramp (elevated) (a)	11,726	4.10	20	0.070841	0.005305	0.003185
20	A27 Havant Bypass Westbound On Ramp (elevated) (a) (junction approach)	8,800	2.00	20	0.047143	0.003732	0.002232
21	A27 Havant Bypass Westbound On Ramp (elevated) (a)	8,800	2.00	20	0.047143	0.003732	0.002232
22	M3 Southbound A27 exit (elevated)	8,218	2.00	20	0.044026	0.003485	0.002085
23	A27 Havant Bypass Eastbound M3 exit	8,218	2.00	20	0.044026	0.003485	0.002085
24	A27 Havant Bypass Bedhampton Roundabout exit	8,218	2.00	20	0.044026	0.003485	0.002085
25	A27 Havant Bypass Bedhampton Roundabout exit (approach)	8,218	2.00	20	0.044026	0.003485	0.002085

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
26	A27 Havant Bypass Eastbound On Ramp (elevated) (a)	11,872	2.00	20	0.063601	0.005035	0.003012
27	A27 North Junction	39,119	2.00	48	0.146594	0.015807	0.009140
28	A27 bridge (elevated)	27,752	2.00	48	0.103998	0.011214	0.006484
29	A27 Havant Bypass towards Bedhampton Roundabout	39,119	2.00	48	0.146594	0.015807	0.009140
30	A27 Havant Bypass towards Bedhampton Roundabout (approach)	39,119	2.00	48	0.146594	0.015807	0.009140
31	M3 Northbound (elevated)	99,850	3.76	112	0.519658	0.043790	0.025907
32	A27 Havant Bypass (a)	88,016	3.68	112	0.457723	0.038521	0.022791
33	A2030 Havant Road	20,257	2.00	48	0.075911	0.008185	0.004733
34	A2030 Havant Road (roundabout approach)	20,257	2.00	48	0.075911	0.008185	0.004733
35	Bedhampton Roundabout (exit A2030)	8,218	2.00	20	0.044026	0.003485	0.002085
36	Bedhampton Roundabout (exit M3)	12,735	4.80	20	0.079842	0.005882	0.003536
37	M3 Northbound On Ramp	12,735	4.80	20	0.079842	0.005882	0.003536
38	Bedhampton Roundabout from M3 Off Ramp	16,545	2.00	20	0.088635	0.007016	0.004197
39	M3 Off Ramp (Roundabout)	16,545	2.00	20	0.088635	0.007016	0.004197
40	Bedhampton Hill	21,249	2.00	48	0.079628	0.008586	0.004965
41	Bedhampton Roundabout (exit Bedhampton Hill)	21,249	2.00	40	0.085611	0.008659	0.005037
42	Bedhampton Roundabout	28,873	2.25	20	0.157054	0.012343	0.007387
43	Bedhampton Road	21,249	2.00	40	0.085611	0.008659	0.005037
44	West Street (east junction)	3,509	1.72	40	0.013978	0.001418	0.000825
45	West Street	3,509	1.72	40	0.013978	0.001418	0.000825
46	West Street (west junction)	3,509	1.72	40	0.013978	0.001418	0.000825
47	Southmoor Lane	1,170	1.75	40	0.004666	0.000473	0.000275
48	Eastern Road North (junction)	22,267	1.97	48	0.083352	0.008989	0.005198
49	Eastern Road North	22,267	1.97	48	0.083352	0.008989	0.005198
50	Eastern Road North (roundabout)	22,267	1.97	48	0.083352	0.008989	0.005198
51	Eastern Road South (roundabout)	33,372	1.20	80	0.114997	0.013105	0.007551
52	Eastern Road South	33,372	1.20	80	0.114997	0.013105	0.007551
53	A27 Havant Bypass (elevated) (b)	160,625	4.39	112	0.840927	0.071589	0.042320
54	A27 Havant Bypass Roundabout (b)	28,932	4.06	30	0.144583	0.012730	0.007504
55	A27 Havant Bypass Eastbound Off Ramp (elevated)	10,822	8.10	30	0.063673	0.005312	0.003142
56	A27 Havant Bypass Westbound Off Ramp (elevated) (b)	18,008	4.80	30	0.092901	0.008090	0.004772

