Report for:

Campbell Reith Hill LLP

Innovation Park Medway

Air Quality Assessment

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Author	Thomas Wescott Junior Air Quality Consultant
Reviewed and Approved By	Graham Parry Managing Director
Report For	Rachel Cossins Campbell Reith Hill LLP Raven House 29 Linkfield Lane Redhill Surrey RH1 1SS
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1 INTRODUCTION

ACCON UK Limited (ACCON) have been commissioned by Campbell Reith Hill LLP to carry out an air quality assessment for the Proposed Innovation Park Medway (IPM) on the site of the western part of Rochester Airport.

In addition to the proposed development there is a proposed redevelopment of the east side of Rochester Airport and a consented housing development east of the site, Horsted Park, that is currently in construction. The proposed IPM development is mostly located within the administrative boundary of Medway Council (MC) and is approximately three kilometres south of the Central Medway Air Quality Management Area (AQMA), which has been declared for exceedances of the NO_2 annual mean objective limit since June 2010. A small part of the northern and southern sections of the site is within the administrative boundary of Tonbridge and Malling Borough Council (TMBC).

This assessment has been completed in order to determine whether the proposed development achieves compliance against the National Air Quality Objectives (NAQOs), along with National and Local Planning Policy. This assessment has been undertaken in accordance with the Department for Environment, Food and Rural Affairs' (DEFRA) current Technical Guidance on Local Air Quality Management (LAQM.TG16.)[1] and covers the effects of local air quality on the development.

The report assesses the overall pollutant concentrations of nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) at sensitive residential and ecological receptors nearby to the proposed development. A glossary of terms is detailed in **Appendix 1** and the location of the site is shown in **Section 3.1**. Plans identifying the nearby sensitive receptor locations (human and ecological), modelled to assess impacts of additional traffic emissions associated with the operation of the development, can be found in **Appendix 4.** It is estimated that the proposed development will be completed and occupied by 2020 at the earliest. This is a worst-case scenario as the trend is for air pollutant concentrations to reduce over time.

The potential air quality impacts of the development have been assessed on the basis of the findings of detailed dispersion modelling using Breeze Roads GIS Pro Version 5.1.8, which has been undertaken in the context of relevant NAQOs, emission limit values and relevant guidance.

[1] DEFRA, Local Air Quality Management Technical Guidance 2016.

Email: enquiry@accon-uk.com ● www.accon-uk.com ● 0118 971 0000
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

2 AIR POLLUTION POLICY CONTEXT

2.1 Introduction

In the UK at the present time, emissions from road transport account for a substantial proportion of national air pollutant emissions. Road transport currently contributes almost 22% of national carbon dioxide emissions[2]. Whilst the UK is set to meet its international commitments on carbon dioxide emission reductions, the transport sector carbon dioxide emissions are continuing to grow.

The number of licensed vehicles in Great Britain in 2016 was 37.1 million, an increase of 41% from 1994[3], with 83.1% of these being cars. Between 1994 and 2014, there was a substantial increase in the amount of diesel cars on the road from 7.4% to 36.2%. Of the 2,274,550 new car registrations in 2015, 51.3% of the vehicles were diesel, 45.7% were petrol with 3% used alternative fuels[4].

It is evident that continued growth in private car ownership and usage will continue to result in a further deterioration of air quality in urban areas and increasing emissions of greenhouse gases. Whilst current technological improvements extended the reduction in emissions to approximately 2010, additional measures are now required in order to prevent re-growth of emissions, both to meet ambient air quality targets in urban areas and to offer an alternative to the car for urban journeys. Consequently, where new development can be located in relatively close proximity to public transport and local services, a contribution to the UK's target of reducing emissions will have been made.

2.2 Legislation

In 1997, the United Kingdom National Air Quality Strategy (NAQS)[5] was published and this document, set out an analysis of the magnitude and potential health and environmental problems associated with air pollutant emissions, particularly those emanating from road traffic.

The strategy proposed a schedule of air quality objectives, which were to be met for various pollutants in the years up to 2005. In setting these objectives, due account was taken of health and socio-economic cost-benefit factors, together with consideration of the practical and pragmatic aspects of whether targets would be achievable. Whilst it was identified in the Strategy that the objectives for benzene, butadiene, lead and carbon monoxide could be achieved as a result of improvement measures already put in place, complying with targets for NO_2 and PM_{10} would be more difficult. In considering what additional measures would have to be introduced to counter these apparent shortfalls, the Government voiced the following thought: "*changes in planning and transport policies (are needed) which would reduce the need to travel and reliance on the car*". With regard to the necessity for encouraging a shift away from private car usage, the Strategy commented, in terms of the new package approach to transport funding, "*As a general rule, traffic demand* management *and restraint measures should be included and this, together with proposals to promote and enhance other modes of transport, should aim to achieve modal shifts away from the private car*".

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[2] Environmental Protection UK. (2010 Update, Published 2017). Car Pollution. Available from www.environmental-protection.org.uk
[3] Department for Transport. (2016). Provisional Road Traffic Estimates, Great Britain: October 2015 - September 2016 Summary
[4] Society of Motor Manufacturers and Traders (2016). Car Registrations October 2016 Overview. Available from www.smmt.co.uk
[5] DEFRA. The National Air Quality Strategy 1997 (1997).

The White Paper on Integrated Transport (July 1998) proposed a range of measures at both national and local level to address issues of congestion and environmental effects. During the consultation process in 1997, the environmental issue most frequently cited by responses was air quality and it is therefore clear that this problem is uppermost in the mind of the public. The implementation of measures to relieve congestion in urban areas, by means of improvements in provision of public transport and encouragement of a modal shift, will also benefit urban air quality.

A review of the UK Air Quality Strategy was undertaken in 1998 and a consultation document was published in January 1999, outlining proposals for amending the Strategy. In August 1999, in response to the consultation, the Government then published an Air Quality Strategy for England, Scotland, Wales and Northern Ireland. The Air Quality Regulations (England) 2000 enacted in April 2000, and the Air Quality (England) (Amendment) Regulations 2002 gave legal force to the air quality standards set out in the Strategy. A new strategy was released in July 2007 with various amendments to the air quality objectives. The proposals, in brief, consisted of recommendations to adopt the provisions of the EU Air Quality Daughter Directives.

Schedule 2 of the Air Quality Standards Regulations 2010[6] implements a limit value for $PM_{2.5}$ to be achieved by 2015, although they are yet to come into force and only apply to England. The Air Quality Standards (AQS) included in the Air Quality Standards Regulations 2010 are set out in **Appendix 2**.

The 'standards' are set as concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a particular pollutant.

The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within The Air Quality (England) Regulations 2000 (Stationery Office, 2000) and The Air Quality (England) (Amendment) Regulations 2002 (Stationery Office, 2002) (termed the 'Regulations'). Air Quality Objectives included in the Regulations and current legislation (CAFE Directive) which are relevant to the current study (NO_2 and PM_{10}) are outlined in **Appendix 2**.

The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties[7], schools, hospitals and care homes. The 24-hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1-hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1-hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded unless the annual mean NO_2 concentration is greater than 60µg/m^3 [8]. Thus exceedances of

[6] HMSO, (2010). The Air Quality Standards Regulations 2010. Statutory Instrument 1001.
[7] Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

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Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

60µg/m^3 as an annual mean NO_2 concentration are used as an indicator of potential exceedances of the 1-hour mean NO_2 objective.

Similarly, studies have also established a relationship between the annual mean PM_{10} concentration and number of exceedances of the 24-hour mean objective: those areas where the annual mean concentrations are greater than 32µg/m^3 were demonstrated to be at risk of exceeding the 24-hour mean objective. Thus exceedances of 32µg/m^3 as an annual mean PM_{10} concentration are used as an indicator of potential exceedances of the 24-hour mean PM_{10} objective.

