Catesby Strategic Land Limited

Land at Moat Road, Headcorn

Air Quality Assessment

Project No.: 444627-01 (02)

SEPTEMBER 2023

RSK

RSK GENERAL NOTES

Project No.: 444627-01 (02)

Title: Air Quality Assessment – Land at Moat Road, Headcorn, Kent

Client: Catesby Strategic Land Limited

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Date:	11th September 2023	Date:	11th September 2023

Abbreviations

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System – Roads (a dispersion modelling software application)
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Standard
ASR	Annual Status Report
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CO	Carbon Monoxide
Defra	Department for Environment, Food and Rural Affairs
DMP	Dust Management Plan
EC	European Commission
EPUK	Environmental Protection UK
EU	European Union
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
MBC	Maidstone Borough Council
NAQS	National Air Quality Strategy
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5µm diameter
PM_{10}	Particulate matter of size fraction approximating to <10µm diameter
RSK	RSK Environment Limited
VOC	Volatile Organic Compounds

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APPENDICES

1 INTRODUCTION

1.1 Background

This report relates to the proposed development by Catesby Strategic Land Limited, located off Moat Road, Headcorn. It provides an air quality assessment in support of "outline application (with all matters reserved except access) for the development of up to 120no. dwellings (Use Class C3) including demolition of existing buildings, means of access into the site from Moat Road (not internal roads), associated highway works, provision of public open space, emergency / pedestrian access to Millbank and associated infrastructure including surface water drainage (with related off site s278 highway works to Moat Road)".

The site includes an area of approximately 18 acres located to the north of Moat Road. Figure 1.1 shows the site plan including the red line boundary. Figure 1.2 shows the proposed site layout. Hereafter, land within the red line boundary is referred to as 'the site'.

The approximate grid reference of the site is 582892, 144581. The site lies within the jurisdiction of Maidstone Borough Council (MBC). The site surroundings are predominantly residential properties to the north and east and agricultural land to the south and west.

This report presents the findings of an assessment of existing/baseline air quality conditions and potential air quality impacts during the construction and operational phases of the proposed development. Mitigation measures have been recommended where appropriate.

Figure 1.1: Red Line Boundary Plan

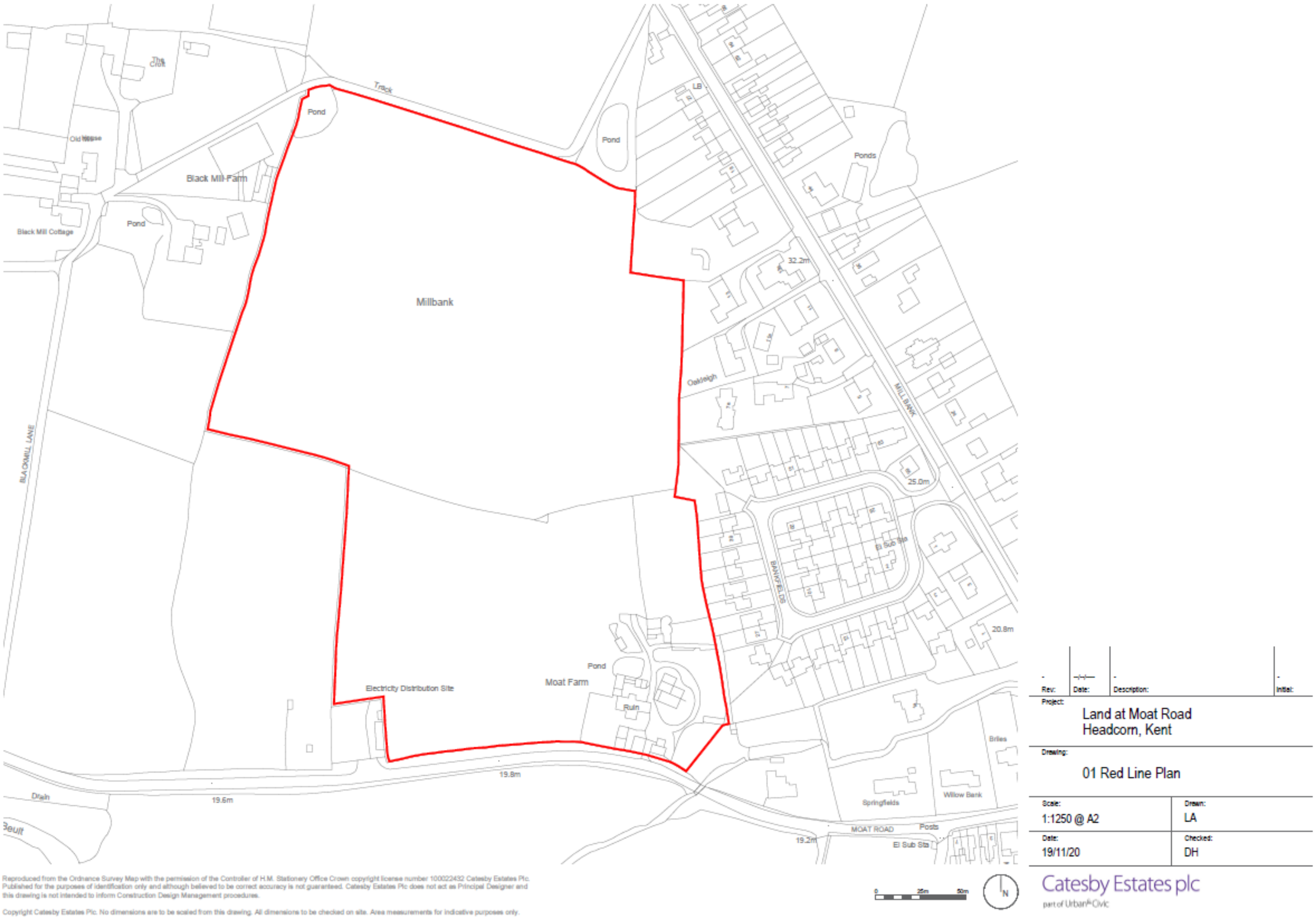


Figure 1.2: Proposed Site Layout

2 LEGISLATION, PLANNING POLICY & GUIDANCE

2.1 Key Legislation

2.1.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy. The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU (European Union) Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

The Clean Air Strategy 2019 updates the Government strategy to reduce emissions from transport, homes, agriculture and industry. However, the air quality objectives remain as previously detailed within the 2007 strategy.

2.1.2 Air Quality Standards

The air quality standards (AQSs) in the United Kingdom are derived from European Commission (EC) directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. The European Union (Withdrawal) Act retains existing EU environmental provisions in the UK. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] AQSs to England and Wales to protect human health are summarised in Table 2.1.

Table 2.1: Air Quality Standards Relevant to the Proposed Development

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit ($\mu g/m^3$)
Nitrogen dioxide (NO_2)	1 calendar year	-	40
	1 hour	18	200
Fine particles (PM_{10})	1 calendar year	-	40

[1] Relevance, in this case, is defined by the scope of the assessment.

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m^3)
	24 hours	35	50
Fine particles ($PM_{2.5}$)	1 year	-	25

2.1.3 The Environment Act

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

On the 10th of November 2021, the new Environment Act (2021) passed royal assent, which amends the Environment Act (1995) to reinforce the local air quality management (LAQM) framework in order to encourage cooperation at the local level and broaden the range of organisations that play a role in improving local air quality.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

In September 2023, the revised National Planning Policy Framework (NPPF) was published, superseding the previous 2012 NPPF (updated in February 2019 and revised in July 2021) with immediate effect. The revised NPPF aims to "*protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."*

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should '*development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*' and goes on to state that '*new development* [should be] *appropriate for its location' and 'the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account*.'

With specific regard to air quality, the NPPF states that: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

2.2.2 Local Planning Policy

The Maidstone Borough Local Plan 2017-2031 (to be adopted 2022)

Maidstone Borough's local plan was adopted by MBC in October 2017 and an updated Local Plan is in review for 2022. It sets out how Maidstone Borough will develop until 2031 and provides guidance for development within the council and plans for infrastructure, homes and jobs the local residents need. It includes Policy LPRSP15:

Policy LPRSP15 - **Principles of Good Design**:

"Proposals which would create high quality design and should meet the following criteria, as appropriate, to be permitted:…

5. *…Respect the amenities of occupiers of neighbouring properties and uses and provide adequate residential amenities for future occupiers of the development by ensuring that proposals do not result in, or its occupants are exposed to, excessive noise, vibration, odour, air pollution, activity or vehicular movements, overlooking, or visual intrusion, or loss of light to occupiers;…"*

Policy LPRTRA1 - **Air Quality** is also included which states:

"Proposals that have an impact on air quality will be permitted, subject to the following criteria being met:

1. *Proposals for development which have the potential, by virtue of their scale, nature and/or location, to have a negative impact on air quality at identified exceedance areas, as defined through the Local Air Quality Management process, will be required to submit an Air Quality Impact Assessment (AQIA) to consider the potential impacts of pollution from individual and cumulative development, and to demonstrate how the air quality impacts of the development will be mitigated to acceptable levels;*
2. *Proposals for development which have the potential, by virtue of their scale, nature and/or location, to have a significant negative impact on air quality within identified Air Quality Management Areas will be required to submit an AQIA to consider the*

potential impacts of pollution from individual and cumulative development, and to demonstrate how the air quality impacts of the development will be mitigated to acceptable levels, even where there will be no negative impact at identified exceedance areas;

3. *Other development proposals, where criteria 1 and 2 do not apply, but which by virtue of their scale, nature and/or location have the potential to generate a negative impact on air quality within identified Air Quality Management Areas will not be required to submit an AQIA, but should demonstrate how the air quality impacts of the development will be minimised; and*
4. *Development proposals which have the potential, by virtue of their scale, nature and/or location, to have a significant negative impact on air quality outside of identified Air Quality Management Areas will submit an AQIA to consider the potential impacts of pollution from individual and cumulative development, and to demonstrate how the air quality impacts of the development will be mitigated to acceptable levels."*

POLICY LPRTRA2 - Assessing the transport impacts of development states:

"Development proposals must:

1. *Demonstrate that the impacts of trips generated to and from the development are accommodated, remedied or mitigated to prevent severe residual highway safety or capacity impacts*
2. *Demonstrate that any measures necessary to mitigate the transport impacts (in terms of highway safety and capacity as well as air quality) of development are viable and will be delivered at the appropriate point in the proposed development's buildout. This will be ahead of first occupation for some measures and at an agreed trigger point for others.*
3. *Provide a satisfactory Transport Assessment for proposals that reach the required threshold and a satisfactory Travel Plan in accordance with the threshold levels set by Kent County Council's Guidance on Transport Assessments and Travel Plans and in Highways England guidance; and*
4. *Demonstrate that development complies with the requirements of policy TRA1 for air quality and the guidance included in the Kent County Council Kent Design Guide…"*

2.3 Best Practice Guidance

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) published a guidance document (Holman *et al*., 2023) on the assessment of construction phase impacts (herein the 'IAQM construction dust guidance'). The guidance was produced to provide advice 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, PM_{10}

impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measure appropriate to the level of risk identified.

