SEVINGTON
INLAND BORDER FACILITY

Department for Environment, Food & Rural Affairs

HM Revenue & Customs

Department for Transport

Environmental Statement

Volume 2: Appendices (Chapter 8)

Appendix 8.1

Legislation, Planning Policy and Guidance

Appendix 8.1: Summary of Relevant Legislation, Planning Policy and Guidance

Legislation

EU Framework Directive 2008/50/EC, 2008

Air pollutants at high concentrations can have adverse effects on the health of humans and ecosystems. European Union (EU) legislation on air quality forms the basis for UK legislation and policy on air quality.

The EU Framework Directive 2008/50/EC on ambient air quality assessment and management came into force in May 2008 and was implemented by Member States, including the UK, by June 2010. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

Air Quality Standards Regulations, 2010

The Air Quality Standards Regulations implement Limit Values prescribed by the EU Framework Directive 2008/50/EC. The Limit Values are legally binding and the Secretary of State, on behalf of the UK Government, is responsible for their implementation.

The UK Air Quality Strategy, 2007

The current UK Air Quality Strategy (UK AQS) was published in July 2007 and sets out the objectives for local planning authorities (LPA) in undertaking their Local Air Quality Management (LAQM) duties. The UK AQS objectives of air pollutants relevant to this assessment are summarised in **Table A1.**

Table A1: Summary of Relevant UK AQS Objectives

Pollutant	Objective		Date by which Objective to be Met
	Concentration	Measured as	
Nitrogen Dioxide (NO_2)	200µg/m^3	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg/m^3	Annual Mean	31/12/2005
Particulate Matter (PM_{10}) (a)	50µg/m^3	24 hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg/m^3	Annual Mean	31/12/2004
Particulate Matter ($PM_{2.5}$) (b)	Target of 15% reduction in concentrations at urban background locations	Annual Mean	Between 2010 and 2020
	25µg/m^3	Annual Mean	01/01/2020

Note: (a) Particulate matter with a mean aerodynamic diameter less than 10 microns (or micrometres – µm)
(b) Particulate matter with a mean aerodynamic diameter less than 2.5 microns

Further to **Table A1**, the European Union (EU) also sets Limit Values for NO_2, PM_{10} and $PM_{2.5}$, which have been adopted by the UK. The Limit Value for NO_2 is the same numerical level as the AQS objective but the target date differs. Achievement of these values is a national obligation rather than a local obligation. In the UK, only monitoring and modelling carried out by Defra and Central Government meets the specification required to assess compliance with the Limit Values. Further, Defra and other central government agencies do not recognise local authority monitoring or local modelling studies when determining the likelihood of the Limit

Values being exceeded. As such the Limit Values have not been considered further in the Air Quality Assessment.

The Environment Act, 1995

In a parallel process, the Environment Act 1995 required the preparation of a national air quality strategy setting health-based air quality objectives for specified pollutants and outlining measures to be taken by LPAs in relation to meeting these objectives (the LAQM system).

Part IV of the Environment Act 1995 provides a system of LAQM under which LPAs are required to review and assess the future quality of the air in their area by way of a staged process. Should this process suggest that any of the AQS objectives will not be met by the target dates, the LPA must consider the declaration of an Air Quality Management Area (AQMA) and the subsequent preparation of an Air Quality Action Plan (AQAP) to improve the air quality in that area in pursuit of the AQS objectives.

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 sets the following targets:

- annual mean $PM_{2.5}$ concentration in ambient air must be equal to or less than 10 µg/m^3 by the end of 31st December 2040; and
- at least a 35% reduction in population exposure when compared with the average population exposure in the baseline period (1st January 2016 to 31st December 2018) by the end of 31st December 2040.

Planning Policy

National Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF), published in December 2024 sets out the Government's planning policies for England and how these should be applied.

Paragraph 109 states *"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."*

Paragraph 180 states *"Planning policies and decisions should contribute to and enhance the natural and local environment by: … preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans"*

Paragraph 191 states *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."*.

Paragraph 192 states *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*.

Local Planning Policy

Ashford Borough Council Local Plan (2030)

The Ashford Borough Council Local Plan sets out the Council's strategy for meeting the Borough's needs until 2030. The following policy refers to air quality:

Policy ENV12: Air Quality

"All major development proposals should promote a shift to the use of sustainable low emission transport to minimise the impact of vehicle emissions on air quality.