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
57	M3 Northbound	99,850	3.76	112	0.519658	0.043790	0.025907
58	A27 Havant Bypass (elevated) (c)	160,625	4.39	112	0.840928	0.071589	0.042320
59	M3 Southbound A27 exit	8,218	2.00	20	0.044026	0.003485	0.002085
60	A27 Havant Bypass Westbound On Ramp (a)	8,800	2.00	20	0.047143	0.003732	0.002232
61	A27 Havant Bypass Eastbound On Ramp (a)	11,872	2.00	20	0.063601	0.005035	0.003012
62	A27 Havant Bypass Westbound Off Ramp(a)	11,726	4.10	20	0.070841	0.005305	0.003185
63	A27 Havant Bypass Eastbound Off Ramp	10,822	8.10	30	0.063673	0.005312	0.003142
64	A27 Havant Bypass Westbound Off Ramp (b)	18,008	4.80	30	0.092901	0.00809	0.004772
65	A27 Havant Bypass Eastbound On Ramp (b)	10,822	8.10	30	0.063673	0.005312	0.003142
66	A27 Havant Bypass Eastbound On Ramp (elevated) (b)	10,822	8.10	30	0.063673	0.005312	0.003142
67	A27 Havant Bypass Westbound On Ramp (b)	18,008	4.80	30	0.092901	0.00809	0.004772
68	A27 Havant Bypass Westbound On Ramp (elevated) (b)	18,008	4.80	30	0.092901	0.00809	0.004772
69	Site Access	-	-	-	-	-	-

Table E3 - 2023 With Development Traffic Data

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
1	Elmleigh Road	6,253	5.90	40	0.029156	0.002844	0.001658
2	Elmleigh Road (roundabout approach)	6,253	5.90	30	0.033769	0.002896	0.001710
3	Park Road North	21,249	2.80	60	0.076027	0.008715	0.005010
4	Park Road North (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
5	New Road	21,249	2.80	40	0.088374	0.008865	0.005160
6	New Road (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
7	Petersfield Road (A)	21,249	2.80	60	0.076027	0.008715	0.005010
8	Petersfield Road (roundabout approach)	21,249	2.80	30	0.100287	0.009010	0.005305
9	Roundabout	5,312	2.80	20	0.029842	0.002310	0.001384
10	Harts Farm Way (roundabout approach)	19,445	2.28	30	0.089552	0.008118	0.004777
11	Harts Farm Way east	19,445	2.28	48	0.073592	0.007922	0.004581
12	Harts Farm Way west	18,863	2.09	48	0.070913	0.007642	0.004419

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
13	Harts Farm Way east (junction approach)	18,863	2.09	30	0.086084	0.007830	0.004607
14	Brockhampton Road (south junction)	4,922	2.06	40	0.019878	0.002009	0.001169
15	Brockhampton Road	4,922	2.06	40	0.019878	0.002009	0.001169
16	Brockhampton Road (north junction)	4,922	2.06	40	0.019878	0.002009	0.001169
17	A27 South Junction	28,366	2.14	48	0.106827	0.011509	0.006655
18	A27 Havant Bypass Westbound Off Ramp (elevated) (a) (junction approach)	11,726	4.10	20	0.070841	0.005305	0.003185
19	A27 Havant Bypass Westbound Off Ramp (elevated) (a)	11,726	4.10	20	0.070841	0.005305	0.003185
20	A27 Havant Bypass Westbound On Ramp (elevated) (a) (junction approach)	8,951	2.11	20	0.048273	0.003809	0.002279
21	A27 Havant Bypass Westbound On Ramp (elevated) (a)	8,951	2.11	20	0.048273	0.003809	0.002279
22	M3 Southbound A27 exit (elevated)	8,369	2.12	20	0.045162	0.003563	0.002132
23	A27 Havant Bypass Eastbound M3 exit	8,369	2.12	20	0.045162	0.003563	0.002132
24	A27 Havant Bypass Bedhampton Roundabout exit	8,369	2.12	20	0.045162	0.003563	0.002132
25	A27 Havant Bypass Bedhampton Roundabout exit (approach)	8,369	2.12	20	0.045162	0.003563	0.002132
26	A27 Havant Bypass Eastbound On Ramp (elevated) (a)	11,933	2.03	20	0.064044	0.005065	0.003030
27	A27 North Junction	39,672	2.09	48	0.149141	0.016073	0.009294
28	A27 bridge (elevated)	28,366	2.14	48	0.106827	0.011509	0.006655
29	A27 Havant Bypass towards Bedhampton Roundabout	39,672	2.09	48	0.149141	0.016073	0.009294
30	A27 Havant Bypass towards Bedhampton Roundabout (approach)	39,672	2.09	48	0.149141	0.016073	0.009294
31	M3 Northbound (elevated)	100,079	3.77	112	0.520899	0.043902	0.025972
32	A27 Havant Bypass (a)	88,138	3.69	112	0.458401	0.038584	0.022829
33	A2030 Havant Road	20,319	2.02	48	0.076197	0.008215	0.004750
34	A2030 Havant Road (roundabout approach)	20,319	2.02	48	0.076197	0.008215	0.004750
35	Bedhampton Roundabout (exit A2030)	8,369	2.12	20	0.045162	0.003563	0.002132
36	Bedhampton Roundabout (exit M3)	12,886	4.84	20	0.080956	0.005959	0.003582
37	M3 Northbound On Ramp	12,886	4.84	20	0.080956	0.005959	0.003582