2.3.2 Local Air Quality Management Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by all UK local authorities in their air quality review and assessment work. This guidance, referred to in this document as LAQM TG.22, has been used where appropriate. LAQM TG.22 has been updated recently by Defra, adopting a new streamlined approach with a greater focus on local measures and public reporting.

2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK's (EPUK) and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM guidance') to facilitate consideration of air quality within local development control processes. It provides a framework for air quality considerations, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes methods for undertaken an air quality assessment and an approach for assessing the significance of effects. The guidance note is widely accepted as an appropriate reference method for this purpose.

2.3.4 Maidstone Borough Council - Air Quality Planning Guidance - 2017

MBC Air Quality Planning Guidance sets out the process to be followed for assessing and addressing the air quality impacts of new development. It also gives guidance on undertaking emissions mitigation assessments (EMAs), the guidance states EMAs should include a statement explaining the "Standard Air Quality Mitigation" (mandatory mitigation for new development) that will be included in the Proposed Development, the Air Quality Damage Costs methodology followed and the calculated costs to be spent on "Additional Air Quality Mitigation", either on- or proven off-site air quality mitigation schemes.

3 ASSESSMENT SCOPE

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative assessment of construction phase fugitive dust impacts;
- Advanced dispersion modelling assessment of air quality impacts of the proposed development traffic under the following three scenarios:
  - (i) Scenario 1 (S1) - 'Baseline' scenario representing the 'existing' air quality situation in 2019;
  - (ii) Scenario 2 (S2) - 'Without Development' scenario (2025, the expected year of opening, without the proposed development in place); and
  - (iii) Scenario 3 (S3) - 'With Development' scenario (2025, the expected year of opening and with the proposed development in place).
- Consideration of possible mitigation measures, where appropriate; and
- Recommendation for any further work.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

A desk-based study has been undertaken including a review of monitoring data available from MBC and estimated background data from the LAQM Support website maintained by Defra. Consideration has also been given to potential sources of air pollution and any AQMAs in the vicinity of the application site.

3.3 Construction Phase Assessment

3.3.1 Construction Dust and Particulate Matter

Demolition and construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM's construction dust guidance.

Three separate dust impacts were considered:

- Disamenity due to dust soiling;
- The risk of health effects due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors.

In order to assess the potential impacts of construction, activities are divided into four types:

- Demolition;
- Earthworks;
- Construction; and
- Trackout[2].

The risk of dust and PM_{10} arising to cause disamenity and/or health or ecological impacts was based on an assessment of likely emissions magnitude and the sensitivity of the surrounding environment. The risk category may be different for each of the four 'construction' activities.

Appendix A sets out the construction dust assessment methodology in detail as per IAQM construction dust guidance. Once the level of risk has been determined, then site specific mitigation proportionate to the level of risk can be identified (as detailed in Appendix C).

The Magic Map application available online by Defra was used to identify statutory ecological receptors near the proposed development site area.

3.3.2 Emissions to Air from Construction Traffic and Plant

Exhaust emissions from construction phase vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the proposed development site and in the vicinity of the proposed development site itself. Detailed information on the number of vehicles and plant associated with the construction phase is not available at this stage (and would not be until after appointment of the main construction contractors). Therefore, a qualitative impact assessment has been undertaken based on professional judgement and considering the following factors:

- The likely duration of the construction phase;
- The potential number and type of construction traffic and plant that could be required; and
- The number and proximity of sensitive receptors to the proposed development site and along the likely construction vehicle routes.

3.4 Operational Phase Impact Assessment

[2] Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto public road network, where it may be deposited and then re-suspended by vehicles using the network.

3.4.1 Traffic Emissions

The proposed development will generate additional traffic emissions in the local area. NO_2, PM_{10} and $PM_{2.5}$ are generally regarded as the most significant air pollutants released by vehicular combustion processes (as they tend to be more likely to be close to exceeding statutory limits in an urban environment), or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

The EPUK-IAQM 2017 guidance provides an approach for determining the significance of air quality impacts associated with a development in relation to emissions from traffic. To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change 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. The approach is further described in Appendix B including the descriptors for the impact significance.

The following subsectors provide further information regarding proposed methodology and dispersion model input for the air quality impact assessment.

3.4.2 Modelling Software

ADMS-Roads is an advanced dispersion model developed by the UK consultancy CERC (Cambridge Environmental Research Consultants). ADMS-Roads is widely used and validated within the UK and Europe. The model allows for the skewed nature of turbulence within the atmospheric boundary layer. ADMS-Roads is capable of processing hourly sequential meteorological data, whilst taking the turbulence caused by vehicles into account in calculating the dispersion profiles of emitted pollutants. ADMS-Roads enables the user to predict concentrations of pollutants of concern at multiple receptor locations.

ADMS-Roads (Version 5.0.0.1) has been used for assessing potential road traffic emission air quality impacts resulting from the operational phase of the proposed development, and the potential exposure of future residents at the proposed development site to poor air quality.

3.4.3 Modelling Scenarios

The following scenarios have been considered in this assessment:

- Scenario 1 (S1): 2019 Base year model verification;
- Scenario 2 (S2): 2025 Opening year - without the Proposed Development;
- Scenario 3 (S3): 2025 Opening year - with the Proposed Development.

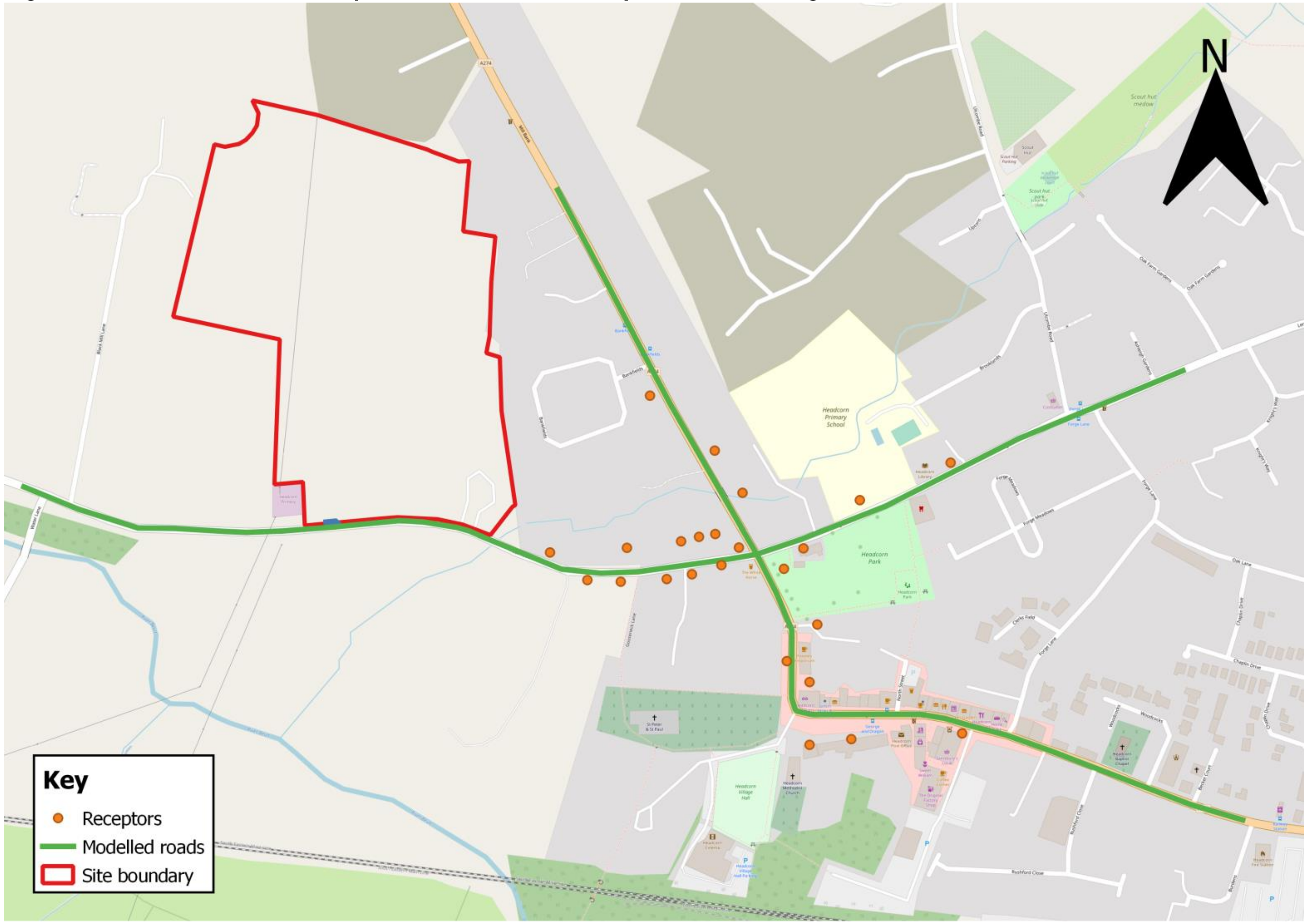
The 2019 base year was selected to represent the ‘base case’ and for model verification. The completion data of the development is currently unknown at the time of writing, and an estimated completion year of 2025 is used. Therefore, 2025 was used as the ‘opening year’ in this assessment.

3.4.4 Traffic Data

Traffic data used in the air quality assessment were provided by the appointed project transport consultant, DTA. The traffic data used in the air quality dispersion modelling are presented in Appendix D.

The road network included in the dispersion model is presented in Figure 3.1. Guidance in LAQM TG.22 and professional judgement was used to estimate speeds for use within the assessment, including reduced speeds at junctions.

Figure 3.1: The Roads and Receptors Included in the Dispersion Modelling Assessment



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3.4.5 Traffic Emission Factors

Version 11.0 of the emissions factor toolkit (EFT), published by Defra, was used to derive vehicle emissions factors (i.e. the amount of pollution emitted from the vehicle fleet, in g/km/s) for nitrogen oxide (NO_x), PM_{10} and $PM_{2.5}$. Within the EFT, emission factors are available for 2018 through to 2050 for England (not London), and 2018 to 2030 for Wales, Scotland, Northern Ireland and London.