Development should be located where it is accessible to support the use of public transport, walking and cycling.

Development proposals that might lead to a significant deterioration in air quality or national air quality objectives being exceeded, either by itself, or in combination with other committed development, will require the submission of an Air Quality Assessment to be carried out in accordance with the relevant guidance. This should address:-

a) The cumulative effect of further emissions; and,

b) The proposed measures of mitigation through good design and offsetting measures that would prevent the National Air Quality Objectives being exceeded or reduce the extent of the air quality deterioration.

Proposals which will result in National Air Quality Objectives being exceeded will not be permitted."

Guidance

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

Published in January 2019 the Clean Air Strategy sets out a coherent framework and national action to improve air quality throughout the UK.

The Strategy is underpinned by new national powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to act in areas with an air pollution problem. The Strategy also supports the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanisms.

Improving Air Quality in the UK: Tackling Nitrogen Dioxide in our Towns and Cities. UK Air Quality Plan for Tackling Nitrogen Dioxide, 2017

The UK Government was required by the High Court to release an Air Quality Plan to meet the NO_2 Limit Value in the shortest timescale as possible. This document was adopted on 26 July

2017.

The plan focuses on reducing concentrations of NO_x and NO_2 around road vehicle emissions within the shortest possible time. With the principal aims to:

a. reduce emissions of NOx from the current road vehicle fleet in problem locations now; and

b. accelerate road vehicle fleet turnover to cleaner vehicles to ensure that the problem remains addressed and does not move to other locations.

The other aims include reducing background concentrations of NO_x from:

- Other forms of transport such as rail, aviation and shipping;
- Industry and non-road mobile machinery; and
- Buildings, both commercial and domestic, and other stationary sources.

The document provided additional measures to reduce NO_x and NO_2 concentrations in the UK, such measures include:

- Mandate local authorities to implement Clean Air Zones within the shortest possible time;
- Consultation on proposal for a Clean Air Zone Framework for Wales;
- Consultation on a draft National Low Emission Framework for Scotland;
- Commitment to establishing a Low Emission Zone for Scotland by 2018;
- Tackling air pollution on the English Road network;
- New real driving emissions requirement to address real world NOx emissions;
- Additional funding to accelerate uptake of hydrogen vehicles and infrastructure;
- Additional funding to accelerate the uptake of electric taxis;
- Further investment in retrofitting alongside additional support of low emission buses and taxis;
- Regulatory changes to support the take up of alternatively fuelled light commercial vehicles;
- Exploring the appropriate tax treatment for diesel vehicles.
- Call for evidence on updating the existing HGV Road User Levy;
- Call for evidence on use of red diesel;
- Ensure wider environmental performance is apparent to consumers when purchasing cars;
- Updating Government procurement policy;
- New emissions standards for non-road mobile machinery;
- New measures to tackle NOx emissions from Medium Combustion Plants; and,
- New measures to tackle NOx emissions from generators.

The above measures do not provide any actions which are relevant to the operation or design of the Development.

A High Court ruling on 21st February 2018, stated the UK Governments air quality improvement plan adopted on 31 July 2017 was unlawful as '*it does not contain measures sufficient to ensure substantive compliance with the 2008 Directive and the English Regulations*'. The UK Government '*must ensure steps are taken to achieve compliance as soon as possible, by the quickest route possible and by a means that makes that outcome likely*'.

The judgement stated that the UK Government must produce a supplementary plan, setting out requirements for feasibility studies to be undertaken in the 33 Local Authority Areas. ABCC is not considered within this judgement.

Environmental Protection UK & Institute of Air Quality Management Guidance; Land-Use Planning & Development Control: Planning for Air Quality, 2017

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning for Air Quality Guidance provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues.

The guidance explains how development proposals can adopt good design principles to reduce emissions and contribute to better air quality. The guidance also provides a method for screening the need for an air quality assessment and a consistent approach for describing the impacts at individual receptors.