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
38	Bedhampton Roundabout from M3 Off Ramp	16,659	2.05	20	0.089517	0.007076	0.004233
39	M3 Off Ramp (Roundabout)	16,659	2.05	20	0.089517	0.007076	0.004233
40	Bedhampton Hill	21,249	2.00	48	0.079628	0.008586	0.004965
41	Bedhampton Roundabout (exit Bedhampton Hill)	21,249	2.00	40	0.085611	0.008659	0.005037
42	Bedhampton Roundabout	29,024	2.29	20	0.158230	0.012422	0.007435
43	Bedhampton Road	21,249	2.00	40	0.085611	0.008659	0.005037
44	West Street (east junction)	3,753	2.17	40	0.015224	0.001537	0.000894
45	West Street	3,753	2.17	40	0.015224	0.001537	0.000894
46	West Street (west junction)	3,753	2.17	40	0.015224	0.001537	0.000894
47	Southmoor Lane	1,170	1.75	40	0.004666	0.000473	0.000275
48	Eastern Road North (junction)	22,280	1.97	48	0.083403	0.008995	0.005201
49	Eastern Road North	22,280	1.97	48	0.083403	0.008995	0.005201
50	Eastern Road North (roundabout)	22,280	1.97	48	0.083403	0.008995	0.005201
51	Eastern Road South (roundabout)	33,440	1.21	80	0.115265	0.013137	0.007569
52	Eastern Road South	33,440	1.21	80	0.115265	0.013137	0.007569
53	A27 Havant Bypass (elevated) (b)	160,927	4.40	112	0.842588	0.071742	0.042410
54	A27 Havant Bypass Roundabout (b)	29,013	4.05	30	0.144915	0.012761	0.007523
55	A27 Havant Bypass Eastbound Off Ramp (elevated)	10,903	8.04	30	0.064006	0.005344	0.003160
56	A27 Havant Bypass Westbound Off Ramp (elevated) (b)	18,089	4.78	30	0.093234	0.008122	0.004791
57	M3 Northbound	100,079	3.77	112	0.520899	0.043902	0.025972
58	A27 Havant Bypass (elevated) (c)	160,928	4.40	112	0.842593	0.071742	0.042410
59	M3 Southbound A27 exit	8,369	2.12	20	0.045162	0.003563	0.002132
60	A27 Havant Bypass Westbound On Ramp (a)	8,881	1.98	20	0.047525	0.003764	0.002251
61	A27 Havant Bypass Eastbound On Ramp (a)	11,953	1.99	20	0.063982	0.005067	0.003031
62	A27 Havant Bypass Westbound Off Ramp(a)	11,807	4.07	20	0.071223	0.005337	0.003204
63	A27 Havant Bypass Eastbound Off Ramp	10,903	8.04	30	0.064006	0.005344	0.003160
64	A27 Havant Bypass Westbound Off Ramp (b)	18,089	4.78	30	0.093234	0.008122	0.004791
65	A27 Havant Bypass Eastbound On Ramp (b)	10,903	8.04	30	0.064006	0.005344	0.003160
66	A27 Havant Bypass Eastbound On Ramp (elevated) (b)	10,903	8.04	30	0.064006	0.005344	0.003160