EFT version 11.0 takes into account the most recent evidence relating to factors such as advances in vehicle and exhaust technology and changes in composition of the vehicle fleet. The emission factors consequently reduce over time. Emission factors for 2019 were used to estimate vehicle emissions for S1 modelling scenario and 2025 emission factors were used for S2 and S3.

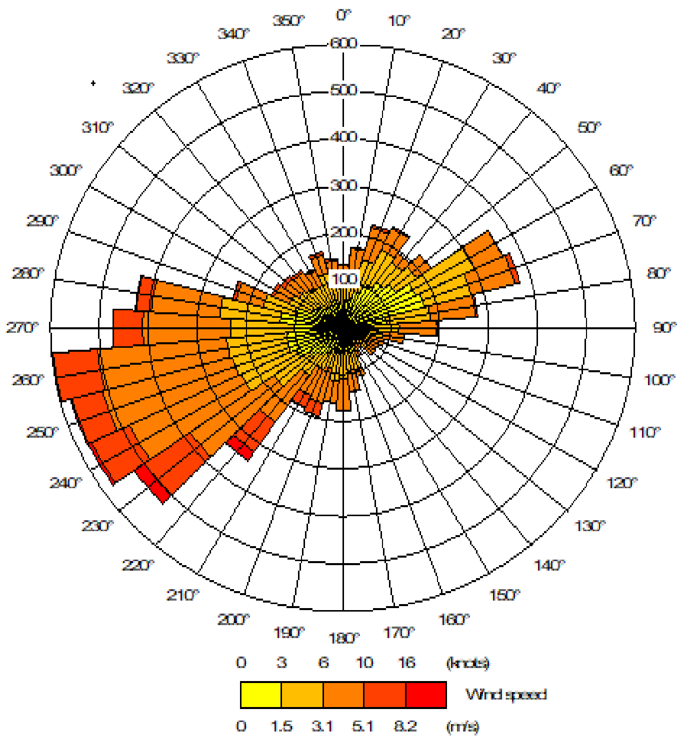
3.4.6 Time-Varying Profile

Vehicle movements vary with time. Diurnal profiles for the roads included within the model were not available and instead the UK National Profile 2019 published by the Department for Transport (DfT) was applied to all of the assessed roads. The diurnal profile is presented in Appendix D. A value of 1 on the y-axis is equivalent to the hourly average flow over 24 hours.

3.4.7 Meteorological Data

2019 hourly sequential meteorological data from the Herstmonceux West End meteorological station was employed in the dispersion model. This meteorological station is located approximately 36.6 km to the south-west of the study area and is considered to be representative of the development site condition. The windrose derived from the 2019 dataset is presented in Figure 3.2. The predominant wind direction was from the west, south west.

Figure 3.2 Windrose from the Herstmonceux West End Meteorological Station in 2019



3.4.8 Sensitive Receptor Locations

Pollutant concentrations were predicted at a number of human receptors at the proposed site and along the roads included in the study at locations where the greatest changes in traffic flows were predicted due to the operational phase. A height of 1.5m and 1m was used for human receptors to represent the approximate average breathing height of an adult and children respectively. Details of all specific human receptors included in the modelling study (and hence the air quality impacts assessed) are summarised in Table 3.1. The locations of all assessed receptors are shown in Figure 3.1.

Table 3.1 Diffusion Tubes and Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
Diffusion tubes used for verification				
Maid P3A	Diffusion tube, Down Pipe of Sainsbury façade along North Street	583461.6	144211.4	1.8

Receptor ID	Receptor Location	Grid Reference		Height (m)
Maid P3B	Diffusion tube, junction of North Street with Kings Road	583281.9	144348.7	2
Maid P3C	Diffusion tube, junction of Mill Bank and Moat Road	583251	144365.92	1.8
Receptors				
ER1	Existing residential receptor, The Moat, Moat Road (closest receptor to site entrance)	583076.9	144359.6	1.5
ER2	Existing residential receptor, Moat Road	583134.1	144363.1	1.5
ER3	Existing receptor, Moat Road	583196.7	144373.8	1.5
ER4	Existing residential receptor, Moat Road	583213	144378.5	1.5
ER5	Existing residential receptor, Moat Road	583228	144380.9	1.5
ER6	Existing residential receptor, Moat Road	583166.2	144337.2	1.5
ER7	Existing residential receptor, Moat Road	583195.9	144341.7	1.5
ER8	Existing residential receptor, Moat Road	583184.7	144340.7	1.5
ER9	Existing residential receptor, Moat Road	583207.4	144344.2	1.5
ER10	Existing residential receptor, Moat Road	583234.5	144353.3	1.5
ER11	Existing residential receptor, North Street	583324	144299.1	1.5
ER12	Existing residential receptor, North Street	583297.6	144267.5	1.5
ER13	Existing residential receptor, North Street	583319.2	144249	1.5
ER14	Existing residential receptor, North Street	583323.3	144198.9	1.5
ER15	Existing residential receptor, North Street	583359.7	144202.2	1.5
ER16	Existing residential receptor, King's Road	583309.3	144371.4	1.5
ER17	Existing receptor, King's Road	583360.2	144416.6	1
ER18	Existing receptor, King's Road	583441.6	144454.7	1
ER19	Existing residential receptor, Mill Bank	583251.5	144420.3	1.5
ER20	Existing residential receptor, Mill Bank	583224.6	144458	1.5
ER21	Existing residential receptor, Mill Bank	583163.4	144506.2	1.5

3.4.9 Background Air Quality Data Used in the Modelling

Given that there are currently no nearby representative background monitoring locations for NO_2, PM_{10} and $PM_{2.5}$, background concentrations for NO_2, PM_{10} and $PM_{2.5}$ were obtained from the 2018-based background maps on the Defra LAQM Support website, which provides estimated annual average background concentrations of NO_2, PM_{10} and $PM_{2.5}$ on a 1 km^2 grid basis. The Defra LAQM background concentration maps assume that background concentrations will improve (i.e. reduce) over time, in line with predicted reduction in vehicle emissions as well as reduction in emissions from other sources. For a conservative approach, Defra background data for 2019 has been used for all modelled scenarios. The background concentrations included in the dispersion modelling assessment are presented in Table 3.2.

Table 3.2 Estimated 2019 Background Concentrations Included in the Assessment

Receptor	2019 Annual Average (µg/m^3)			Source
	NO_2	PM_{10}	$PM_{2.5}$	
ER1	9.12	14.40	9.50	NO_2, PM10 & $PM_{2.5}$ – 2019 estimated data from Defra 2018 based Background maps
ER2	9.12	14.40	9.50	
ER3	9.12	14.40	9.50	
ER4	9.12	14.40	9.50	
ER5	9.12	14.40	9.50	
ER6	9.12	14.40	9.50	
ER7	9.12	14.40	9.50	
ER8	9.12	14.40	9.50	
ER9	9.12	14.40	9.50	
ER10	9.12	14.40	9.50	
ER11	9.12	14.40	9.50	
ER12	9.12	14.40	9.50	
ER13	9.12	14.40	9.50	
ER14	9.12	14.40	9.50	
ER15	9.12	14.40	9.50	
ER16	9.12	14.40	9.50	
ER17	9.12	14.40	9.50	
ER18	9.12	14.40	9.50	
ER19	9.12	14.40	9.50	
ER20	9.12	14.40	9.50	
ER21	9.12	14.40	9.50	

3.4.10 Other Model Input Parameters

In order to represent the nature of the study area and surrounding area, a surface roughness of 0.3 was used in the model. The Monin-Obukhov length (related to atmospheric stability) was assumed to be 10m (Small towns). Settings were adjusted at the meteorological data site; a surface roughness of 0.2 and a Monin-Obukhov length of 10m (Small towns) were used.

3.4.11 Model Verification and Results Processing

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 study area considered in this assessment. 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 attempts 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 LAQM.TG.22.

There are seventy-four diffusion tube locations within Maidstone. Three of them (i.e. Maid P3A, Maid P3B, Maid P3C) are located within the study area. Diffusion tube Maid P3A, Maid P3B, Maid P3C are roadside monitors where traffic data is available and situated close to roads (less than 5m), which is considered to be representative monitoring location of the development site. Therefore, 2019 monitored annual mean NO_2 concentration from these diffusion tubes have been used to verify the predicted road NO_x concentrations. Diffusion tube Maid P3A is situated outside of Sainsbury's along North Street. Maid P3B is situated along North Street, near the junction connecting to King's road. Diffusion P3C is located along moat road.

Full details of the verification calculations are presented within Appendix E.

An adjustment factor of 1.88 was obtained as part of the verification process for NO_2. The adjustment factor was applied to the modelled road-NO_x component before estimation of annual mean NO_2 concentrations using the NO_x: NO_2 calculator (version 8.1) available from the Defra website.

Local monitoring data are not available for concentrations of PM_{10} and $PM_{2.5}$ and consequently, the predicted road-PM_{10} and road-$PM_{2.5}$ contributions were adjusted using the factor calculated for road-NO_x, before adding the appropriate background concentrations. This approach is consistent with guidance given in LAQM.TG.22.

LAQM TG.22 advises that an exceedance of the 1 hour mean NO_2 objective is unlikely to occur where the annual mean concentration is below 60µg/m^3, where road transport is the main source of pollution. This concentration has been used to screen whether the hourly mean objective is likely to be achieved.

Once processed, the predicted concentrations (full results presented in Section 5) were compared against the current statutory limit values and objectives for NO_2, PM_{10} and $PM_{2.5}$ set out in Table 2.1.

The modelling input parameters for the dispersion modelling assessment are presented in Table 3.3.