The EPUK and IAQM guidance, advises that:

"In arriving at a decision about a specific proposed development the local planning authority is required to achieve a balance between economic, social and environmental considerations. For this reason, appropriate consideration of issues such as air quality, noise and visual amenity is necessary. In terms of air quality, particular attention should be paid to:

- *Compliance with national air quality objectives and of EU Limit Values;*
- *Whether the development will materially affect any air quality action plan or strategy;*
- *The overall degradation (or improvement) in local air quality; or*
- *Whether the development will introduce new public exposure into an area of existing poor air quality".*

Planning Practice Guidance, 2019

The Government's national Planning Practice Guidance (PPG) states that air quality concerns are more likely to arise where development is proposed within an area of existing poor air quality, or where it would adversely impact upon the implementation of air quality strategies and / or action plans. The PPG notes that when deciding whether air quality is relevant to a planning application, considerations would include whether the development would lead to:

- Significant effects on traffic, such as volume, congestion, vehicle speed, or composition;
- The introduction of new point sources of air pollution, such as furnaces, centralised boilers and Combined Heat and Power (CHP) plant; and
- Exposing occupants of any new developments to existing sources of air pollutants and areas with poor air quality.

Local Air Quality Management Policy Guidance, 2022

The Local Air Quality Management Policy Guidance LAQM.PG(22) provides guidance to improve local air quality using available levers, including planning, public health and transport responsibilities. LAQM.PG(22) describes how power stations, motor vehicles, industrial and domestic combustion processes all contribute to local air pollution. Transport initiatives are set out to illustrate how transport measures may bring improvements in air quality.

Institute of Air Quality Management: Guidance on the Assessment of Dust from Demolition and Construction, 2024

The IAQM Construction Dust Guidance provides guidance to consultants and Environmental Health Officers (EHOs) on how to assess air quality impacts from construction related activities. The guidance provides a risk-based approach based on the potential dust emission magnitude of the site (small, medium or large) and the sensitivity of the area to dust impacts. The importance of professional judgement is noted throughout the guidance. The guidance recommends that once the risk class of the site has been identified, the appropriate level of mitigation measures are implemented to ensure that the construction activities have no significant impacts.

Ashford Air Quality Strategy (2019-2022)

The ABC Air Quality Strategy outlines the actions ABC will take to improve air quality. In order to improve air quality ABC has developed the following key priorities:

- Ensuring we lead the way – actions the council will undertake to set a high standards for ourselves.
- Working with our partners – actions to council will undertake with its partners to safeguard and where possible improve standards of air quality.
- Enabling behavioural change – actions the council will undertake to facilitate lasting behavioural change within the population of the borough.

Appendix 8.2

Consultation with Ashford Borough Council

Appendix 8.2: Consultation with Ashford Borough Council

From: [redacted]
Sent: 14 November 2024 15:10
To: [redacted]

Hi [redacted]

Thank you for your prompt reply and the additional information you have provided regarding large developments within the surrounding area, we will consider these as necessary in our assessment.

Best wishes

[redacted]
Waterman Infrastructure & Environment Ltd
[redacted]

[redacted]

From: [redacted]
Sent: 14 November 2024 14:39
To: [redacted]

Subject: RE: Sevington EHO Consultation

Hello [redacted]

I am sorry for the oversight. Thank you for chasing. Our 2024 ASR is available on the following link Information and reports about national and local air quality.

The proposal looks satisfactory. On an additional note, there is a number of large developments due to be constructed to the west of the site on the Waterbrook site/Arrowhead Road (other side of the current Ashford International Truck Stop). A large housing development to the south west of this location along with a large leisure facility (David Lloyd), supermarket and drive through/ takeaway businesses. However, it may fall outside the scope of the report/assessment area.

Many thanks and regards

[redacted]

[redacted] Environmental Health Practitioner
Environmental Protection & Licensing

[redacted]
Ashford Borough Council

Ashford Borough Council

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From: [redacted]
Sent: 14 November 2024 14:12
To: [redacted]
Cc: [redacted]

Subject: RE: Sevington EHO Consultation

Hi [redacted]

I hope you are well. Following up on my previous email, I would greatly appreciate your feedback on the proposed methodology for the air quality assessment of the Sevington Inland Border Facility.

Best wishes

[redacted]
Waterman Infrastructure & Environment Ltd

[redacted]

From: [redacted]
Sent: 31 October 2024 16:44
To: [redacted]
Cc: [redacted]
Subject: Sevington EHO Consultation

Good afternoon [redacted]

I would like to agree with Ashford Borough Council on the scope for an air quality assessment for the Sevington Inland Border Facility.