Road Link	Name	AADT (Total vehicles)	%HDV	Speed (km/h)	NO _x Emission Factor (g/km/s)	PM ₁₀ Emission Factor (g/km/s)	PM _{2.5} Emission Factor (g/km/s)
67	A27 Havant Bypass Westbound On Ramp (b)	18,089	4.78	30	0.093234	0.008122	0.004791
68	A27 Havant Bypass Westbound On Ramp (elevated) (b)	18,089	4.78	30	0.093234	0.008122	0.004791
69	Site Access	1,070	8.50	15	0.009361	0.000562	0.000345

Roughness Length

The roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5 was used to describe the modelling extents and 0.3m for the meteorological station site. These values of z_0 are considered appropriate for the morphology of these areas and are suggested within ADMS-Roads as being suitable for 'parkland, open suburbia' and 'agricultural areas (max)', respectively.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used to describe the modelling extents and 10m for the meteorological station site. These values are considered appropriate for the nature of both areas and are suggested within ADMS-Roads as being suitable for 'small towns <50,000'.

Model Verification

Introduction

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions. The following are examples of potential causes of such discrepancy:

- ▲ Estimates of background pollutant concentrations;
- ▲ Meteorological data uncertainties;
- ▲ Traffic data uncertainties;
- ▲ Model input parameters, such as 'roughness length'; and
- ▲ Overall limitations of the dispersion model.

Nitrogen Dioxide

The model has been run to predict the 2019 annual mean road-NO_x contribution at three diffusion tubes within the modelled road network with suitable monitoring data and adequately detailed traffic data at the verification location. The model outputs of road-NO_x have been compared with the 'measured' road-NO_x, which was determined from the NO₂ concentrations measured using the diffusion tubes at the monitoring locations, utilising the NO_x to NO₂ Calculator provided by Defra and the NO₂ background concentrations (from the Defra background map). As discussed in the methodology section, the most recent suitable monitoring data available for model verification purposes is 2019 data.

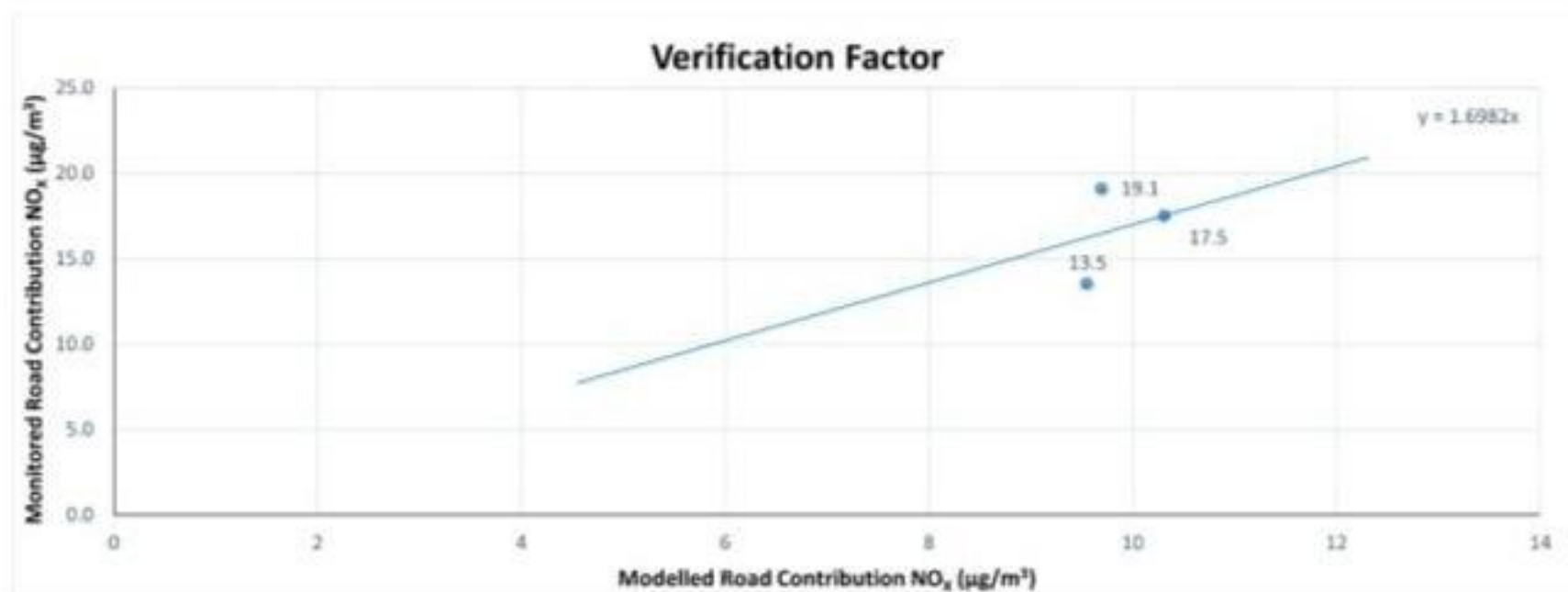
Table E4 - Model Verification (2019)