2.3 Planning Policy

2.3.1 National Planning Policy Framework

The National Planning Policy Framework[9] was published in July 2018 and *"sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced"*. Air quality policy is discussed in 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"*

2.3.2 National Planning Practice Guidance

Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads.

[8] DEFRA, 2007. Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, 2003. Laxen and Mariner.
[9] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2018

- Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.
- Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- The design and layout of development to increase separation distances from sources of air pollution;
- Using green infrastructure, in particular trees, to absorb dust and other pollutants;
- Means of ventilation;
- Promoting infrastructure to promote modes of transport with low impact on air quality;
- Controlling dust and emissions from construction, operation and demolition; and
- Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.

2.3.3 Medway Local Plan

The Medway Local Plan[10], which was adopted in May 2003 and has six core values that guide its policies:

- *"Giving value for money."*
- *"Promoting economic, physical and social regeneration."*
- *"Fostering citizenship."*
- *"Improving the environment."*
- *"Working for equal opportunity and access."*
- *"Realising everyone's potential."*

The plans policy on air quality (BNE24) states,

> *"Development likely to result in airborne emissions should provide a full and detailed assessment of the likely impact of these emissions. Development will not be permitted when it is considered that unacceptable effects will be imposed on the health, amenity or natural environment of the surrounding area, taking into account the cumulative effects of other proposed or existing sources of air pollution in the vicinity."*

Medway also has a Draft Local Plan[11] from January 2017 which will cover development in the area until 2035. The plan contains a policy on Air Quality (from paragraph 7.22 onwards) and the council's approach to the policy is as follows:

[10] Medway Council, Medway Local Plan, May 2003
[11] Medway Council, Medway Council Local Plan 2012 – 2035 (draft), Consultation Report from January 2017

"The council seeks to reduce exposure to areas of poor air quality, maintain areas of good air quality, and where possible improve air quality through restricting development or requiring acceptable and effective mitigation measures.

All proposals should take account of the Medway Council Air Quality Planning Guidance that sets out a screening checklist for major size development and proposed development within, or close to an AQMA. Depending on the scale of development, the Local Planning Authority may require the submission of an Air Quality Assessment and/or an Emissions Mitigation Assessment. The guidance also advocates mitigation measures for all development. Where mitigation is not integrated into a scheme, the Local Planning Authority will require this through a planning condition(s). If on site mitigation is not possible, then the Local Planning Authority may seek contribution to wider air quality mitigation measures through a planning obligation."

Email: enquiry@accon-uk.com ● www.accon-uk.com ● 0118 971 0000
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

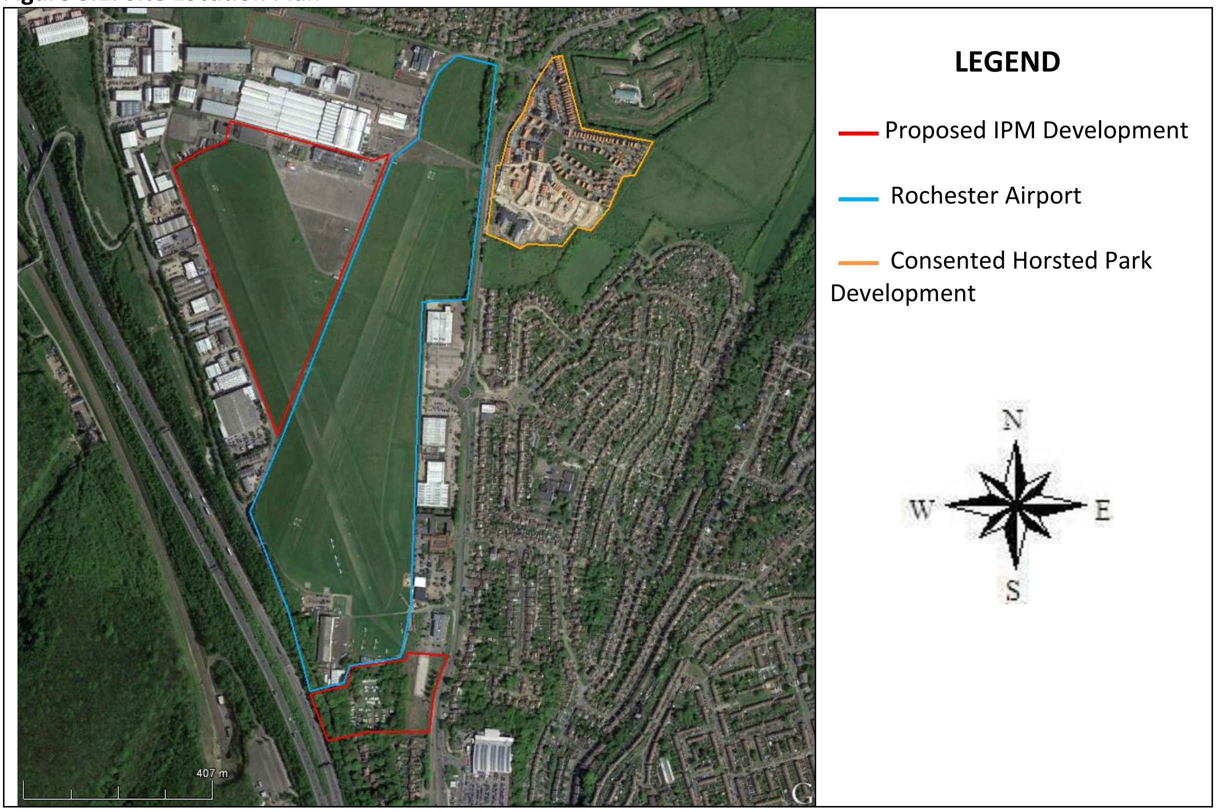
3 SITE DESCRIPTION AND BASELINE CONDITIONS

3.1 Site Description

The existing site is currently occupied by Rochester Airport, including two runways. A proposed science park known as The Innovation Park Medway is planned on the western side of the airport. The Innovation Park Medway Masterplan allows for the erection of up to 101,000 square metres of Business (Use Class B1) and General Industrial (Use Class B2) floor space with associated means of access, distributor and service roads, multi-storey parking facilities, footpaths and cycle ways, sustainable drainage systems and landscaping. The eastern side of the Airport and its eastern runway are proposed to be redeveloped as part of a separate planning application. To the east of the site there is a consented housing development under construction (Horsted Park). To the west of the site boundary is the B2097, to the east is the A229, to the north-east is the A230 and to the south and south west is the M2. There are residential properties at a number of location near to the proposed development including: north west of it on the B2097, north east of it on the A229 and A230 and south of it on the A229. There is also a site of special scientific interest to the south of the site, Detling to Wouldham Escarpment, close to the A229. There are no designated European Ecologically Important Sites[12] (SAC/cSAC/SPA/cSPA) within 200 metres of the development so air quality impacts of traffic generation on these sites have been screened out of the assessment.

The location and red line boundaries of the sites are detailed below in **Figure 3.1**.

Figure 3.1: Site Location Plan



[12] Natural England, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations, June 2018

3.2 Air Quality Review and Assessment

As previously indicated, Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the limit values. Where these objectives are unlikely to be achieved, local authorities must designate these areas as AQMA's and prepare a written action plan to achieve the AQS's.