Table 3.3 Summary of Inputs to the Dispersion Model

Parameter	Brief description	Input into Model
Emission year	Predicted emission rates depend on the year of emission being used	2019 for S1, 2025 for S2 and S3
Road source emissions	Road source emission rates calculated from traffic flow data using an emission factor toolkit from AQC or Defra EFT	EFT V11.0
Time varied emissions	Diurnal variations of emissions applied to road sources	2019 national diurnal profile
Road elevation	Elevation of road above ground level	No elevated roads and no terrain file used (due to relatively flat nature of study area)
Road width	Width of road (m)	Road widths determined based on approximate measurement of roads (internet mapping)
Road type	Selection of different types of road to be assessed, inputted into the emission factor toolkit calculations	'Rural (not London)' settings
Road speeds	Speed of the road effects the vehicle emissions to air	Standard speed limits used and professional judgement with slowing at junctions or bends. Adjustment to speed limits used from proposed changes with development.
Meteorology	Representative hourly sequential meteorological data	Herstmonceux West End meteorological station 2019
Latitude	Allows the location of the model area to be determined	51°
Surface roughness	This defines the surface roughness of the model area	0.3m
Monin-Obukhov length	A boundary layer parameter required to precisely describe the atmospheric stability conditions and to predict dispersion of pollutants released from road	10m

	traffic	

3.5 Uncertainties and Assumptions

The following uncertainties and assumptions have been made in the air quality assessment:

- In the absence of measured NO_2, PM_{10} and $PM_{2.5}$ at the proposed development location, estimated background data from the Defra LAQM website were used in the assessment. In reality, baseline air quality levels vary with time and location but in the absence of on-site baseline monitoring data, the assumption that the baseline concentrations obtained from the above-mentioned data source is applicable to the site location, is considered appropriate;
- Emissions from the average vehicle fleet using the local road network cannot be known, and therefore it is assumed those generated by the EFT provide an accurate representation of emissions generated by vehicles which currently and will use the modelled roads.
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Herstmonceux West End meteorological station in 2019 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain in order to simplify the real-world dilution and dispersion conditions;
- An important step in the assessment is verifying the dispersion model against measured data. The model verification was based on the comparison of model results based on 2019 traffic data with 2019 measured roadside NO_2 diffusion tube data. As no PM_{10} or $PM_{2.5}$ monitoring data were available near the site area, the adjustment factors used for the predicted roadside NO_x concentrations have been applied to the predicted PM_{10} and $PM_{2.5}$ concentrations, as per guidance in LAQM.TG.22.
- The national diurnal profile published by the Department for Transport for 2019, has been assumed to be applicable for the roads assessed.
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

4.1 Emissions Sources and Key Air Pollutants

The proposed development is adjacent to residential areas to the north and agricultural land to the west of the site. The main source of air pollution is likely to be road traffic exhaust emissions. The site is bounded by Moat Road to the south.

The principal pollutants relevant to this assessment are considered to be NO_2, PM_{10} and $PM_{2.5}$, generally regarded as the most significant air pollutants released by vehicular combustion processes, or subsequently generated by vehicle emissions in the atmosphere through chemical reactions.

4.2 Presence of AQMAs

MBC has currently declared two Air Quality Management Areas (AQMAs) as follows:

- Maidstone Town AQMA
- Maidstone Borough AQMA

The closest AQMA to the proposed development is approximately 8km away, hence the proposed development site is not located within, or close to an AQMA.

4.3 Local Authority Air Quality Monitoring Data

According to the MBC's 2020 Air Quality Annual Status Report, there were two automatic monitoring stations and a network of 74 diffusion tube monitoring locations in 2019.

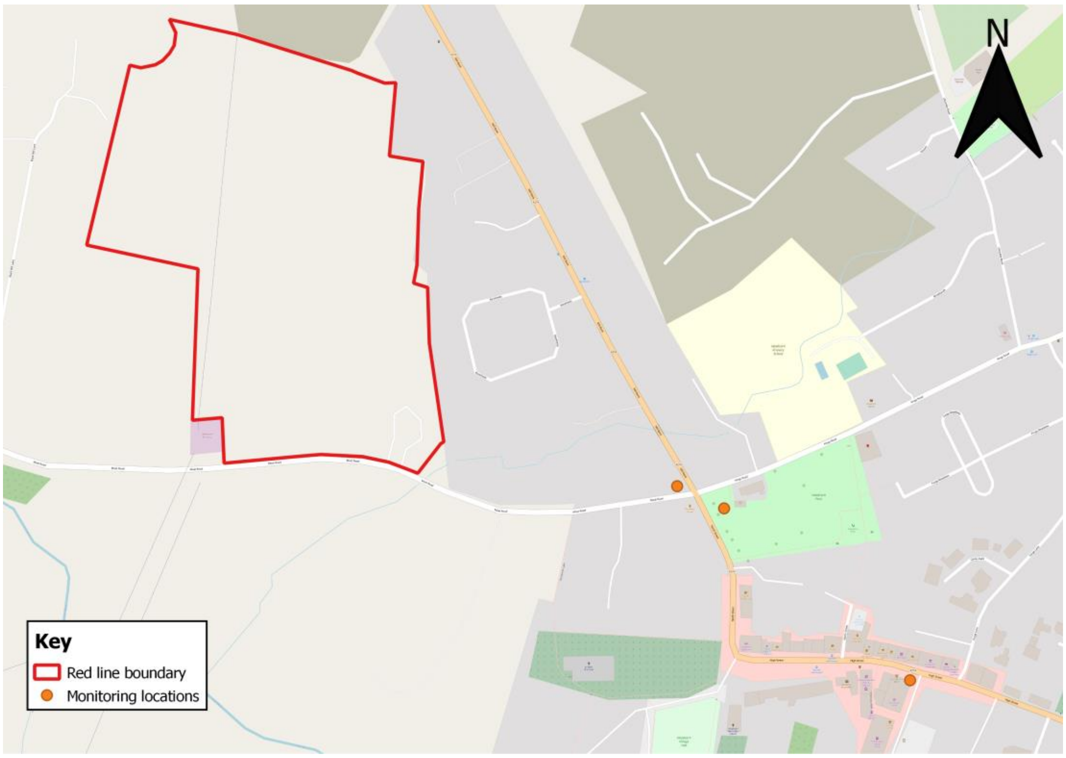
There were three diffusion tubes 1 km and of the proposed development site. No annual NO_2 data is available prior to 2019 for the selected locations. The 2019 annual average NO_2 concentrations for the diffusion tubes within 1 km from the proposed development site are reproduced in Table 4.1 below. The data from these tubes show that there were no exceedances of the annual mean NO_2 AQS (40µg/m^3) in 2019.

Table 4.1: Annual Mean Measured NO_2 Concentrations at Diffusion Tubes within 1 km of the Proposed Development Site

Site ID	Location	Site Type	Approx distance from proposed development (km)	Annual Mean NO_2 Concentrations (µg/m^3)

				2019
Maid P3A	Down Pipe of Sainsbury façade facing High St but adjacent to junction of track to car park TN27 9NE	Roadside	0.7	19.3
Maid P3B	Good Intent road sign pole, junction of North St with Kings Rd TN27 9NT	Roadside	0.5	17.8
Maid P3C	On road sign bracket junction of Mill Bank and Moat Rd TN27 9NT	Roadside	0.4	16.7

Figure 4.1: Monitoring Location within 1km of the Proposed Development Site



4.4 LAQM Background Data

In addition to local monitoring data, estimated background air quality data available from the Local Air Quality Management (LAQM) website operated by Defra, may also be used to establish likely background air quality conditions at the proposed development site.

This website provides estimated annual average background concentrations of NO_2, PM_{10} and $PM_{2.5}$ on a 1km^2 grid basis. Table 4.3 identifies estimated annual average background concentrations for the grid square containing the proposed development site for years from 2019, 2022 and 2023.

No exceedances of the NO_2, PM_{10} or $PM_{2.5}$ AQSs are predicted. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective annual mean standards.

Table 4.3: Estimated Background Annual Average NO_2, PM_{10} and $PM_{2.5}$ Concentrations at Proposed Development Site (from 2018 base map)

Assessment Year	Estimated Annual Average Pollutant Concentrations Derived from the LAQM Website (µg/m^3)		
	NO_2	PM_{10}	$PM_{2.5}$
2019	8.3	14.3	9.1
2022	7.46	13.71	8.59
2023	7.29	13.53	8.45
Air Quality Objective	**40**	**40**	**25**

Note: Presented concentrations for 1 km^2 grid centred on 582500, 144500; approximate centre of development site is 582892, 144581.

5 ASSESSMENT OF IMPACTS

5.1 Construction Phase

Atmospheric emissions from construction activities will depend on a combination of the potential for emissions (the type of activity and prevailing conditions) and the effectiveness of control measures. In general terms, there are two sources of emissions that will need to be controlled to minimise the potential for adverse environmental effects:

- exhaust emissions from site plant, equipment and vehicles; and
- fugitive dust emissions from site activities.

5.1.1 Exhaust Emissions from Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing the pollutants NO_x, PM_{10}, volatile organic compounds (VOCs) and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition. The operation of site equipment, vehicles and machinery will result in emissions to atmosphere of exhaust gases, but such emissions are unlikely to be significant, particularly in comparison to levels of similar emission components from vehicle movements on the local road network surrounding the development site.

Construction traffic will comprise haulage/construction vehicles and vehicles used for workers' trips to and from the site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network. At this stage, it is estimated that there will be 10-50 HDV outward movements per day, which is considered unlikely to cause a significant impact on local air quality, in accordance with the IAQM guidance.

5.1.2 Fugitive Dust Emissions

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture content, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

Fugitive dust arising from construction and demolition activities is mainly of a particle size greater than the PM_{10} fraction (that which can potentially impact upon human health). However, it is noted that demolition and construction activities may contribute to local PM_{10} concentrations. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

5.1.3 Potential Dust Emission Magnitude

With reference to the IAQM guidance criteria outlined in Appendix A, the dust emissions magnitude for demolition, earthworks, construction and trackout activities are summarised in Tables 5.1, 5.2, 5.3 and 5.4. Risk categories for the four construction activities are summarised in Table 5.5.

Worst-case assumptions have been made, where information is not currently available, for a conservative assessment.