Site ID	2019 Monitored Total NO ₂ (µg/m ³)	2019 Background NO ₂ (µg/m ³)*	2019 Monitored Road Contribution NO _x (µg/m ³)	2019 Modelled Road Contribution NO _x (µg/m ³)	Ratio
W10	27.2	18.1	17.5	10.3	1.699
DT28	33.7	24.1	19.1	9.7	1.970
DT22	31.0	24.1	13.5	9.5	1.418

* In order to achieve a more representative model verification, monitored background NO₂ concentrations were obtained from DT27 for DT28 and DT22 and DT14 for W10 as these were the closest background sites.

The road-NO_x adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure E1**). This resulted in a factor of **1.70**, indicating that the model was over-predicting. In order to represent a robust assessment this factor was applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentration was then determined by inputting the adjusted modelled road-NO_x concentration and the background NO₂ concentration into the NO_x to NO₂ Calculator.

Figure E1 - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x



PM₁₀ and PM_{2.5}

There are no local PM₁₀ or PM_{2.5} monitoring data against which the model could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x contribution has been applied to the predicted road-PM₁₀ and road-PM_{2.5} contributions, consistent with guidance set out in LAQM.TG16.

Model Uncertainty

An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG16 identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. These include:

- Root mean square error (RMSE);
- Fractional bias (FB); and
- Correlation coefficient (CC).

These parameters estimate how the model results agree or diverge from the observations. These calculations can be carried out prior to, and after adjustment, or based on different options for adjustment, and can provide useful information on model improvement. Further details can be found in Box 7.17 of LAQM.TG16.

Table E5 - Methods for Describing Model Uncertainty

Statistical Parameter	Comments
RMSE	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO₂ objective of 40µg/m³, if an RMSE of 10µg/m³ or above is determined for a model it is advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4µg/m³ for the annual mean NO₂ objective.
Fractional Bias	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.