The review of air quality takes on several prescribed stages, of which each stage is reported. MC's Air Quality Annual Status Report 2017[13] provides the most recent air quality monitoring results for the District (2016). Details of the monitoring data used for model verification purposes is provided in **Section 3.3.**

3.3 Local Air Quality Monitoring

MC has a large network of air quality monitoring sites. Three of the closest diffusion tubes, within five kilometres of the site, were chosen for verification of the air quality modelling. NA1S30 located on Corporation Street, Rochester, NA1S18 located on Chatham High Street and NA1S3 located on Commercial Road, Rochester.

The 2016 annual mean NO_2 concentrations for the monitoring sites are shown in **Table 3.1** below. The annual mean NO_2 NAQO is exceeded at diffusion tube NA1S3.

Table 3.1: Local Monitoring Data Suitable for Model Verification (2016)

Location	Distance to nearest Kerb (m)	Grid Reference		2016 Annual Mean NO_2 (µg/m^3)	2016 Data Capture (%)
		X	Y		
NA1S30	2.5	578007	169262	30.8	100
NA1S18	2.5	574758	167892	35.9	100
NA1S3	2.5	573793	169164	51.7	100

3.4 Identification of Relevant Receptors

Existing sensitive receptors have been identified close to major roads near to the proposed development. These include receptors at the facades of existing properties (ERs), receptors at the facades of properties under construction at Horsted Park (ERs) and receptors at a nearby sensitive ecological habitat, Wouldham to Detling Escarpment[14] (ECRs). These receptors have been modelled to determine if there is likely to be any cumulative air quality impacts from the developments on them. The existing residential receptors were modelled at ground floor elevations (1.5 metres height) as these were the lowest floors with sensitive receptors. The ecological receptors were modelled at ground level elevations (0 metres height) to simulate NOx deposition on the ground.

Appendix 4 identifies the ER and ECR locations respectively.

3.5 Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the 2015 pollutant concentration maps which were updated by DEFRA in November 2017. These updated maps are

[13] Medway Council, Air Quality Annual Status Report 2017
[14] Sensitive ecological habitat information link: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001339.pdf

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based on monitoring and meteorological data for 2015. **Table 3.2** identifies the background pollutant concentrations at the diffusion tubes and the proposed development site. The estimated background concentrations for annual mean NO_2 and PM_{10} used in the assessment are significantly below the annual mean objective limit of 40µg/m^3 in 2016 and 2020.

Table 3.2: Background Concentrations of Pollutants

Location and Year	NO_x µg/m^3	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
NA1S30 Diffusion Tubes (2016) (574,500, 168,500)	25.0	17.7	16.1	11.3
NA1S18 Diffusion Tubes (2016) (574,500, 167,500)	23.7	16.9	18.0	13.0
NA1S3 Diffusion Tubes (2016) (573,500, 169,500)	24.9	17.7	16.0	11.1
NW of Site Receptors (2020)	19.4	14.1	14.8	10.1
NE of Site Receptors (2020)	19.5	14.2	14.5	9.8
S of Site Receptors (2020)	24.4	17.5	16.1	10.7

Note: The ratio between PM_{10} and $PM_{2.5}$ on site in 2020 is 0.68 (NW of site), 0.68 (NE of site) and 0.66 (S of Site).

4 METHODOLOGY AND ASSESSMENT CRITERIA

4.1 Methodology

In the UK, DEFRA provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). DEFRA regularly updates its Technical Guidance, with the latest LAQM Technical Guidance (TG16) published in April 2016. The methodology in LAQM.TG16. directs air quality professionals to a number of tools published by DEFRA to predict and manage air quality. For example, it is necessary to use the updated NO_x to NO_2 calculator to derive NO_2 concentrations from the NO_x outputs from Breeze Roads modelling. This is because NO_2 concentrations within the model are predicted using the CALINE4 NO_x to NO_2 conversion methodology, which should not be used within the model as current evidence shows that the proportion of primary NO_2 in vehicle exhausts has increased since the model was developed, which would affect the relationship between NO_x and NO_2 at roadside locations.

In order to determine the extent to which air quality issues will affect the development of the site, the study has considered the following:

- Any air quality measurements carried out in the area near the proposed development; and
- The most recent Air Quality Review and Assessment Reports from Medway Council.

4.2 Breeze Roads Modelling of Pollutant Concentrations

Dispersion modelling has been undertaken using Breeze Roads to determine air quality concentrations across the site. Breeze Roads is an air dispersion modelling software suite that predicts air quality impacts of carbon monoxide (CO), nitrogen dioxide, particulate matter (PM), and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roadways and roadway intersections.

Breeze Roads can be used in conjunction with the MOBILE5, EMFAC emission models or other emissions data, to demonstrate compliance with the UK's National Air Quality Strategy. Breeze Roads predicts air pollutant concentrations near highways and arterial streets due to emissions from motor vehicles operating under free-flow conditions and idling vehicles. In addition, 1-hour and running 8-hour averages of CO or 24-hour and annual block averages of PM_{10} can be calculated.

4.3 Model Set-up Parameters

The most recent Emissions Factor Toolkit (EFT, version 8.0.1, December 2017) issued by DEFRA was used to derive emissions factors (in grams per kilometre) for vehicle movements along roads incorporated into the model. This version of the EFT includes updates to COPERT NOx and PM_{10} emissions factors for road traffic which are taken from the European Environment Agency EEA COPERT 5 emissions calculation tool, including new EURO 6 subcategories.

There have also been updates to the vehicle fleet and age information. Version 8.0.1 of the EFT was produced by DEFRA in response to changes in 'real world' vehicle emissions. As such, it has been assumed that the EFT produces reliable emission factors which are suitable for dispersion modelling as it is the most up-to-date tool provided by DEFRA. 2016 Meteorological data from Gravesend has been used in the modelling.

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4.4 Local Air Quality Management Technical Guidance (2016) Recommendations

The Local Air Quality Management Technical Guidance (TG.16) has made recommendations of where the AQS should and should not be applied, as summarised in **Table 4.1**.

As it is not always possible to be prescriptive in this matter, Local Authorities may apply local knowledge and judgement when considering the application of the AQS. The examples given in **Table 4.1** are not intended to be a comprehensive list.

Table 4.1: Examples of Where AQS Should Be Applied

Averaging Period	AQS Should Apply	AQS Should Not Apply
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of: • Residential properties • Schools • Hospitals • Care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. • Hotels, unless people live there as their permanent residence. • Residential gardens • Kerbside sites or any other location where public exposure is expected to be short term.
24-hour and 8-hour mean	All locations where the annual mean objective would apply. • Hotels • Residential gardens	Kerbside sites or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. • Kerbside sites (e.g. pavements of busy shopping streets) • Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might spend one hour or more. • Any outdoor locations where members of the public might spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

4.5 Applying the AQS to this Development

As this planning application includes residential properties the AQS calendar year limit value will apply to these properties. The 24-hour and 1-hour mean objectives will also be considered.

4.6 Assessment Criteria

A detailed assessment was considered appropriate for this proposed development with model results being verified against local monitoring data. This was carried out using the detailed dispersion model Breeze Roads.

For the purposes of this assessment, the limit values assigned to individual pollutants as set out in the Air Quality Standards Regulations 2010 form the basis of the air quality assessment. The limit

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values are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health.

4.7 Construction Phase

During the construction phase, there will be a number of activities undertaken that have the potential to generate and/or re-suspend dust and $PM_{10}/PM_{2.5}$. At the time of assessment, the exact activities to be undertaken during construction are unknown. In order to evaluate the magnitude and extent of potential adverse impacts likely to result from the proposed development, it has been assumed that the following construction activities could be responsible for the emission of dust:

- Handling, storing, stockpiling and disposing of materials, including potential spillages;
- Ground disturbance and exhaust emissions associated with the operation of site plant;
- Laying of hard surfaces and landscaping;
- Site clearance and preparation;
- Construction and fabrication processes; and
- Internal and external finishing.