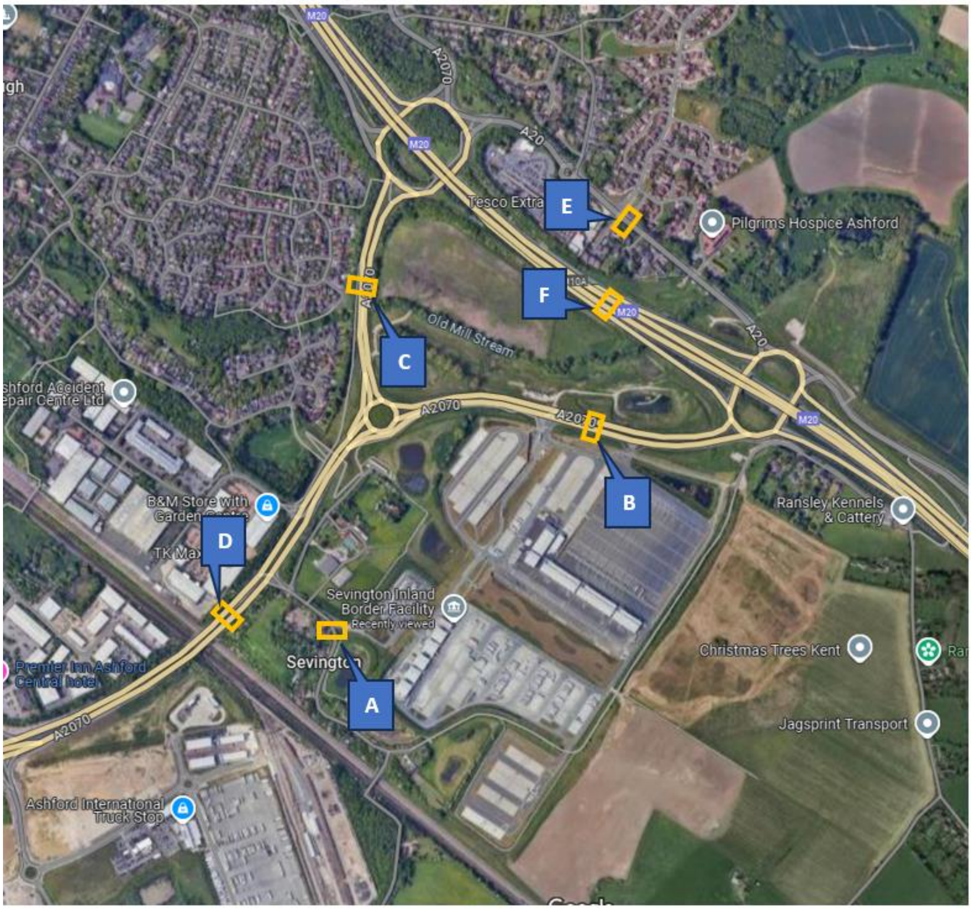
We propose to use the detailed dispersion model ADMS Roads to model the impact of the development at existing sensitive receptors in proximity to the Site and within the domain of the roads modelled. The model will also consider the likely future concentrations users of the Development would be exposed to. As part of the inputs as traffic flows follow a diurnal variation throughout the day and week, the ADMS-Roads model will therefore include the DfT traffic profile for all roads nationally. Additionally, Transport Refrigeration Unit (TRU) generator emissions would be modelled and, if any point source emissions such as CHP / Boiler emissions or generators are proposed, they would be modelled using ADMS 6.

We propose to verify the model using the 2022 data or 2023 data (if available) from diffusion tubes located in the vicinity of the site. if required, an adjustment factor would be used.

If 2023 bias-adjusted monitoring data is available, please may you send it across to us?

We propose to model the following road links (as shown in the figure below):

A. Church Road (south of Staff car park access)
B. A2070 Link Road
C. A2070 Bad Munstereifel Road
D. A2070 Bad Munstereifel Road
E. A20 Hythe Road
F. M20



I would welcome your thoughts on the proposed methodology.

Best wishes

[redacted]

Waterman Infrastructure & Environment Ltd

Linear Park | Temple Quay | Bristol BS2 0PS

[redacted]

[redacted]

Appendix 8.3

Air Quality Modelling Study

Appendix 8.3: Air Quality Modelling Study

Introduction

Appendix 8.3 presents the technical information and data upon which the assessment on the completed and operational Development is based.

ADMS-Roads

In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; which requires a range of input data, which can include pollutant emissions rates, meteorological data and local topographical information.