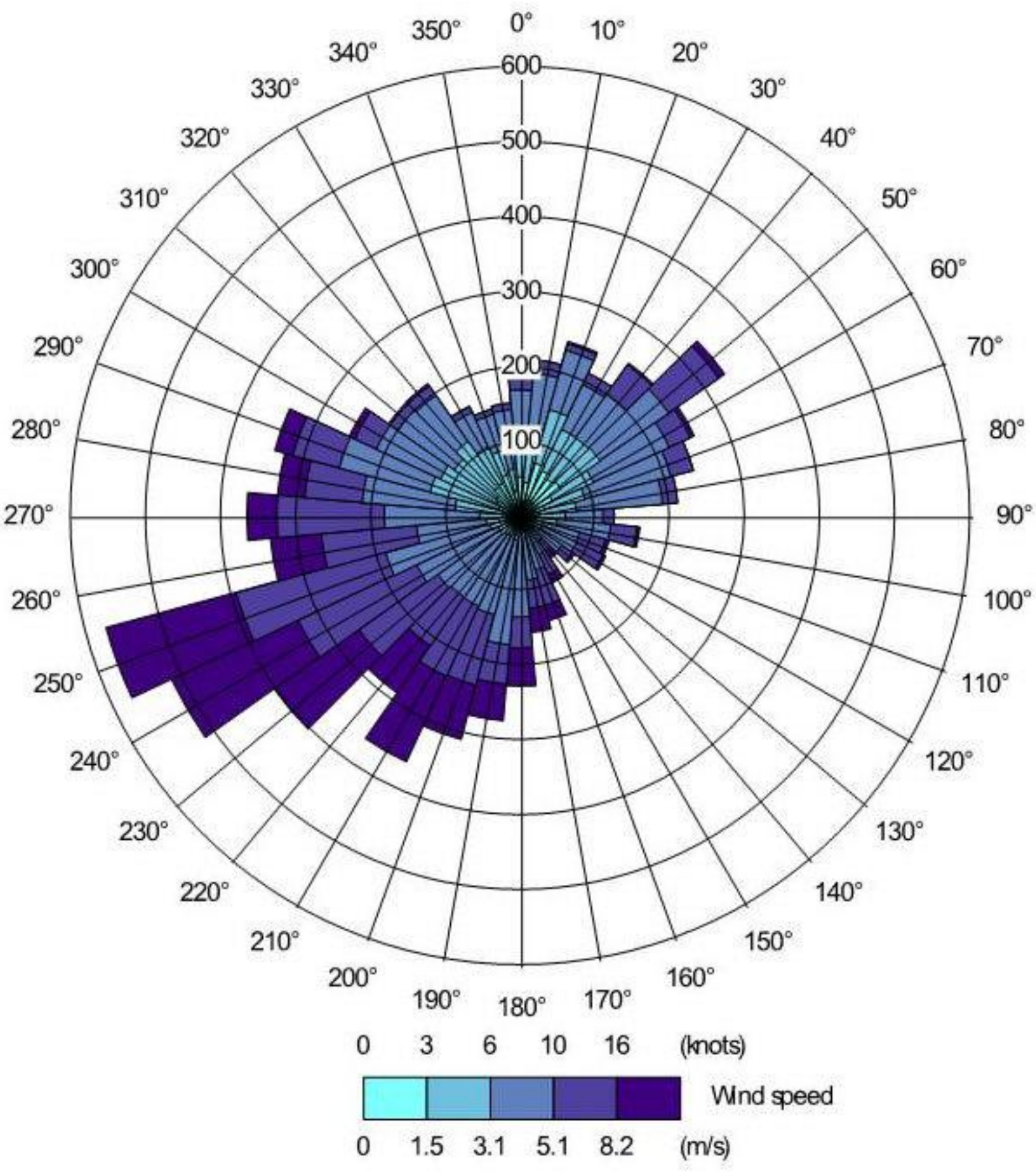
Statistical Parameter	Comments
Correlation Coefficient	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.

To assess the uncertainty of a model, the RMSE is the simplest parameter to calculate providing an estimate of the average error of the model in the same units as the modelled predictions. It is also often easier to interpret the RMSE than the other statistical parameters and therefore it has been calculated in this assessment to understand the model uncertainty.

The overall weighted RMSE value calculated after verification was below 10% and therefore the final predictions are considered to be acceptable.

Appendix F - Wind Rose for Thorney Island (2019)

Wind Rose for Thorney Island (2019)



Appendix G - Dispersion Modelling Results

Human Receptors

Table G1 - Annual Mean NO₂ Concentration

Receptor	Future Without Dev.(µg/m ³)	Future With Dev. (µg/m ³)	% of AQAL	Change (µg/m ³)	% of AQO	Impact
R1	26.4	26.5	66.3	0.1	<0.5	Negligible
R2	38.1	38.1	95.3	<0.1	<0.5	Negligible
R3	33.5	33.5	83.8	<0.1	<0.5	Negligible
R4	34.1	34.1	85.3	<0.1	<0.5	Negligible
R5	34.8	34.8	87.0	<0.1	<0.5	Negligible