The magnitude of the potential impacts of a construction site on air quality is mainly determined by its size, the range of activities undertaken across the site, the proximity of the site to sensitive receptors, the prevailing wind direction, the complexity of terrain and any barriers between the sources and receptors. A qualitative assessment of the potential impacts during construction has been undertaken using information in guidance documents produced by the Building Research Establishment[15] and the recent document produced by the Institute of Air Quality Management[16].

Following the release of the IAQM Guidance in 2016, the assessment criteria have been revised. The dust assessment criteria have now been broken down into five steps;

- Step 1: Screen the need for a detailed assessment;
- Step 2: Assess the risk of dust impacts;
    - Step 2A – Determine the scale and nature of the works;
    - Step 2B – Assess the sensitivity of the area;
    - Step 2C – Combine 2A and 2B to determine the risk of dust impacts;
- Step 3: Site Specific Mitigation;
- Step 4: Determine Significance of Effects;
- Step 5: Dust Assessment Report.

According to the IAQM Guidance (2016), activities on construction sites can be divided into four types to reflect their different potential impacts, with the potential for dust emissions to be assessed only for each activity taking place:

- Demolition;
- Earthworks;

[15] BRE, 2003. Control of Dust from Construction and Demolition Activities
[16] IAQM. 2016. Guidance on the Assessment of Dust from Demolition and Construction.

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- Construction; and
- Trackout.

The assessment methodology is to consider three separate dust effects:

- Annoyance due to soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}

Account is also to be taken of the distance of the receptors that may experience these effects. Receptors are generally considered to be of a medium or high sensitivity to each type of construction activity when they are situated within 200m of the site boundary. Human receptors include locations where people spend time and where property may be affected by dust. In terms of annoyance effects, this will most commonly relate to the loss of amenity due to dust deposition or visible dust plumes, often related to people making complaints, but not necessarily sufficient to be a statutory nuisance. Details of potential dust mitigation strategies can be found in **Appendix 5**.

The wind rose provided in **Appendix 3**, identifies that the predominant wind direction in the region is from the south-west. As such, it is expected that receptors located to the north-east are more at risk of experiencing the effects of construction dust.

The assessment procedure assumes no mitigation measures are applied except those required by legislation. **Tables 4.2** to **4.5** set out the risk category from each of the four types of activity.

Table 4.2: Risk Category from Demolition Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site (large impact)	Medium Risk Site (medium impact)	Medium Risk Site (medium impact)
Medium	High Risk Site (large impact)	Medium Risk Site (medium impact)	Low Risk Site (small impact)
Low	Medium Risk Site (medium impact)	Low Risk Site (small impact)	Negligible (negligible impact)

Table 4.3: Risk Category from Earthworks Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site (large impact)	Medium Risk Site (medium impact)	Low Risk Site (small impact)
Medium	Medium Risk Site (medium impact)	Medium Risk Site (medium impact)	Low Risk Site (small impact)
Low	Low Risk Site (small impact)	Low Risk Site (small impact)	Negligible (negligible impact)

Table 4.4: Risk Category from Construction Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site (large impact)	Medium Risk Site (medium impact)	Low Risk Site (small impact)
Medium	Medium Risk Site (medium impact)	Medium Risk Site (medium impact)	Low Risk Site (small impact)

Low	Low Risk Site (small impact)	Low Risk Site (small impact)	Negligible (negligible impact)

Table 4.5: Risk Category from Trackout

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site (large impact)	Medium Risk Site	Low Risk Site (small impact)
Medium	Medium Risk Site	Low Risk Site (small impact)	Negligible (negligible impact)
Low	Low Risk Site (small impact)	Low Risk Site (small impact)	Negligible (negligible impact)

Note: The terms in brackets denote the terminology requested to be used by the client to describe the impacts, whereas the terms not in brackets denote the official terminology in the guidance.

4.8 Operation Phase

The main pollutants of concern are generally considered to be NO_2 and PM_{10} for road traffic. The Breeze Roads methodology has been used for this assessment to predict the impacts of any additional traffic generated from the development on surrounding sensitive receptors.

For the assessment, the following scenarios were considered:

- 2016 Model Verification;
- 2020 Opening Year Without Development; and
- 2020 Opening Year With Development.

4.9 Traffic Data

The Breeze Roads prediction model requires the user to provide various input data, including the Annual Average Hourly Traffic (AAHT) flow, the number of heavy duty vehicles (HDVs), the distance of the road centreline from the receptors and vehicle speeds.

The traffic information is detailed in **Table 4.6** and **Table 4.7** below for the verification and assessment scenarios. For the verification scenario 2016 traffic flow and vehicle split data were obtained from the Department for Transport (DfT). Vehicle speeds were estimated based on local speed limits and traffic conditions and were reduced near junctions and crossings to replicate queuing traffic.

Table 4.6: 2016 Traffic Flow Data for Verification

Monitoring Site	Road Section	AAHT	Speed (km/h)	HDV%
NA1S18	High Street, free-flowing eastern section	934	48	3.4
	High Street, section with traffic lights near NA1S18	934	12	3.4
	High Street, junction with City Way	934	15	3.4
	A229, junction with High Street and Star Hill	635	18	2.5
NA1S30	Corporation Street Southbound Lane, free-flowing section north of Blue Boar Lane	707	48	2.5

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Monitoring Site	Road Section	AAHT	Speed (km/h)	HDV%
	Corporation Street Southbound Lane, junction with Blue Boar Lane	707	20	2.5
	Corporation Street Southbound Lane, free-flowing section south of Blue Boar Lane	707	48	2.5
	Corporation Street Northbound Lane, free-flowing section north of Blue Boar Lane	707	48	2.5
	Corporation Street Northbound Lane, junction with Blue Boar Lane	707	20	2.5
	Corporation Street Northbound Lane, free-flowing section south of Blue Boar Lane	707	48	2.5
NA1S3	A2 Eastbound Lane, section east of A207	824	20	2.9
	A2 Eastbound Lane, junction with B2002	824	10	2.9
	A2 Eastbound Lane, narrow section near junction with B2002	824	40	2.9
	A2 Westbound Lane, section between Pelican Crossings	824	48	2.9
	A2 Westbound Lane, junction with B2002	824	10	2.9

Note: This is a non-exhaustive summary of the road sections modelled and includes the sections that are likely to contribute the greatest emissions to the development receptors.

Table 4.7 identifies the estimated 2020 AAHT traffic flows for roads near to the proposed development (for use in the impacts modelling). For the "Without Development" scenario 2017 traffic flows and vehicle split data were obtained from the DfT. These flows were then scaled to 2020 using a Medway specific traffic growth factor of 1.048, obtained from Tempro. For the "With Development" scenario, additional traffic flows associated with the Proposed Innovation Park Medway were sourced from a spreadsheet provided by the Transport Consultants, Campbell Reith Hill LLP, and then these flows were added to the DfT baseline traffic flows. The transport consultants also included the percentage distribution of the additional traffic expected on each road, this was factored into the modelling. Additional traffic generation data was provided in a Transport Assessment[17] for the Proposed Rochester Airport Redevelopment, these were also added to the baseline traffic flows. According to the transport statement[18] for the consented Horsted Park development, there will be a net reduction in traffic compared with the sites previous use, therefore additional traffic flows from this site were not included in the "With Development" scenario. The traffic consultants did not provide traffic split data and therefore the DFT HDV% values were used. Vehicle speeds were estimated based on local speed limits and traffic conditions and were reduced near junctions and crossings to replicate queuing traffic.