Table 5.1: Summary of Dust Emissions Magnitude of Demolition Activities (Before mitigation)

Demolition Criteria	Dust Emissions Class	Evaluation of the Effects
Total volume of buildings to be demolished	Small	<12,000m^3
Height of demolition activities above ground	Small	<6m
Dust potential of demolition materials	Medium	Yes
Overall Rating	**Small**	Conservative Rating based on professional judgement

Table 5.2: Summary of Dust Emissions Magnitude of Earthworks Activities (Before mitigation)

Earthworks Criteria	Dust Emissions Class	Evaluation of the Effects
Total site area	Medium	18,000-110,000 m^2
Soil type	Large	Potentially dusty soil on-site, clays
Earth moving vehicles at any one time	Medium	5-10
Height of bunds	Small	<4 m
Total material moved	Medium	20,000–100,000 tonnes
Overall Rating	**Large**	Conservative rating based on professional judgement

Table 5.3: Summary of Dust Emissions Magnitude of Construction Activities (Before mitigation)

Construction Criteria	Dust Emissions Class	Evaluation of the Effects
Total building volume	Large	>75,000m^3
Dust potential of construction materials	Medium	Yes, assumed no on-site concrete batching or sandblasting
Overall Rating	**Medium-Large**	Conservative rating based on professional judgement

Table 5.4: Summary of Dust Emissions Magnitude of Trackout Activities (Before mitigation)

Trackout Criteria	Dust Emissions Class	Evaluation of the Effects

Trackout Criteria	Dust Emissions Class	Evaluation of the Effects
Number of HDV>3.5t per day	Medium	<10-50
Surface type of the site	Medium	Potentially dusty soil on-site
Length of unpaved road	Small	<50 m
Overall Rating	**Medium**	Conservative rating based on professional judgement

Table 5.5: Summary of Dust Emission Magnitude of the Site (Before mitigation)

Construction Activities	Dust Emissions Magnitude
Demolition	Small
Earthworks	Large
Construction	Medium-Large
Trackout	Medium

5.1.4 Sensitivity of the Area

The assessed sensitivity of the area takes into account a number of factors, including:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human and ecological receptors. Distances are estimated from the construction site boundary and the trackout route proposed. Where necessary, for example, the trackout route is not yet known, a conservative view on the likely route has been taken.

Construction and trackout 'buffers' were used to identify the sensitivity of the area (refer to Figure 5.1 to 5.2). Table 5.6 presents the determined significance of the area. Construction activities are relevant up to 350m from the proposed development site boundary whereas trackout activities are only considered relevant up to 200m from the edge of the road, as per the IAQM guidance. Only 20m and 50m buffers have been included for trackout for this reason. Figures 5.1 and 5.2 show maps indicating the demolition/earthworks/construction and trackout buffers, for identifying the sensitivity of the area.

No designated ecological statutory sites have been identified within 50m of the application site boundary therefore following the IAQM guidance, ecological receptors have been screened out of the assessment for demolition, earthworks and construction. However, the River Beult, a site of special scientific interest, is located 150m to the south of the site and within 50m of the potential trackout routes along Moat Road.

Figure 5.1: Demolition/Earthworks/Construction Activities Buffer Map

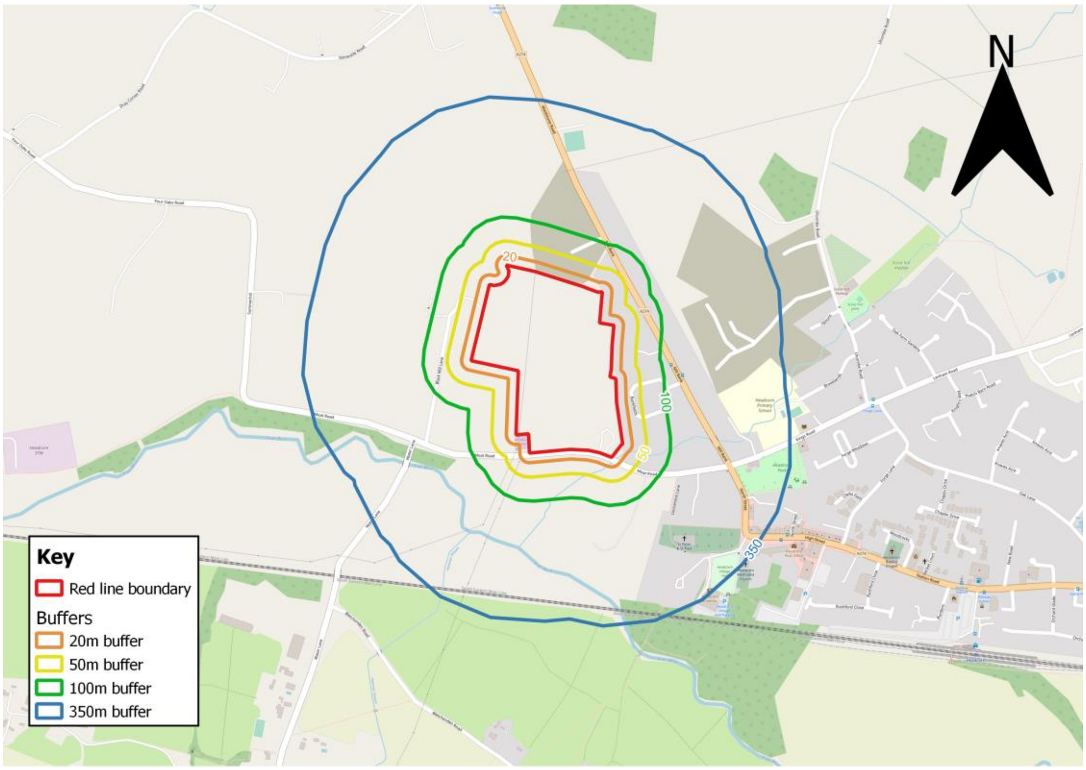


Figure 5.2: Trackout Activities Buffer Map

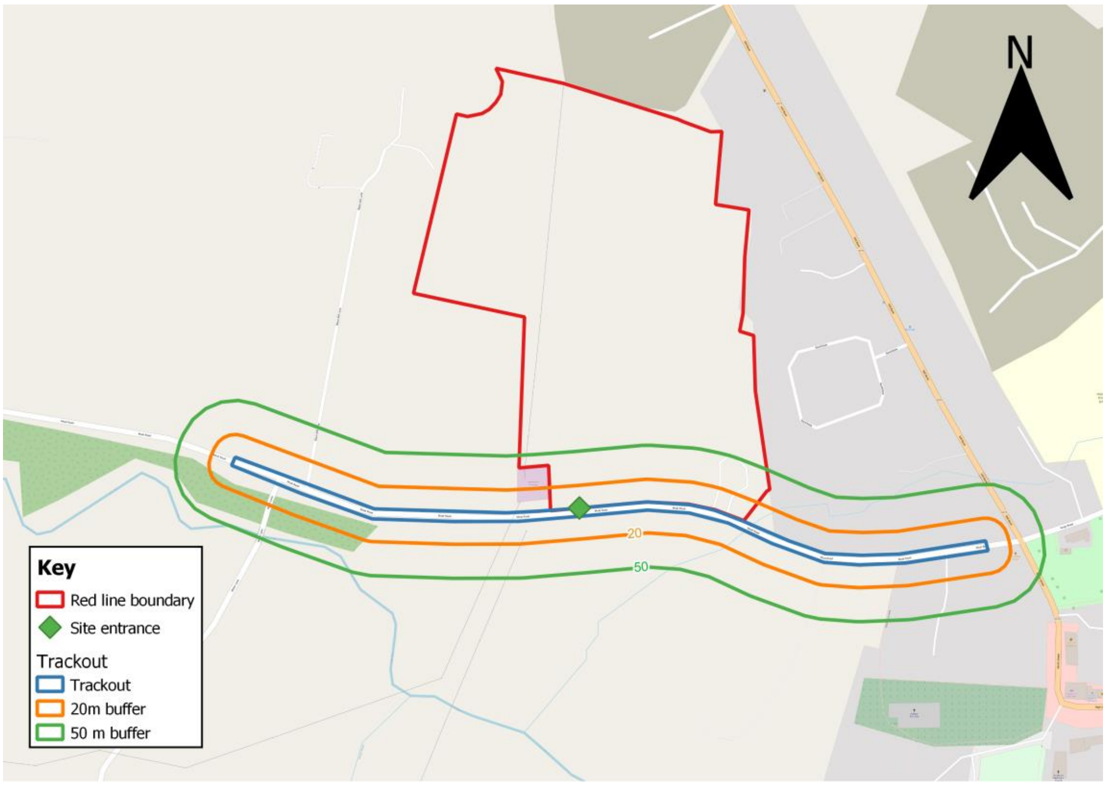


Table 5.6: Sensitivity of the area

Potential Impact		Sensitivity of the surrounding area			
		Demolition	Earthworks	Construction	Trackout
Dust soiling	Receptor sensitivity	High	High	High	High
	Number of receptors	10-100	10-100	10-100	1-10
	Distance from the source	<50m	<50m	<50m	<20m
	Sensitivity of the area	**Medium**	**Medium**	**Medium**	**Medium**
Human health	Receptor sensitivity	High	High	High	High
	Annual mean PM_{10} concentration	<24µg/m³	<24µg/m³	<24µg/m³	<24µg/m³
	Number of receptors	10-100	10-100	10-100	1-10
	Distance from the source	<20m	<20m	<20m	<20m
	Sensitivity of the area	**Low**	**Low**	**Low**	**Low**
Ecological	Receptor sensitivity	N/A	N/A	N/A	High
	Distance from the source	N/A	N/A	N/A	<50
	Sensitivity of the area	**N/A**	**N/A**	**N/A**	**Medium**

5.1.5 Risk of Impacts

The dust emission magnitude is combined with the sensitivity of the area to determine the risk of impacts of construction activities before mitigation; these are evaluated based on risk categories of each activity in Appendix A. The risk of dust impacts from construction activities is identified in Table 5.7. Site specific mitigation measures to reduce construction phase impacts are defined based on this assessment in Section 6 and Appendix C.

Table 5.7: Summary of the Dust Risk from Construction Activities

Potential Impact	Dust Risk Impact			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	Low Risk	Medium Risk	Medium Risk	Low Risk
Human health	Negligible Risk	Low Risk	Low Risk	Low Risk
Ecological	N/A	N/A	N/A	Low Risk

5.2 Operational Phase

5.2.1 Dispersion Modelling Results

Detailed dispersion modelling has been undertaken with the use of the ADMS-Roads dispersion model software, following guidance in LAQM.TG.22. The modelled concentrations have been verified and results processed as detailed in Section 3 and Appendix E.

Full results are presented in Appendix F and a summary is provided below.

5.2.1.1 Nitrogen Dioxide (NO_2)

The AQS objective for annual mean NO_2 concentrations is 40µg/m^3. The results of the assessment show that concentrations are predicted to meet the annual mean NO_2 objective at all assessment receptors.

Table 5.8 shows the comparison of annual mean NO_2 concentrations between the 'S2 2025 without proposed development' and 'S3 2025 with proposed development' scenarios at the assessed receptor locations. The percentage changes in annual mean NO_2 concentrations relative to the air quality objective and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

The proposed development is not predicted to cause any new exceedances of the annual mean NO_2 objective.

The changes in annual mean NO_2 concentrations as a result of the proposed development and traffic redistribution, range between 0% and 1% of the air quality assessment level (AQAL). The impacts of the proposed development on nearby sensitive receptors are predicted to be 'negligible' at all receptor locations.