* Results are rounded to 0.1µg/m³

Table G2 - Annual Mean PM₁₀ Concentration

Receptor	Future Without Dev.(µg/m ³)	Future With Dev. (µg/m ³)	% of AQAL	Change (µg/m ³)	% of AQO	Impact
R1	17.2	17.2	43.0	<0.1	<0.5	Negligible
R2	19.3	19.3	48.4	<0.1	<0.5	Negligible
R3	18.2	18.2	45.5	<0.1	<0.5	Negligible
R4	18.7	18.7	46.8	<0.1	<0.5	Negligible
R5	19.4	19.4	48.5	<0.1	<0.5	Negligible

* Results are rounded to 0.1µg/m³

Table G3 - Annual Mean PM_{2.5} Concentration

Receptor	Future Without Dev.(µg/m ³)	Future With Dev. (µg/m ³)	% of AQAL	Change (µg/m ³)	% of AQO	Impact
R1	11.9	11.9	47.5	<0.1	<0.5	Negligible
R2	13.0	13.0	51.9	<0.1	<0.5	Negligible
R3	12.3	12.3	49.2	<0.1	<0.5	Negligible
R4	12.3	12.3	49.2	<0.1	<0.5	Negligible
R5	13.2	13.2	52.9	<0.1	<0.5	Negligible

* Results are rounded to 0.1µg/m³

Ecological Receptors

Table G4 - Predicted NO_x Concentrations

Receptor	Designation	Predicted Annual Mean NO _x				Predicted 24hr Mean NO _x			
		Concentration (µg/m ³)		Proportion of EQS (%)		Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC	PC	PEC	PC	PEC
ER1	Langstone Harbour SSSI	0.11	45.8	0.37	152.7	0.76	92.14	1.02	122.86
ER2	Langstone Harbour SSSI	0.15	45.8	0.49	152.8	0.95	92.33	1.27	123.11
ER3	Langstone Harbour SSSI	0.17	45.9	0.57	152.9	0.77	92.15	1.02	122.86
ER4	Langstone Harbour SSSI	0.07	45.8	0.23	152.5	0.24	91.62	0.32	122.16
ER5	Langstone Harbour SSSI	0.02	45.7	0.08	152.4	0.14	91.52	0.18	122.02
ER6	Langstone Harbour SSSI	0.03	45.7	0.09	152.4	0.05	91.43	0.06	121.90
ER7	Langstone Harbour SSSI	0.10	45.8	0.34	152.6	0.38	91.76	0.51	122.35
ER8	Langstone Harbour SSSI	0.07	45.8	0.22	152.5	0.24	91.62	0.32	122.16

Table G5 - Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Designation	Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of the			
				Lower Critical Load		Higher Critical Load	
		PC	PEC	PC	PEC	PC	PEC
ER1	Langstone Harbour SSSI	0.016	14.1	0.1	94.1	0.1	47.1
ER2	Langstone Harbour SSSI	0.021	14.1	0.1	94.1	0.1	47.1
ER3	Langstone Harbour SSSI	0.025	14.1	0.2	94.2	0.1	47.1
ER4	Langstone Harbour SSSI	0.010	14.1	0.1	94.1	0.0	47.0
ER5	Langstone Harbour SSSI	0.003	14.1	0.0	94.0	0.0	47.0
ER6	Langstone Harbour SSSI	0.004	14.1	0.0	94.0	0.0	47.0
ER7	Langstone Harbour SSSI	0.015	14.1	0.1	94.1	0.0	47.0
ER8	Langstone Harbour SSSI	0.010	14.1	0.1	94.1	0.0	47.0

Table G6 - Predicted Annual Mean Acid Deposition Rates

Receptor	Designation	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr) CLMinN		Proportion of Critical Loads (%) CLMaxN	
		PC	PEC	PC	PEC
ER1	Langstone Harbour SSSI	0.3	228.6	0.0	22.0
ER2	Langstone Harbour SSSI	0.3	228.7	0.0	22.0
ER3	Langstone Harbour SSSI	0.4	228.7	0.0	22.0
ER4	Langstone Harbour SSSI	0.2	228.5	0.0	22.0
ER5	Langstone Harbour SSSI	0.1	228.4	0.0	21.9
ER6	Langstone Harbour SSSI	0.1	228.4	0.0	21.9
ER7	Langstone Harbour SSSI	0.2	228.5	0.0	22.0
ER8	Langstone Harbour SSSI	0.2	228.5	0.0	22.0