[17] Ramboll Environ, Rochester Airport Development Environmental Statement Volume 3: Technical Appendices, August 2017
[18] WYG Transport, Phase II Horsted Park Transport Statement Addendum

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Table 4.7: 2020 Opening Year Traffic Flow Data

Model scenarios	Road Section	AAHT	Speed (km/h)	HDV (%)
Opening Year Without Development	B2097, north of bus stops	722	40	2.2
	B2097, junction with Valley View Road, Hawser Road and Summerson Close	722	40	2.2
	B2097, south of bus stops	722	40	2.2
	B2097, south section free-flowing	722	48	2.2
	Roman Road, south of junction with A230	661	40	2.4
	Roman Road, junctions with A230	661	20	2.4
	City Way, free-flowing section	661	48	2.4
	A230, junctions with A229	872	18	1.6
	A230, free-flowing section to east	872	48	1.6
	A229, junction with A2045	1779	113	1.2
	A229 South of junction with A2045, free-flowing	2881	105	4.0
	A2045, junction with A229	2168	56	4.8
	A2045, junction with M2	2168	56	4.9
	M2	4336	105	10.1
Opening Year With Development	B2097, north of bus stops	829	40	2.2
	B2097, junction with Valley View Road, Hawser Road and Summerson Close	829	40	2.2
	B2097, south of bus stops	829	40	2.2
	B2097, south section free-flowing	829	48	2.2
	Roman Road, south of junction with A230	712	40	2.4
	Roman Road, junctions with A230	712	20	2.4
	City Way, free-flowing section	712	48	2.4
	A230, junctions with A229	1026	18	1.6
	A230, free-flowing section to east	1026	48	1.6
	A229, junction with A2045	1891	113	1.2
	A229, south of junction with A2045, free-flowing	2993	105	4.0

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Model scenarios	Road Section	AAHT	Speed (km/h)	HDV (%)
	A2045, junction with A229	2239	56	4.8
	A2045, junction with M2	2239	56	4.9
	M2	4440	105	10.1

4.10 Validation and Verification of the Model

Model validation undertaken by the software developer will not have been carried out in the vicinity of the site being considered in this assessment. As a result, it is necessary to perform a comparison of the modelled results with local monitoring data at suitable locations. This verification process aims to minimise model uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results. The verification was carried out in accordance with LAQM.TG16. Suitable monitoring data for the purpose of verification is available for concentrations of NO_2 and PM_{10} at the monitoring positions detailed in **Section 3.3**.

The verification exercise resulted in an average difference for the NO_x contribution between the modelled and monitored NO_x roads of -74.68, which indicates that the model is significantly under predicting. When the monitored and modelled results are compared as recommended in LAQM.TG16 the road NO_X adjustment factor is **4.033** (as identified in **Table 4.8**). This factor was applied to all modelled NO_x results prior to calculating modelled NO_2 using the NO_x to NO_2 calculator. In the absence of appropriate PM_{10} monitoring within close proximity to the site, the NO_x adjustment factor has also been applied to the PM_{10} modelled concentrations, in accordance with the guidance provided in LAQM.TG16.

Table 4.8: NO_2 Annual Mean Verification for 2016

Monitoring Position	Monitored		Modelled		% Difference (NO_2 Total) Before Adjustment	% Difference (NO_2 Total) After Adjustment	Road NO_X Factor
	Road NO_2 µg/m³	Road NO_X[19] µg/m³	Road NO_2 µg/m³	Road NO_X µg/m³			
NA1S30	13.2	26.4	3.7	7.0	-30.9	2.6	**4.033**
NA1S18	19.1	39.2	5.9	11.3	-36.7	7.5	
NA1S3	34.1	76.2	8.0	15.7	-50.4	-10.1	

Typically, with smaller datasets the root mean square error (RMSE) is the important statistic and the verification process resulted in an RMSE close to the ideal value of 0 µg/m³ as identified in **Table 4.9**. Therefore, there is a high level of confidence in the verification process.

[19] Obtained from NO_X to NO_2 Calculator Spreadsheet available from www.laqm.Defra.gov.uk

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Table 4.9: Summary of the Statistics Used to Assess Model Uncertainty

Statistical Parameter	Value	Description
Correlation Coefficient	0.968	Used to measure the linear relationship between predicted and observed data. The ideal value (an absolute relationship) is 1.
Root Mean Square Error (RMSE)	3.4	RMSE defines the average error/uncertainty of the model verification and is in the same units as the model outputs ($\mu g/m^3$). Values should be <10$\mu g/m^3$ or ideally <4$\mu g/m^3$ where concentrations are near the AQO. The ideal value is 0$\mu g/m^3$.
Fractional Bias	0.0	Identifies if the model shows a systematic tendency to over/under predict concentrations. The ideal value is 0 and range between +/- 2. Negative values suggest an over prediction whilst positive values suggest under prediction.

4.11 Assessment of $PM_{2.5}$

The 2007 Air Quality Strategy introduced a new exposure reduction regime for $PM_{2.5}$, tiny particles associated with respiratory and cardio-vascular illness and mortality which have no known safe limit for human exposure. The new regime will attempt to reduce the exposure of all urban dwellers, alongside the existing method of reducing hotspots of PM exposure. $PM_{2.5}$ typically makes up two thirds of PM_{10} emissions and concentrations. However, objectives for $PM_{2.5}$ (as shown in **Table 4.10**) are not currently incorporated into Local Air Quality Management regulations, therefore there is no statutory obligation to review and assess air quality against them.

Table 4.10: National Exposure Reduction Target, Target Value and Limit Value for $PM_{2.5}$

Time Period	Objective/Obligation	To be achieved by
Annual mean	Target value of 25$\mu g/m^3$	2010
Annual mean	Limit value of 25$\mu g/m^3$	2015
Annual mean	Stage 2 indicative limit value of 20$\mu g/m^3$	2020
3 year Average Exposure Indicator (AEI)[a]	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
3 year Average Exposure Indicator (AEI)[a]	Exposure concentration obligation of 20$\mu g/m^3$ (of vegetation)	2015

[a] The 3 year running mean of AEI is calculated from the $PM_{2.5}$ concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

Presently, Breeze Roads does not predict the concentration of $PM_{2.5}$ as part of the methodology therefore the future concentration of $PM_{2.5}$ will be calculated using the typical ratio between the background concentrations of PM_{10} and $PM_{2.5}$ for the opening year of development. This calculated concentration will then be compared against the annual mean Objective Limit value of 25$\mu g/m^3$.

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5 IMPACTS AND CONSTRAINTS OF AIR QUALITY

5.1 Predicted Construction Impacts

The main sources of dust and particulate matter during the construction phase include:

- Demolition of the existing building on the site;
- Handling, storing, stockpiling and disposing of materials, including potential spillages;
- Ground disturbance and exhaust emissions associated with the operation of site plant;
- Laying of hard surfaces and landscaping;
- Site clearance and preparation;
- Construction and fabrication processes;
- Internal and external finishing; and
- Emissions associated with construction traffic on haulage routes and nearby roads.

The majority of the releases are likely to occur during the typical 'working-week'. However, for some potential sources, for example exposed soil produced from earthworks 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 take place.

Depending on wind speed and turbulence it is likely that the majority of dust will be deposited in the area immediately surrounding the source (up to 200 metres away). The wind rose in **Appendix 3** identifies that the dominant wind direction for the site is from the south-west. Therefore, properties within 200 metres to the north-east of the site are more at risk of experiencing the effects of construction dust. As the size of the site is classified as 'medium, the effects of trackout have been assessed up to 100 metres away from the proposed development. As the current structure will be demolished, the potential effects of this has been included in the assessment.