LAQM.TG(22) notes that 'exceedances of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60µg/m^3 or above'. In the opening year of 2025, annual mean NO_2 concentrations (see Table 5.8) are not predicted to exceed 60µg/m^3 at any receptors. Therefore, it is not anticipated that the hourly mean NO_2 objective would be exceeded at the site prior to or when the proposed development becomes operational.

Table 5.8: Predicted Annual Mean NO_2 Impact

Receptor ID	Annual Mean NO_2 Concentration					Impacts**
	AQ-S2 – 2025 Without Development		AQ-S3 - 2025 With Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	NO_2 Concentration ($\mu g/m^3$)	As % of AQAL	NO_2 Concentration ($\mu g/m^3$)	As % of AQAL		
ER1	11.2	28.1	11.6	29.0	1	Negligible
ER2	10.9	27.2	11.1	27.8	1	Negligible
ER3	11.5	28.7	11.7	29.3	1	Negligible
ER4	11.9	29.8	12.2	30.4	1	Negligible
ER5	12.7	31.9	13.0	32.5	1	Negligible
ER6	11.7	29.3	12.1	30.3	1	Negligible
ER7	12.0	30.1	12.4	31.1	1	Negligible
ER8	12.0	30.0	12.4	31.1	1	Negligible
ER9	12.3	30.8	12.7	31.8	1	Negligible
ER10	14.2	35.4	14.8	36.9	1	Negligible
ER11	13.0	32.5	13.1	32.6	0	Negligible
ER12	15.9	39.7	15.9	39.8	0	Negligible
ER13	14.2	35.6	14.3	35.7	0	Negligible
ER14	12.3	30.7	12.3	30.8	0	Negligible
ER15	12.9	32.2	12.9	32.2	0	Negligible
ER16	14.6	36.6	14.7	36.8	0	Negligible
ER17	12.2	30.4	12.2	30.5	0	Negligible
ER18	12.2	30.5	12.2	30.6	0	Negligible
ER19	13.9	34.7	14.1	35.3	1	Negligible
ER20	14.1	35.1	14.3	35.8	1	Negligible
ER21	12.9	32.3	13.1	32.8	0	Negligible

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, have been described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

5.2.1.2 Particular Matter (PM_{10})

Table 5.9 shows the comparison of annual mean PM_{10} concentrations between the 'S2 2025 without proposed development' and 'S3 2025 with proposed development' scenarios at the assessed receptor locations. The percentage changes in annual mean PM_{10} concentrations relative to the air quality objective and the classification of impact magnitudes with reference to the EPUK-IAQM guidance are also presented.

Predicted annual mean concentrations of PM_{10} are all below the AQS objective of 40µg/m^3 for all modelled scenarios.

The proposed development is not predicted to cause any new exceedances of the annual mean PM_{10} objective.

The changes in annual mean PM_{10} concentrations as a result of the proposed development are 0% of the AQAL (i.e. <0.5% and therefore no perceptible change). The impacts of the proposed development on nearby sensitive receptors in relation to PM_{10} concentrations are predicted to be 'negligible' at all receptor locations.

LAQM TG.22 indicates that the number of annual exceedances of the 24-hour mean PM_{10} AQS can be estimated using the following formula: *-18.5 + 0.00145 × annual mean*^{3} *+ (206/annual mean).* Table 5.10 presents results for the 24-hour mean PM_{10} concentrations as number of day greater than 50µg/m^3 for S2 and S3. The objective for 24-hour mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year. The number of days exceeding 50µg/m^3 predicted is a maximum of 1 day/annum, which is well below the objective.

The results indicate that in the opening year of 2025, no exceedances of annual mean PM_{10} concentrations are predicted with the proposed development at any of the proposed receptors.

Table 5.9: Predicted Annual Mean PM_{10} Impact

Receptor ID	Annual Mean PM_{10} Concentration					Impacts**
	AQ-S2 - 2025 Without Development		AQ-S3 - 2025 With Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	PM_{10} Concentration ($\mu g/m^3$)	As % of AQAL	PM_{10} Concentration ($\mu g/m^3$)	As % of AQAL		
ER1	14.81	37	14.88	37	0	Negligible
ER2	14.74	37	14.78	37	0	Negligible
ER3	14.85	37	14.90	37	0	Negligible
ER4	14.93	37	14.98	37	0	Negligible
ER5	15.09	38	15.14	38	0	Negligible
ER6	14.90	37	14.98	37	0	Negligible
ER7	14.95	37	15.03	38	0	Negligible
ER8	14.95	37	15.03	38	0	Negligible
ER9	15.00	38	15.08	38	0	Negligible
ER10	15.33	38	15.45	39	0	Negligible
ER11	15.17	38	15.19	38	0	Negligible
ER12	15.79	39	15.81	40	0	Negligible
ER13	15.41	39	15.42	39	0	Negligible
ER14	15.02	38	15.03	38	0	Negligible
ER15	15.16	38	15.17	38	0	Negligible
ER16	15.38	38	15.41	39	0	Negligible
ER17	14.99	37	15.00	38	0	Negligible
ER18	15.02	38	15.03	38	0	Negligible
ER19	15.36	38	15.42	39	0	Negligible

Receptor ID	Annual Mean PM_{10} Concentration					Impacts**
	AQ-S2 - 2025 Without Development		AQ-S3 - 2025 With Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	PM_{10} Concentration ($\mu g/m^3$)	As % of AQAL	PM_{10} Concentration ($\mu g/m^3$)	As % of AQAL		
ER20	15.41	39	15.48	39	0	Negligible
ER21	15.18	38	15.23	38	0	Negligible

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

Table 5.10: Predicted 24-Hour Mean PM_{10} Impact

Receptor ID	24-Hour Mean PM_{10}* (number of days >50µg/m³)		
	AQ-S2 - 2025 Without Development	AQ-S5 – 2025 With Development	Change between AQ-S2 and AQ-S3
ER1	0	0	0
ER2	0	0	0
ER3	0	0	0
ER4	0	0	0
ER5	0	0	0
ER6	0	0	0
ER7	0	0	0
ER8	0	0	0
ER9	0	0	0

Receptor ID	24-Hour Mean PM_{10}* (number of days >50µg/m^3)		
	AQ-S2 - 2025 Without Development	AQ-S5 – 2025 With Development	Change between AQ-S2 and AQ-S3
ER10	0	0	0
ER11	0	0	0
ER12	0	0	0
ER13	0	0	0
ER14	0	0	0
ER15	0	0	0
ER16	0	0	0
ER17	0	0	0
ER18	0	0	0
ER19	0	0	0
ER20	0	0	0
ER21	0	0	0
*Rounded to whole days			

5.2.1.3 Particular Matter ($PM_{2.5}$)

Table 5.11 shows the comparison of annual mean $PM_{2.5}$ concentrations between the 'S2 2025 without proposed development' and 'S3 2025 with proposed development' scenarios at the assessed receptor locations. The results as percentages of the AQAL (i.e. the UK AQS objectives) are also presented which are used in the determination of significance of impacts (based on the EPUK-IAQM guidance).

Predicted annual mean concentrations of $PM_{2.5}$ are all below the AQS objective of 25µg/m^3 for all modelled scenarios. The proposed development is not predicted to cause any new exceedances of the annual mean $PM_{2.5}$ objective.

The changes in annual mean $PM_{2.5}$ concentrations as a result of the proposed development are 0% of the AQAL (i.e. <0.5% and therefore no perceptible change). The impacts of the proposed development on nearby sensitive receptors in relation to $PM_{2.5}$ concentrations, are predicted to be 'negligible' at all receptor locations.

The results indicate that in the opening year of 2025, no exceedances of annual mean $PM_{2.5}$ concentrations are predicted with the proposed development at any of the proposed receptors.

Table 5.11: Predicted Annual Mean $PM_{2.5}$ Impact

Receptor ID	Annual Mean $PM_{2.5}$ Concentration					Impacts**
	AQ-S2 – 2025 Without Development		AQ-S3 - 2025 With Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL		
ER1	9.74	24	9.78	24	0	Negligible
ER2	9.70	24	9.73	24	0	Negligible
ER3	9.76	24	9.79	24	0	Negligible
ER4	9.81	25	9.84	25	0	Negligible
ER5	9.91	25	9.94	25	0	Negligible
ER6	9.79	24	9.84	25	0	Negligible
ER7	9.83	25	9.87	25	0	Negligible
ER8	9.82	25	9.87	25	0	Negligible
ER9	9.86	25	9.90	25	0	Negligible
ER10	10.05	25	10.12	25	0	Negligible
ER11	9.96	25	9.97	25	0	Negligible
ER12	10.32	26	10.33	26	0	Negligible
ER13	10.10	25	10.11	25	0	Negligible
ER14	9.87	25	9.87	25	0	Negligible
ER15	9.95	25	9.95	25	0	Negligible
ER16	10.09	25	10.10	25	0	Negligible
ER17	9.85	25	9.85	25	0	Negligible
ER18	9.86	25	9.87	25	0	Negligible
ER19	10.07	25	10.10	25	0	Negligible

Receptor ID	Annual Mean $PM_{2.5}$ Concentration					Impacts**
	AQ-S2 – 2025 Without Development		AQ-S3 - 2025 With Development		Change Between AQ-S2 and AQ-S3 as % of AQAL*	Impact of the proposed development
	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL	$PM_{2.5}$ Concentration (µg/m3)	As % of AQAL		
ER20	10.10	25	10.13	25	0	Negligible
ER21	9.96	25	9.99	25	0	Negligible

*As recommended in the EPUK-IAQM guidance, percentages have been rounded to whole numbers. Changes less than 0.5% i.e. 0%, will be described as negligible.

**Impacts are determined in accordance with EPUK-IAQM guidance.

5.2.2 Summary

Overall, the impact of the proposed development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at sensitive human receptors, prior to mitigation, is negligible; all receptor locations are not expected to be significantly impacted.

Predicted concentrations across the proposed development site itself show that future occupants are not predicted to be exposed to air quality exceeding the UK AQS objectives.

6 MITIGATION MEASURES & RESIDUAL IMPACTS

6.1 Construction Phase Mitigation

The dust emitting activities outlined in section 5.1 can be effectively controlled by appropriate dust control measures and any adverse effects can be greatly reduced or eliminated.

It is recommended that a dust management plan (DMP, which may be as part of a Construction Environmental Management Plan (CEMP)) for the construction phase should be prepared and agreed with the Local Authority to ensure that the potential for adverse environmental effects on local receptors is minimised. The DMP should include *inter alia*, measures for controlling dust and general pollution from site construction operations and include details of any monitoring scheme, if appropriate. Controls should be applied throughout the construction period to ensure that emissions are mitigated.