The effect of the Development on local air quality was assessed using the advanced atmospheric dispersion model ADMS-Roads; considering the contribution of emissions from forecast road-traffic on the local road network by the completion year.

The ADMS-Roads model is a comprehensive tool for investigating air pollution in relation to road networks. On review of the Application Site, and its surroundings, ADMS-Roads was considered appropriate for the assessment of the long and short-term effects of the proposals on air quality. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions of air pollutant concentrations. It can predict long-term and short-term concentrations, including percentile concentrations.

ADMS-Roads model is a formally validated model, developed in the United Kingdom (UK) by CERC (Cambridge Environmental Research Consultants). This includes comparisons with data from the UK's air quality Automatic Urban and Rural Network (AURN) and specific verification exercises using standard field, laboratory and numerical data sets. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at www.cerc.co.uk.

Model Scenarios

The year 2019 was modelled to establish the existing baseline situation. Base year traffic data for 2019 and meteorological data for 2019 were also used to be consistent with the verification year.

To assess the effect of the Development on local air quality, future 'without Development' and 'with Development' scenarios were assessed. The Development is anticipated to be operational in 2026, the year 2026 has therefore been used to assess the future 'without Development' and 'with Development' scenarios.

Model Uncertainty

Analyses of historical monitoring data by Defra identified a disparity between actual measured NO_X and NO_2 concentrations and the expected decline associated with emission forecasts, which form the basis of air quality modelling as described above. In February 2020, Air Quality Consultants published a report on Performance of Defra's Emission Factor Toolkit 2013-2019[1]. The report concluded that recent

1 Air Quality Consultants (2020): 'Performance of Defra's Emission Factor Toolkit 2013 – 2019'. February 2020.

analysis of recent NO_X measurements provides evidence that vehicle controls are working, and as a result, the Emission Factor Toolkit (EFT) is now reflecting the rate of observed reductions. This air quality assessment has been undertaken using the latest emission factors published by Defra in the EFT version 12, which accounts for the uptake of low carbon passenger cars and light good vehicles with electric and hybrid electric propulsion systems.

Model Inputs

Traffic Data

Traffic flow data comprising Annual Average Daily Traffic (AADT) flows, traffic composition (% HDVs – Heavy-Duty Vehicles) and speeds (in kph) were used in the model as provided by Waterman for the surrounding road network.

The methodology for calculating the expected change in vehicle trips because of the Development is set out in detail within **Chapter 7: Transport and Access**. The air quality assessment covers all vehicle traffic generated by the Application Site, that meets the '*Indicative Criteria to Proceed to an Air Quality Assessment*' set out in the EPUK/IAQM guidance, including servicing and delivery trips.

Table A8.1 presents the traffic data used within the air quality assessment

Table A8.1: Air Quality Assessment Traffic Data

Link Name	Direction	Speed (kph)	2019 Baseline		2026 Without Development		2026 With Development	
			AADT	%HDV	AADT	%HDV	AADT	%HDV
A292 Hythe Road	Southbound	64	5,751	2.1%	6,135	2.00%	6,147	2.00%
	Northbound	64	15,335	7.1%	16,262	6.40%	16,391	6.30%
A2070 Kennington Road	Southbound	48	8,750	4.0%	9,325	3.70%	9,353	4.00%
	Northbound	48	6,286	2.4%	6,712	2.20%	6,719	2.70%
A20 exit	Eastbound	32	7,100	3.0%	7,587	3.00%	7,589	3.40%
A20 approach to M20 J10 RBT	Westbound	32	16,433	6.4%	17,556	5.70%	17,565	4.60%
A2070 Bad Munstereifel Road	Northbound	64	19,043	5.9%	15,594	6.10%	15,761	6.80%
	Southbound	64	13,497	6.6%	13,042	8.50%	13,101	8.50%
A20	Combined	64	8,917	4.7%	-	-	-	-
	Eastbound	64	-	-	6,132	5.1%	6,135	5.1%
	Westbound	64	-	-	4,052	3.7%	4,061	3.7%
A2070	Eastbound	64	4,887	11.4%	10,385	15.20%	11,404	24.10%
	Westbound	64	11,137	6.4%	12,043	13.60%	12,240	20.70%
A2070 Bad Munstereifel Road	Eastbound	64	19,654	7.8%	21,580	6.90%	21,601	6.80%
	Westbound	64	13,409	6.6%	14,650	5.80%	14,737	4.60%
LT-slip at A2070 3-arm RBT	Westbound	48	6,947	8.2%	7,556	8.10%	7,635	11.00%
A2070 Bad Munstereifel Road	Eastbound	64	19,654	7.8%	22,436	9.40%	22,561	9.40%
	Westbound	64	23,181	8.2%	21,248	9.50%	24,153	9.50%