The risk of effects are summarised in **Table 5.1** below and the assessment was carried out qualitatively using professional judgement.

Table 5.1: Summary of Risk Effects with No Mitigation

Source	Dust Soiling Effects	Ecological Effects	PM_{10} Effects
Demolition	Low Risk (small impact)	Negligible (negligible impact)	Negligible (negligible impact)
Earthworks	Medium Risk (medium impact)	Negligible (negligible impact)	Negligible (negligible impact)
Construction	Medium Risk (medium impact)	Negligible (negligible impact)	Negligible (negligible impact)
Trackout	Negligible (negligible impact)	Negligible (negligible impact)	Negligible (negligible impact)

Note: The terms in brackets denote the terminology requested to be used by the client to describe the impacts, whereas the terms not in brackets denote the official terminology in the legislation.

In consideration of the factors described above, the overall effects of dust nuisance without mitigation would therefore be temporary, short term, local in effect and of negligible to medium risk.

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5.2 Air Quality Impact of Development Traffic - Acceptability Criteria

It is common practice in the UK to use the Environmental Protection UK's (EPUK) Guidance[20] on Air Quality Assessments for Planning Applications to assess the impact of a development. This advises that an air quality assessment will be required where the development is anticipated to give rise to significant changes in air quality. There will also be a need to assess air quality implications of a development where a significant change in relevant exposure is anticipated. A full air quality assessment should normally be undertaken where proposals give rise to significant changes in either volumes, typically a change in annual average daily traffic (AADT) or peak traffic flows of +/-5% or +/-10%, depending on local circumstances, or in vehicle speed (or both), usually on a road with more than 10,000 AADT (5,000 if narrow and congested). It also advises of the need for an assessment where the proposals will:

- Generate or increase congestion;
- Alter the traffic composition on local roads;
- Include significant new car parking;
- Significantly affect nitrogen deposition on sensitive habitats;
- Introduce new exposure close to existing sources of air pollutants;
- Give rise to potentially significant impacts during construction; or
- Include a large, long-term construction site.

5.3 Air Quality Impacts

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) updated their guidance on "Land-Use Planning and Development Control: Planning for Air Quality". The guidance provides a methodology for determining the impacts of increased pollutant concentrations at sensitive receptor locations resulting from emission sources such as the generation of traffic from development sites.

To characterise the impacts of the proposed development on local air quality, predictions of air pollutant concentrations have been made for an operational year of 2020 using the Breeze Roads dispersion model.

[20] Environmental Protection UK and IAQM (2017) – Land-Use Planning and Development Control: Planning for Air Quality

Table 5.2: Impacts of Pollutant Concentrations as a result of the Development

Long Term Average Concentration in Assessment Year	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible (negligible impact)	Negligible (negligible impact)	Slight (small impact)	Moderate (medium impact)
76-94% of AQAL	Negligible (negligible impact)	Slight (small impact)	Moderate (medium impact)	Moderate (medium impact)
95-102% of AQAL	Slight (small impact)	Moderate (medium impact)	Moderate (medium impact)	Substantial (large impact)
103-109% of AQAL	Moderate (medium impact)	Moderate (medium impact)	Substantial (large impact)	Substantial (large impact)
110% or more of AQAL	Moderate (medium impact)	Substantial (large impact)	Substantial (large impact)	Substantial (large impact)

The AQAL is the Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level'
Note: The terms in brackets denote the terminology requested to be used by the client to describe the impacts, whereas the terms not in brackets denote the official terminology in the legislation.

5.4 Air Quality Impact of Development Traffic - Assessment

The proposed IPM development will include up to approximately 101,000 m^2 of B1 and B2 commercial space and up to approximately 57,000 m^2 of associated parking provision. The Transport Consultants have predicted an additional vehicle flows of 11,073 AADT (converted from peak hour data) as a result of the proposed IPM development with the following distribution onto each of the nearby roads: B2097 – 16.8%, A229 N - 4.6%, A230 - 27.0%, A2045 – 9.1%, M2 – 16.3%, A229 S – 17.9%. The additional vehicles produced by the Proposed Rochester Airport Development predicted by their Transport Consultants is 699 AADT (converted from peak hour). As the consented Horsted Park Development is predicted to produce a net reduction in additional traffic onto the local road network, flows for this development were not included in this overall assessment. Sensitive receptors were modelled at the façades of existing properties north west, north east and south of the development, on residential properties currently under construction at Horsted Park and at sensitive ecological receptors at the Wouldham to Detling Escarpment. The modelled predicted NO_2 and particulate matter pollutant concentrations at these sensitive receptors can found in **Tables 5.3** and **5.4**.

5.5 2020 Pollutant Concentrations

5.5.1 2020 Annual Mean NO_2 Concentrations

Table 5.3 identifies the modelled NO_2 concentrations in 2020 both with the development completed and fully occupied and without the development. For the residential receptors (ER1 to ER11) the greatest change in pollutant concentrations is 0.7µg/m^3 at ER2, and the pollutant concentrations will remain below the AQO, therefore the impact is negligible. For the ecological receptors (ECR1 to ECR3)

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there was no predicted change at any of the receptors and the pollutant concentrations will remain below the AQO, therefore the impact is less than negligible.

Table 5.3: Modelled 2020 NO_2 Concentrations – Existing and Future Receptors

Receptor	Floor	Air Quality Objective (µg/m³)	Without Development Total NO_2 (µg/m³)	With Development Total NO_2 (µg/m³)	Change in Concentration (µg/m³)	Impact Descriptor
ER1	Ground Floor	40	17.9	18.4	0.5	Negligible
ER2		40	19.2	19.9	0.7	Negligible
ER3		40	17.2	17.6	0.4	Negligible
ER4		40	19.2	19.6	0.4	Negligible
ER5		40	20.4	21.0	0.6	Negligible
ER6		40	27.3	29.3	2.0	Negligible
ER7		40	24.0	25.5	1.5	Negligible
ER8		40	30.0	30.0	0.0	Negligible
ER9		40	34.1	34.2	0.1	Negligible
ER10		40	28.1	28.1	0.0	Negligible
ER11		40	29.2	29.2	0.0	Negligible
ECR1	Ground Level	30 (NOx)	28.4 (NOx)	28.4 (NOx)	0.0	Negligible
ECR2		30 (NOx)	28.5 (NOx)	28.5 (NOx)	0.0	Negligible
ECR3		30 (NOx)	28.3 (NOx)	28.3 (NOx)	0.0	Negligible

5.5.2 NO_2 1-hour Exposure Assessment

According to guidance, there is only a risk that the NO_2 1-hour objective (200µg/m³) could be exceeded at local sensitive receptors if the annual mean NO_2 concentration is greater than 60µg/m³. At the existing residential receptors, the worst-case annual mean predicted concentration is 34.2µg/m³ (ER8) and therefore hourly exceedances would not be expected.

5.5.3 2020 Annual Mean Particulate Matter Concentrations

Table 5.4 identifies the modelled PM_{10} and $PM_{2.5}$ concentrations in 2020 both with and without the development completed and fully occupied. For the residential receptors, the highest predicted annual mean PM_{10} concentration without the development is 19.2µg/m³ (ER9) and with the development is also 19.2µg/m³ (ER9). For the ecological receptors, the highest predicted annual mean PM_{10} concentration without the development is 16.5µg/m³ (ECR1 and ECR2) and with the development is also 16.5 µg/m³ (ECR1 and ECR2). The highest change in PM_{10} concentration is 0.1µg/m³**.** For the residential receptors, the highest predicted annual mean $PM_{2.5}$ concentration without the development is 12.8µg/m³ (ER9) and with the development is also 12.8µg/m³ (ER9). For the ecological receptors, the highest predicted annual mean $PM_{2.5}$ concentration without the development is 10.9µg/m³ (all receptors) and with the development is also 10.9µg/m³ (all receptors).