The dust risk categories identified have been used to define appropriate, site-specific mitigation methods. More detailed, site-specific mitigation measures are contained in Appendix C.

The traffic effects of the proposed development during the construction phase will be limited to a relatively short period and will be along traffic routes employed by haulage/construction vehicles and workers. Any effects on air quality will be temporary i.e. during the construction and demolition period only, and can be suitably controlled by the employment of mitigation measures appropriate to the development project.

With implementation of the proposed construction phase mitigation measures (detailed in Appendix C), the residual impacts are considered to be negligible.

6.2 Operational Phase Mitigation

As identified in section 5, the proposed development is not expected expose future users to poor air quality, the impact of the proposed development on air quality is predicted to be not significant.

At the time of writing, no significant stationary combustion sources such as combined heat and power (CHP) plants or biomass boilers are proposed within the development.

6.2.1 Emission Mitigation Assessment

MBC are part of the Kent and Medway Air Quality Partnership, and as such the proposed development requires that emissions damage costs are calculated for the proposed development site. The following tools were used for the damage cost calculation:

- Defra '*Emission Factors Toolkit v11.0*' (available online at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/); and
- Defra 'Air quality appraisal: damage cost toolkit' (available online at: https://www.gov.uk/government/publications/assess-the-impact-of-air-quality).

Step 1: Quantify change in emissions for NO_x and $PM_{2.5}$

- **Pollutants: NOx and $PM_{2.5}$** – road traffic is expected to be the main source of air pollutants once the development is operational. The principal pollutants relevant to this assessment are therefore considered to be nitrogen oxides (NO_x) and particulate matter (PM), which are generally regarded as the most significant air pollutant released by vehicular combustion processes. $PM_{2.5}$ has been used for PM in line with the Defra Air Quality Appraisal guidance.
- **Road Type: Rural (not London)**
- **Traffic Flow: 793 Annual Average Daily Trips (AADT) for Light Duty Vehicles (LDVs)** – data provided by project Transport Consultants,
- **Cars only** (that is, 0% HGV)
- **Average speed: 50 kph** (in accordance with Thanet guidance)
- **Trip length used: 10km**
- **Years: 2025-2029** - 2025 is the anticipated opening year of the first phase of the development. 5 years of emissions, in line with the Thanet guidance, have then been used up to 2029.

Table 6.1 presents the EFT output with the emissions converted from kg/yr to tonnes/yr.

Table 6.1: Converted EFT output

Emissions (tonnes/yr)					
	2025	2026	2027	2028	2029
NO_x	0.516	0.464	0.414	0.371	0.333
$PM_{2.5}$	0.0386	0.0384	0.0382	0.0380	0.0379

Step 2: Calculate damage costs for NO_x and $PM_{2.5}$

The Defra Damage Cost Appraisal Toolkit (updated March 2021) was used with the following input:

- Start year: 2025
- End year: 2029
- Price Based Year: 2022
- Number of Pollutants: 2 (NO_x and $PM_{2.5}$)
- Source: Road transport

Table 6.2 presents the damage cost calculation outputs. The damage cost calculation is considered to provide a basis for quantifying the financial commitment required for offsetting potential development-generated emissions. The calculated central damage cost value over a five-year period is **£43,431**.

Table 6.2 Damage Cost Appraisal Toolkit Output

Output from Damage Cost Appraisal Toolkit						
	2024	2025	2026	2027	2028	Total
Central Value NO_x	£6,039	£5,345	£4,707	£4,148	£3,675	**£23,913**
Central Value $PM_{2.5}$	£4,064	£3,977	£3,898	£3,824	£3,755	**£19,518**
					Total Central Value Costs	**£43,431**

The damage cost calculation is considered to provide a basis for quantifying the financial commitment required for offsetting potential development-generated emissions. The calculated central damage cost value over a five-year period is £43,431, which can be used to fund onsite mitigation measures or towards off site mitigation measures. It should be noted that the following mitigation measures are required as standard for the development:

- Electric Vehicle charging - 1 Electric Vehicle charging point per dwelling with dedicated parking or 1 charging point per 10 spaces (unallocated parking)

In addition to the above additional mitigation measures will be required. It is understood that at this stage design and costings for mitigation measures are not finalised and as such the money allocated will need to be discussed and agreed with MBC, and the extent of the total money for Air Quality mitigation should be equal to/greater than the value determined by the damage cost calculation (i.e. £43,431). A list of possible additional mitigation measure are available in MBCs Air Quality Planning Guidance in Table 6.

7 CONCLUSIONS

An air quality assessment for the proposed Moat Road, Headcorn development has been prepared with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

Construction phase impacts were assessed following the IAQM construction dust guidance. Mitigation measures are recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, no significant impacts are anticipated during the construction phase.

The principal air quality impact once the proposed development is complete and operational is likely to be emissions from the increased traffic on local roads surrounding the site. An assessment of operational phase impacts has been undertaken using the ADMS-Roads atmospheric dispersion model.

Concentrations of the key pollutants (NO_2, PM_{10} and $PM_{2.5}$) were predicted at relevant receptor locations for the base year and for 2025 without and with the proposed development. The air quality impacts were assessed as 'negligible' with respect to annual mean NO_2, PM_{10} and $PM_{2.5}$ at all assessed sensitive receptors. Therefore, the overall air quality impact of the development may be considered 'not significant'.

No significant stationary combustion sources such as combined heat and power (CHP) plants or biomass boilers are proposed within the development.

In accordance with MBC Air Quality Planning Guidance, the development is class as a major development. Therefore, an Emission Mitigation Assessment has also been undertaken. The damage cost calculation has been undertaken for both NO_x and PM, as these are the major pollutants associated with road traffic emission. The calculated central damage cost value is **£43,431**. Mitigation measures are recommended in Section 6. How the money is allocated should be discussed and agreed with MBC, and the extent of the total money for Air Quality mitigation should be equal to/greater than the value determined by the damage cost calculation (i.e. £43,431).

Based on the results of the assessment, it is judged that with appropriate construction phase mitigation, the proposed development complies with relevant national and local planning policies and that there are no air quality constraints.

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APPENDIX A
CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This appendix contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM construction dust guidance. The assessment follows the steps recommended in the guidance.

Step 1: Screen the requirement for assessment

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

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

Step 2A: Defining the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total building volume >75,000m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >12m above ground level;
- **Medium**: Total building volume 12,000m^3 – 75,000m^3, potentially dusty construction material, demolition activities 6m – 12m above ground level; and
- **Small**: Total building volume <12,000m^3, construction material with low potential for dust release, demolition activities <6m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total site area >110,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >6m in height;

- **Medium**: Total site area 18,000 – 110,000m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 3 – 6m in height; and
- **Small**: Total site area < 18,000m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, earthworks during wetter months.

Construction

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: Total building volume >750,000m^3, on site concrete batching;
- **Medium**: Total building volume 12,000 – 750,000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and
- **Small**: Total building volume <12,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: >50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and
- **Small**: <20 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site-specific factors, such as whether here are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 has been used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table A1: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect a enjoyment of a high level of amenity. • The appearance, aesthetics or value of their property would be diminished by soiling. • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) • Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations with an international or national designation *and* the designated features may be affected by dust soiling. • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home. • The appearance, aesthetics or value of their property could be diminished by soiling. • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Examples include parks and places of work.	• Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. • Locations with a national designation where the features may be affected by dust deposition. • Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• The enjoyment of amenity would not reasonably be expected. • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition. • Example is a local Nature Reserve with dust sensitive features.

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. Tables A2 to A4 indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the IAQM construction dust guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

Table A2: Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distances 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 A3: Sensitivity of the area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Conc.	Number of Receptors	Distances from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A4: Sensitivity of the area to Ecological Impacts

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

<u>Step 2C</u>: Defining the Risk of Impacts

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. Tables A5 to A7 indicate the method used to assign the level of risk for each construction activity.

Table A5: Risk of Dust Impacts from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A6: Risk of Dust Impacts from Earthworks/Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A7: Risk of Dust Impacts from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX B – OPERATIONAL PHASE IMPACT SIGNIFICANCE CRITERIA

This appendix contains the significance criteria used in the assessment for the operational impact assessment from the 2017 EPUK-IAQM guidance.

To assess the impacts of a development on the surrounding area, the EPUK-IAQM 2017 guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change 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. Table B1 presents the suggested framework, provided within the EPUK/IAQM guidance, for describing the impacts.

Table B1: Impact Descriptors for Individual Receptors

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 AQAL	Negligible	Negligible	Slight	Moderate
76-94% AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	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.

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

The EPUK/IAQM guidance notes that the criteria in Table C1 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- 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.

The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the severity of impacts.

APPENDIX C
SITE-SPECIFIC MITIGATION MEASURES

Site-specific mitigation measures are divided into general measures, applicable to all sites and measures specific to demolition, earthworks, construction and trackout. Depending on the level of risk assigned to each site, different mitigation is assigned. The method of assigning mitigation measures as detailed in the IAQM guidance has been used.

For those mitigation measures that are general, the highest risk has been applied. In this case, the 'medium risk' site mitigation measures have been applied, as determined by the dust risk assessment in Section 5. There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 5.7. Desirable measures are presented in *italics*.

<u>Communications</u>

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of people accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

<u>Dust Management</u>

- Develop and implement a 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. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/ or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the log book.

Monitoring

- *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 100m of site boundary, with cleaning to be provided if necessary.*

- Carry out regular site inspections to monitor compliance with the dust management plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles/Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- *Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul routes 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).*
- *Implement a Travel plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).*

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes 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.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires or burning of waste material.

Specific to Demolition

- *Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).*
- 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 provide fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Specific to Earthworks

- *Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.*
- *Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.*
- *Only remove the cover in small areas during work and not all at once.*

Specific to Construction

- *Avoid scabbling (roughening of concrete surfaces) if possible.*
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- *Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.*
- *For similar supplies of fine powder material ensure bags are sealed after use and stored appropriately to prevent dust.*

Specific to Trackout

- *Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.*
- *Avoid any dry sweeping of large areas.*
- *Ensure 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.*
- *Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).*

APPENDIX D
ROAD TRAFFIC DATA

This appendix contains the traffic data used in the dispersion modelling assessment. The data was provided by DTA Transportation. Included are traffic flow data in AADT and the percentage Heavy Duty Vehicles (HDV), the speed included for each road link and the diurnal profile used. Reduced speeds were used at junctions, roundabout, roads with traffic light and pedestrian lane.