Vehicle Speeds

To consider the presence of slow-moving traffic near junctions and at roundabouts within the model, the speed at each junction was reduced to 20 kph. This follows the criteria recommended within Defra's Local Air Quality Management Technical Guidance (LAQM.TG(22))[2], which considers that in most instances the two-way average speed for all vehicles at a junction would be in the range of 20-40 kph based on the estimate that:

- Traffic pulling away from the lights, 40-50 kph;
- Traffic approach the lights when green, 20-50 kph; and
- Traffic on the carriageway approaching the lights when red, 5-20 kph, depending on the time of day and how congested the junction is.

Diurnal Profile

The ADMS-Roads model uses an hourly traffic flow based on the daily (AADT) flows. Traffic flows follow a diurnal variation throughout the day and week. Therefore, a diurnal profile was used in the model to replicate how the average hourly traffic flow would vary throughout the day and the week. This was based on data collated by Waterman from the Department for Transport (DfT) statistics Table *TRA0307: Traffic distribution by time of day on all roads in Great Britain, 2019*[3]. **Figure A8.1** presents the diurnal variation in traffic flows which has been used within the model.

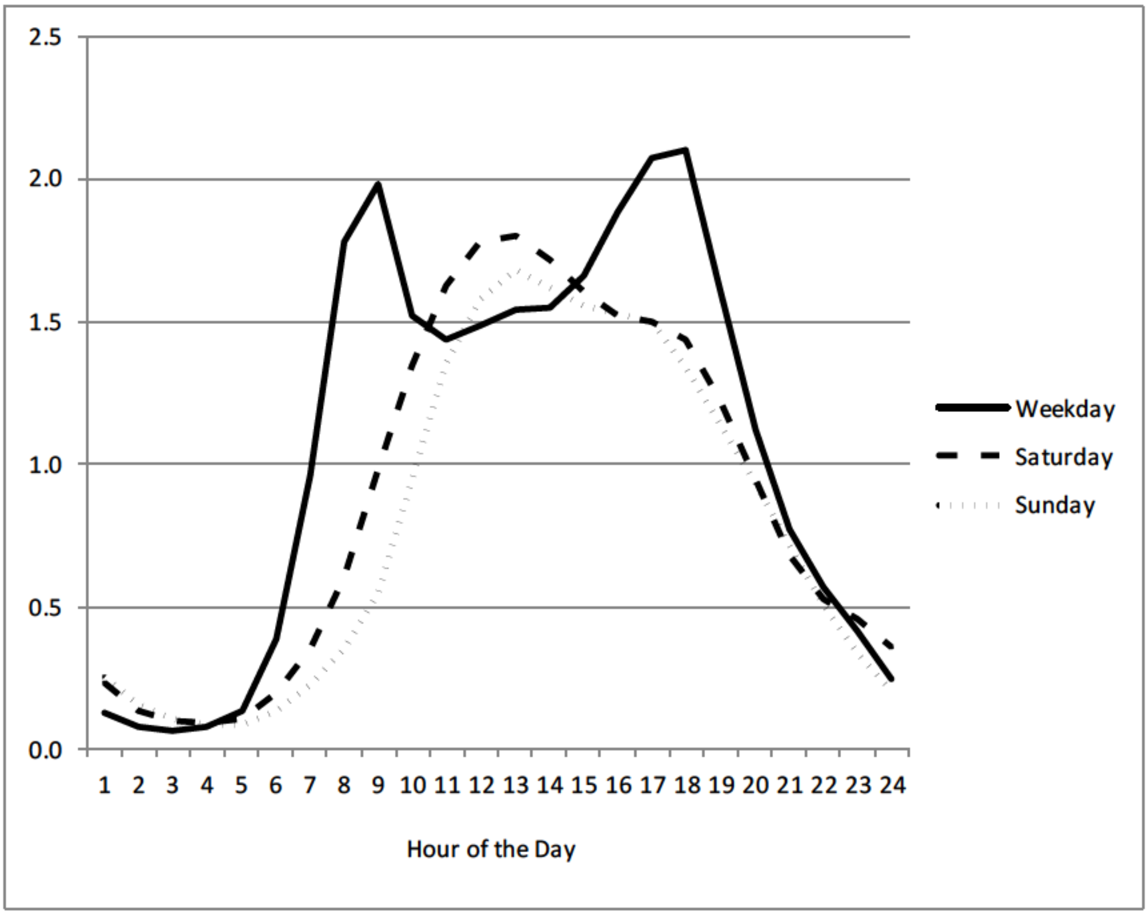


Figure A8.1: Department for Transport 2019 Diurnal Traffic Variation

2 Department for Environment, Food and Rural Affairs. 2022. Local Air Quality Management Technical Guidance (TG22) August 2022

3 Department for Transport (DfT) Statistics, www.dft.gov.uk/statistics/series/traffic

Road Traffic Emission Factors

The latest version of the ADMS-Roads model (version 5.0.1.3) was used for the assessment. The model was input with the latest vehicle emission factors published by Defra in the EFT (v12.1 published in August 2024) and is based on the latest COPERT database published by the European Environment Agency.

The model uses several parameters (traffic flow, percentage of HDV, speed and road type) to calculate road traffic emissions for the selected pollutants.

Transport Refrigeration Unit (TRU) emissions

Table A8.2 presents TRU emissions data related to the types and sizes of generators used to power refrigerated trailers. For consistency, the TRU emissions are based on information presented in the Air Quality Impact Assessment undertaken by Mott MacDonald in February 2022.

Table A8.2: Air Quality Assessment Traffic Data

Parameter	Value	Unit	Data source