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Table 5.4: Modelled 2020 PM_{10} and $PM_{2.5}$ Concentrations – Existing and Future Receptors

Receptor	Total PM_{10} Without Development µg/m³ (Days >50 µg/m³)	Total PM_{10} With Development µg/m³ (Days >50 µg/m³) [21]	Change in PM_{10} (µg/m³)	Total $PM_{2.5}$ Without Development (µg/m³)	Total $PM_{2.5}$ With Development (µg/m³)	Change in $PM_{2.5}$ (µg/m³)
ER1	15.5 (0)	15.6 (0)	0.1	10.5	10.6	0.1
ER2	15.8 (0)	15.9 (0)	0.1	10.7	10.8	0.1
ER3	15.4 (0)	15.5 (0)	0.1	10.5	10.5	0.0
ER4	15.5 (0)	15.5 (0)	0.0	10.5	10.5	0.0
ER5	15.5 (0)	15.6 (0)	0.1	10.5	10.6	0.1
ER6	16.5 (1)	16.8 (1)	0.3	11.2	11.4	0.2
ER7	16.0 (0)	16.2 (0)	0.2	10.8	11.0	0.2
ER8	18.3 (2)	18.3 (2)	0.0	12.2	12.2	0.0
ER9	19.2 (3)	19.2 (3)	0.0	12.8	12.8	0.0
ER10	18.1 (2)	18.1 (2)	0.0	12.1	12.1	0.0
ER11	18.5 (2)	18.5 (2)	0.0	12.3	12.3	0.0
ECR1	16.5 (0)	16.5 (0)	0.0	10.9	10.9	0.0
ECR2	16.5 (0)	16.5 (0)	0.0	10.9	10.9	0.0
ECR3	16.4 (0)	16.4 (0)	0.0	10.9	10.9	0.0

[21] Not to be exceeded more than 35 times a year.

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6 MITIGATION

6.1 Construction Phase

As identified by the construction dust impact assessment, there will be negligible to medium impacts on local sensitive receptors. Beyond dust mitigation methods that are applied as standard practice in the industry to meet legislation, additional mitigation may be considered, especially in regards to the earthworks and construction phases. A list of dust mitigation methods can be found in **Appendix 5**.

6.2 Operation Phase

As identified by the impact assessment, there are no exceedances of the NAQO's for NO_2, NOx, PM_{10} or $PM_{2.5}$ at any of the nearby residential or ecological sensitive receptors.

The highest expected increase in NO_2 concentrations at a sensitive receptor with the development in place is 1.5µg/m^3, which results in an NO_2 pollutant concentration of 25.5 µg/m^3 (ER7).

The highest expected increase in PM_{10} concentrations at sensitive receptors with the development in place is 0.2µg/m^3 which results in a PM_{10} pollutant concentration of 11.0 µg/m^3 (ER7) and 11.4 µg/m^3 (ER7).

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7 CONCLUSIONS

In respect of dust impacts during construction, subject to best practicable means mitigation, the impacts at sensitive receptors will be negligible.

During the operation phase, the modelling predicts that there will be negligible to small increases in nitrogen dioxide and particulate matter at nearby residential and ecological sensitive receptors as a result of the cumulative effects of the proposed development and neighbouring development and that pollutant concentrations will remain significantly below the air quality objective levels. Therefore, no mitigation is required.

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APPENDICES

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Appendix 1: Glossary of Terms

AADT	Annual Average Daily Traffic
AAHT	Annual Average Hourly Traffic
AQMA	Air Quality Management Area -An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.
AQS/ NAQOs	Air Quality Standard/ National Air Quality Objectives - 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 assessment of the effects of each pollutant on human health including the effects on sensitive sub groups.
AURN	Automatic Urban and Rural Network Air Quality Monitoring Site.
Calendar Year	The average of the concentrations measured for each pollutant for one year. In the case of the AQS this is for a calendar year.
Concentration	The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, micrograms per cubic metre, $\mu g/m^3$) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
LAQM	Local Air Quality Management
Nitrogen Oxides	Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released to the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO_2), which is harmful to health. NO_2 and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).
PM_{10}/$PM_{2.5}$	Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM_{10} (less than 10 microns in aero-dynamic diameter), but the finer fractions such as $PM_{2.5}$ (less than 2.5 microns in aero-dynamic diameter) is becoming of increasing interest in terms of health effects.
$\mu g/m^3$	Micrograms per cubic metre of air - A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollution.

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Appendix 2: Air Quality Standards

Pollutant	Averaging Period	Limit Value	Margin of Tolerance
Benzene	Calendar Year	5µg/m^3	
Carbon Monoxide	Maximum daily running 8 Hour Mean	10mg/m^3	
Lead	Calendar Year	0.5µg/m^3	100%
Nitrogen Dioxide	One Hour	200µg/m^3 Not to be exceeded more than 18 times per year	
	Calendar Year	40µg/m^3	
Particulates (PM_{10})	One day	50µg/m^3 Not to be exceeded more than 35 times per year	50%
	Calendar Year	40µg/m^3	20%
Particulates ($PM_{2.5}$)	Calendar Year	25µg/m^3	20%
Sulphur Dioxide	One Hour	350µg/m^3 Not to be exceeded more than 24 times per calendar year	150µg/m^3
	One Day	150µg/m^3 Not to be exceeded more than 3 times per calendar year	

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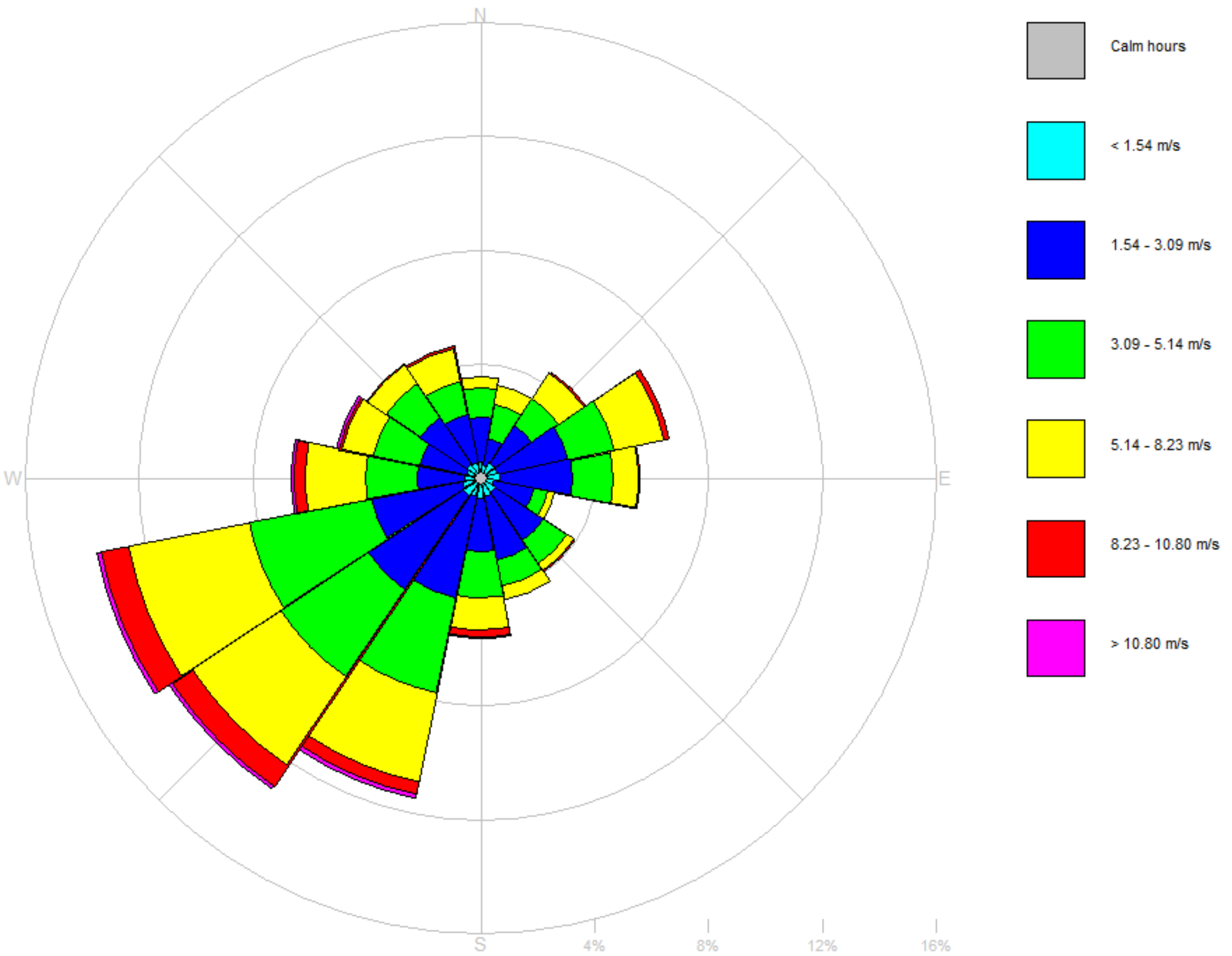
Appendix 3: 2016 Gravesend Wind Rose