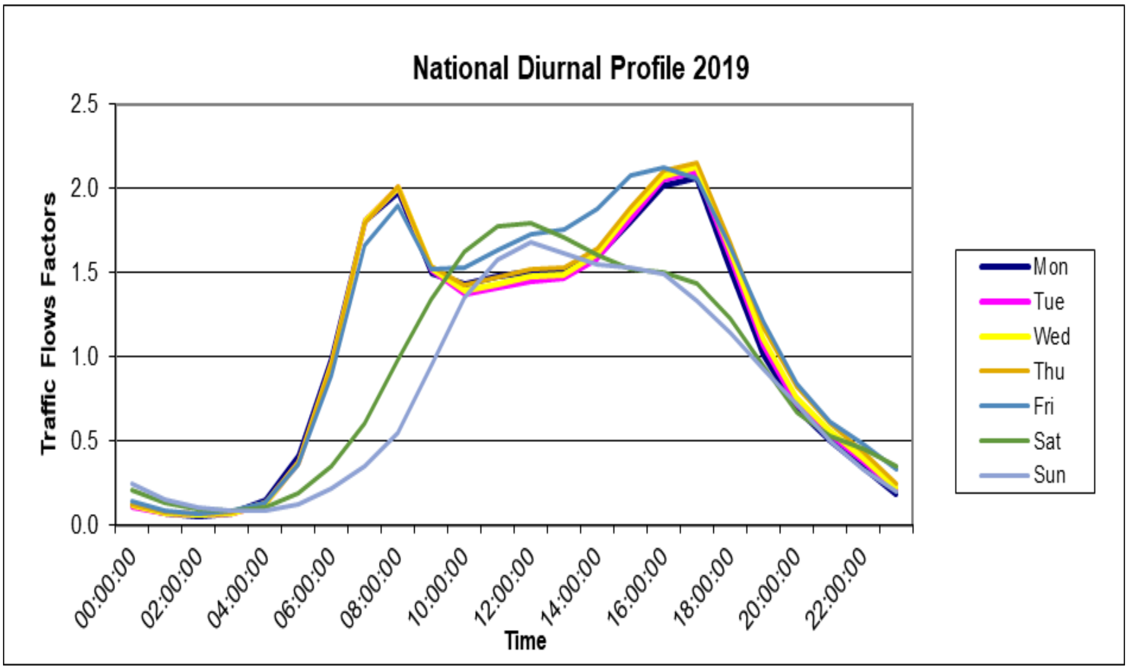
Table D1 24-hour Traffic Flow (AADT) and Speed Data used in the Dispersion Modelling Assessment

Figure D1 Diurnal Profile Included in the Dispersion Modelling Assessment

Table D1: 24-hour Traffic Flow (AADT) and Speed Data used in the Dispersion Modelling Assessment

Ref	Road Link	Average Speed (kph)	(S1) 2019 Base year		(S2) 2025 Without Development		(S3) 2025 With Development	
			Total AADT	HDV%	Total AADT	HDV%	Total AADT	HDV%
1	Moat Road (West of entrance)	96	3970	1%	4164	1%	4294	1%
2	Moat Road (East of access)	96 (48 for development)	2994	2%	2491	2%	3154	1%
3	A274 Mill Bank (East of site, north at junction)	48	8391	5%	9111	5%	9648	5%
4	Kings Road (East of site, east at junction)	48	3254	4%	3533	4%	3551	4%
5	North Street (East of site, south at junction	48	8389	5%	9109	5%	9218	5%

Figure D1 Diurnal Profile Included in the Dispersion Modelling Assessment



APPENDIX E
MODELLING OF OPERATIONAL PHASE – VERIFICATION METHODOLOGY

The dispersion model results were verified following the relevant guidance in LAQM TG.22. Predicted results from a dispersion model may differ from measured concentrations for a variety of reasons, these are identified in LAQM TG.22 to include:

- Estimates of background concentrations;
- Meteorological data uncertainties;
- Uncertainties in source data for example, traffic flow data, stack emissions and emission factors;
- Model input parameters such as roughness length, minimum Monin-Obukhov and overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

As discussed in section 3, Maid P3A, P3B and P3C were used for the dispersion model verification against traffic data. Tables E1- E2 present details of the monitoring location used and the dispersion model verification process.

Table E1: Monitoring Location used in Verification Process

Site ID	Receptor Location	Site Type	Grid Reference		Height (m)
			X	Y	
Maid P3A	Down Pipe of Sainsbury façade facing High St but *adjacent* to junction of track to car park TN27 9NE	Roadside	583461.62	144211.36	1.8
Maid P3B	Good Intent road sign pole, junction of Nor*th* St with Kings Rd TN27 9NT	Roadside	583281.88	144348.73	2
Maid P3C	On road sign bracket junction of Mill Bank and Moat *R*d TN27 9NT	Roadside	583251	144365.92	1.8

Table E2: Modelled versus Monitored NO_x/NO_2

Site	Monitored total NO_2	Background NO_2	Monitored Road Contribution NO_x	Modelled road contribution NO_x	Ratio of Modelled and Measured Road NO_x
Maid P3A	19.3	9.12	18.93	10.05	1.88
Maid P3B	17.8	9.12	16.02	12.63	1.27

Site	Monitored total NO_2	Background NO_2	Monitored Road Contribution NO_x	Modelled road contribution NO_x	Ratio of Modelled and Measured Road NO_x
Maid P3C	16.7	9.12	13.91	10.42	1.33
Overall Adjustment Factor					1.88

An adjustment factor of **1.88** was obtained during the verification process and applied to the modelled road-NO_x component predicted at each receptor. The verified annual mean modelled road contribution NO_x concentrations have then been converted into annual mean road NO_2 by using the Defra NO_x to NO_2 spreadsheet; a comparison of monitored and model adjusted NO_2 is presented in Table E3. This shows that, following adjustment, the modelled NO_2 result is within +/- 25% of monitored NO_2 concentrations. In accordance with the LAQM TG.22 guidance, it is not considered that further verification is required.

Table E3: Difference between Monitored and Modelled Following Adjustment

Site	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NO_x	Modelled total NO_2 (based on empirical NO_x/NO_2 relationship)	Monitored Total NO_2	% Difference [(modelled - monitored)/monitored] x100
Maid P3A	1.88	18.93	19.3	19.3	0.0
Maid P3B	1.88	16.02	21.78	17.8	22.4
Maid P3C	1.88	13.91	19.66	16.7	17.7

Measured annual PM_{10} and $PM_{2.5}$ concentrations were not available therefore, as per the recommendations in LAQM.TG.22, the same factor was applied to the modelled PM_{10} and $PM_{2.5}$ concentrations.

Verified model results are shown in Appendix F.

APPENDIX F
MODEL RESULTS

Table F1: Predicted Pollutant Concentrations at Proposed Receptor Locations (2019 meteorological data, background concentrations included): S1, S2 and S3

Receptor ID	NO_2 Annual Average Concentrations (µg/m³)				No. days PM_{10} 24-Hour Average Concentrations (µg/m³)			PM_{10} Annual Average Concentrations (µg/m³)				$PM_{2.5}$ Annual Average Concentrations (µg/m³)			
	Background	S1	S2	S3	S1	S2	S3	Background	S1	S2	S3	Background	S1	S2	S3
Maid P3B	9.12	19.23	16.40	16.42	0	0	0	14.40	15.88	15.92	15.94	9.50	10.41	10.40	10.41
Maid P3C	9.12	21.69	18.01	18.15	0	0	0	14.40	15.91	15.91	15.95	9.50	10.45	10.41	10.43
ER1	9.12	19.59	16.09	16.68	0	0	0	14.40	15.70	15.61	15.73	9.50	10.32	10.23	10.30
ER2	9.12	12.62	11.22	11.59	0	0	0	14.40	14.88	14.81	14.88	9.50	9.80	9.74	9.78
ER3	9.12	11.91	10.86	11.10	0	0	0	14.40	14.78	14.74	14.78	9.50	9.73	9.70	9.73
ER4	9.12	12.72	11.47	11.70	0	0	0	14.40	14.89	14.85	14.90	9.50	9.80	9.76	9.79
ER5	9.12	13.32	11.92	12.15	0	0	0	14.40	14.96	14.93	14.98	9.50	9.85	9.81	9.84
ER6	9.12	14.46	12.74	13.00	0	0	0	14.40	15.11	15.09	15.14	9.50	9.94	9.91	9.94
ER7	9.12	13.37	11.73	12.13	0	0	0	14.40	14.98	14.90	14.98	9.50	9.86	9.79	9.84
ER8	9.12	13.78	12.03	12.43	0	0	0	14.40	15.03	14.95	15.03	9.50	9.89	9.83	9.87
ER9	9.12	13.76	11.99	12.42	0	0	0	14.40	15.03	14.95	15.03	9.50	9.89	9.82	9.87
ER10	9.12	14.18	12.31	12.72	0	0	0	14.40	15.08	15.00	15.08	9.50	9.92	9.86	9.90
ER11	9.12	17.01	14.17	14.76	0	0	0	14.40	15.44	15.33	15.45	9.50	10.15	10.05	10.12
ER12	9.12	14.61	13.00	13.05	0	0	0	14.40	15.16	15.17	15.19	9.50	9.97	9.96	9.97

ER13	9.12	18.54	15.86	15.90	0	0	0	14.40	15.76	15.79	15.81	9.50	10.33	10.32	10.33
ER14	9.12	16.31	14.23	14.27	0	0	0	14.40	15.39	15.41	15.42	9.50	10.11	10.10	10.11
ER15	9.12	13.58	12.29	12.31	0	0	0	14.40	15.01	15.02	15.03	9.50	9.87	9.87	9.87
ER16	9.12	14.39	12.87	12.89	0	0	0	14.40	15.14	15.16	15.17	9.50	9.96	9.95	9.95
ER17	9.12	16.93	14.63	14.73	0	0	0	14.40	15.38	15.38	15.41	9.50	10.11	10.09	10.10
ER18	9.12	13.41	12.15	12.20	0	0	0	14.40	14.99	14.99	15.00	9.50	9.86	9.85	9.85
ER19	9.12	13.44	12.20	12.22	0	0	0	14.40	15.01	15.02	15.03	9.50	9.87	9.86	9.87
ER20	9.12	15.86	13.88	14.13	0	0	0	14.40	15.35	15.36	15.42	9.50	10.08	10.07	10.10
ER21	9.12	16.05	14.05	14.30	0	0	0	14.40	15.39	15.41	15.48	9.50	10.11	10.10	10.13