Energy consumption	9.8	kWe	R.A Barnitt et al (2010) Emissions of transport refrigeration units with CARB diesel, gas to liquid diesel and emission control devices, conference paper NREL/CP-540-46598
Height	3	m	Assumed exhaust height of TRU generator
Exhaust velocity	13.6	m/s	Calculated based on typical exhaust flow rate for a diesel engine (5 kg/hr per kW), which is scalable per kW output.
Exhaust temperature[a]	170	°C	A. Mayer et al (2005) Retrofitting TRU-diesel engines with DPF-systems using FBC and intake throttling for active regeneration.
TRU generator NO_x emission factor[b]	6 (0.016)	g/kwhe (g/s)	CE Delft (2015) Electrical trailer cooling during rest projects
	0.011	g/s	Zemo Partnership (2021) Emissions Testing of Two Auxiliary Transport Refrigeration Units
TRU generator PM emission factor[b]	0.7 (0.002)	g/kwhe (g/s)	CE Delft (2015) Electrical trailer cooling during rest projects
	0.0003	g/s	Zemo Partnership (2021) Emissions Testing of Two Auxiliary Transport Refrigeration Units
Percentage spaces used for TRU	20	%	HMRC

Note: [a] Ambient temperature is conservatively applied to the model as it is assumed that exhaust gas rapidly decreases to ambient temperature after emission from tail pipe.
[b] The higher emission rates from the CE Delft (2015) test have been conservatively used in this modelling assessment

Street Canyon Effect

Narrow streets with tall buildings on either side have the potential to create a confined space, which can interfere with the dispersion of traffic pollutants and may result in pollutant emissions accumulating in these streets. In an air quality model these narrow streets are described as street canyons.

ADMS-Roads includes a street canyon model to take account of the additional turbulent flow patterns occurring inside such a narrow street with relatively tall buildings on both sides. LAQM.TG(22) identifies a street canyon *"as narrow streets where the height of buildings on both sides of the road is greater than the road width."*

Following a review of the road network to be included within the model, it was considered that modelled roads are relatively wide and most of the existing buildings along these roads are not considered to be tall. The Development would not cause any street canyons to be created.

Meteorological Data

Local meteorological conditions strongly influence the dispersal of pollutants. Key meteorological data for dispersion modelling include hourly sequential data including wind direction, wind speed, temperature, precipitation and the extent of cloud cover for each hour of a given year. As a minimum ADMS-Roads requires wind speed, wind direction, and cloud cover.