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Appendix 4: Proposed Development Nearby Sensitive Receptor Locations (north of site)

LEGEND

- Existing / Future Residential Receptor Location
- ER1 Existing / Future Residential Receptor Number
- MIP Development Boundary
- Rochester Airport Development Boundary
- Horsted Park Development Boundary

Client: Campbell Reith Hill LLP		North of Site Nearby Sensitive Receptors	Design:	TW	23.08.2018
			Drawn:	TW	23.08.2018
Rev: A	Description: FINAL	Rev: A	Checked:	GP	23.08.2018
			Approved:	GP	23.08.2018

Appendix 4

Scale: On Map

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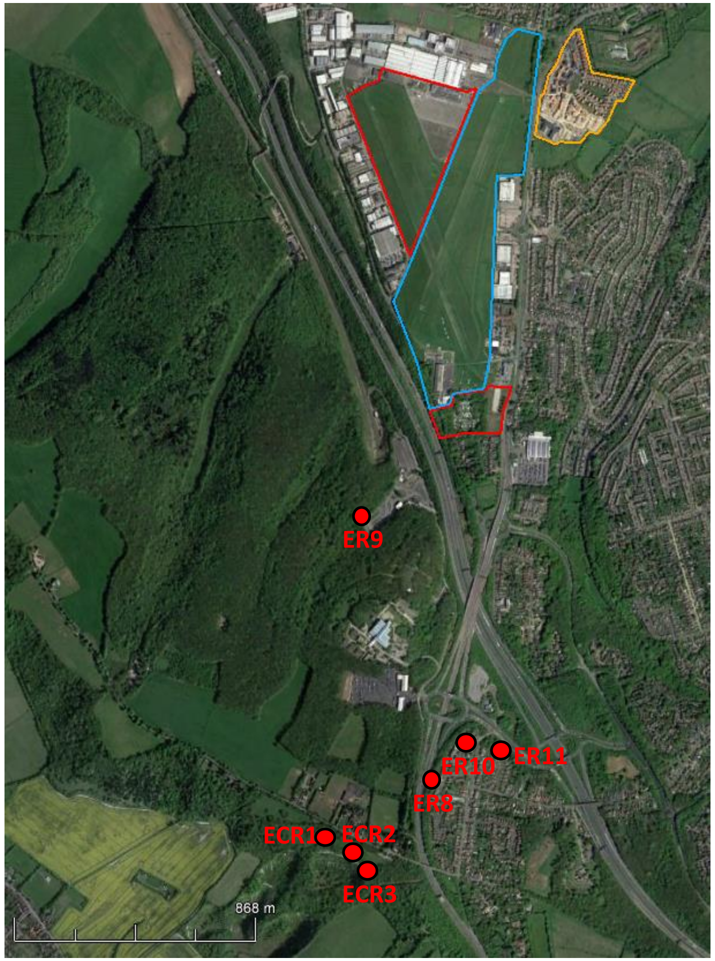
Appendix 5: Proposed Development Nearby Sensitive Receptor Locations (south of site)



LEGEND

- Existing Residential Receptor Location
- ER1 — Existing Residential Receptor Number
- Existing Ecological Receptor Location
- ECO1 — Existing Ecological Receptor Number
- MIP Development Boundary
- Rochester Airport Development Boundary
- Horsted Park Development Boundary

Client: Campbell Reith Hill LLP		South of Site Nearby Sensitive Receptors	Design:	TW	23.08.2018
			Drawn:	TW	23.08.2018
Rev: A	Description: FINAL	Rev: A	Checked:	GP	23.08.2018
			Approved:	GP	23.08.2018

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Appendix 5

Scale: On Map

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Appendix 6: Construction Mitigation Measures Adapted from the 2012 IAQM Guidance on Assessments of the Impacts of Construction on Air Quality and the Determination of their significance

Key:
H Highly Recommended
D Desirable
N Not Required

Mitigation Measures - Communications	Low Risk	Medium Risk	High Risk
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
3. Display the head or regional office contact information	H	H	H

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Mitigation Measures - Dust Management	Low Risk	Medium Risk	High Risk
4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, realtime PM10 continuous monitoring and/or visual inspections.	D	H	H
Site Management			
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H	H	H
8. Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N	N	H
Monitoring			
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within	D	D	H

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100 m of site boundary, with cleaning to be provided if necessary			
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	H	H	H
11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H
Preparing and Maintaining the Site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	D	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H

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Operating Vehicle/Machinery and Sustainable Travel			
21. Ensure all vehicles switch off engines when stationary - no idling vehicles	H	H	H
22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable	H	H	H
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials	N	H	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			
26. 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.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	D	H	H

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Waste Management			
31. Avoid bonfires and burning of waste materials.	H	H	H

Mitigation Measures for Demolition	**Low Risk**	**Medium Risk**	**High Risk**
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H
Mitigation Measures for Earthworks	**Low Risk**	**Medium Risk**	**High Risk**
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once	N	D	H

Mitigation Measures for Construction	**Low Risk**	**Medium Risk**	**High Risk**
39. Avoid scabbling (roughening of concrete surfaces) if possible.	D	D	H
40. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	D	H	H

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41. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	N	D	H
42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D

Mitigation Measures for Trackout	**Low Risk**	**Medium Risk**	**High Risk**
43. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	D	H	H
50. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	N	H	H
51. Access gates to be located at least 10 m from receptors where possible.	N	H	H

Email: enquiry@accon-uk.com

Reading Office:
Unit B, Fronds Park,
Frouds Lane, Aldermaston,
Reading, RG7 4LH
Tel: 0118 971 0000 Fax: 0118 971 2272

Brighton Office:
Citibase, 95 Ditchling Road,
Brighton, East Sussex, BN1 4ST
Tel: 01273 573 814

www.accon-uk.com