The meteorological data input into the model was Numerical Weather Prediction (NWP) data as the closest meteorological stations within the vicinity of the Application Site (Langdon Bay and Lydd) were located within coastal areas and not considered representative of the meteorological conditions at the Application Site. 2019 data was used to be consistent with the base traffic year and model verification year. **Figure A8.2** presents the wind-rose for the meteorological data.

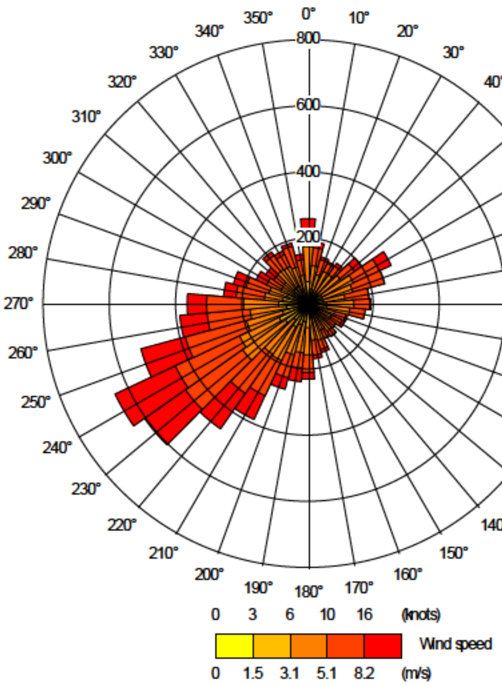


Figure A8.2: 2019 Wind Rose of the NWP Meteorological Data for the Application Site[4]

Most dispersion models do not use meteorological data if they relate to calm wind conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75 m/s. It is recommended in the Local Air Quality Management Technical Guidance (LAQM.TG(22)) that the meteorological data file be tested within a dispersion model and the relevant output log file checked, to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. LAQM.TG(22) recommends that meteorological data should only be used if the percentage of usable hours is greater than 85%. The 2019 NWP meteorological data includes 8,759 usable hours, which equates to 99%. The 2019 NWP meteorological data is above the 85% threshold and therefore adequate for the dispersion modelling.

A surface roughness value of 0.5 was used for the 2019 NWP meteorological data. This value is representative of parkland and open suburbia and considered appropriate following a review of the local area surrounding the Application Site.

Other Model Parameters

There are a number of other parameters that are used within the ADMS-Roads which are described here for completeness and transparency:

- The model requires a surface roughness value to be inputted:
  - a value of 0.5 was used for the Application Site which is representative of parkland and open suburbia and;
  - a value of 0.5 was used for the 2019 NWP meteorological data. This value is representative of parkland and open suburbia.
- The model requires the Monin-Obukhov length (a measure of the stability of the atmosphere) to be inputted. A value of 30m (representative of cities and large towns) was used for the modelling; and
- The ADMS-Roads model requires the Road Type to be inputted. 'England [urban]' was selected and used for the modelling.

Energy Strategy

The Development's energy strategy would not include a centralised combustion plant. If required later, any energy centre would be assessed using relevant guidance when technical specifications are known. The energy strategy has therefore not been considered within the air quality assessment.

Background Pollutant Concentrations

Background pollutant concentration data (i.e. concentrations due to the contribution of pollution sources not directly considered in the dispersion modelling) have been added to contributions from the modelled pollution sources.

LAQM Technical Guidance (TG22) classifies an urban background site as 'an urban location distanced from sources and therefore broadly representative of city-wide background conditions

4 Source: Atmospheric Dispersion Modelling Ltd

urban background site is distanced from sources of pollution and representative of background conditions'.

Urban background monitoring is not undertaken in ABC using automatic monitors. In 2019, urban background annual mean NO_2 monitoring was undertaken at thirteen sites within ABC using diffusion tubes. However, these diffusion tubes are located in a more urban environment than the Application Site and are not considered representative of air quality conditions at the Application Site. As a result, the ABC urban background diffusion tubes have not been considered further.

In addition to the monitoring data, forecast UK background of NOx, NO_2, PM_{10} and $PM_{2.5}$ are available from the Defra LAQM Support website[5] for 1x1km grid squares for assessment years between 2018 and 2040. **Table A8.3** presents the Defra background concentrations for the years 2023, 2031 and 2030, for the grid squares the Application Site is located within (603500, 140500 and 604500, 140500).

Table A8.3: Defra Background Maps in 2019 and 2026 for the Grid Squares covering the Site

Pollutant	AQS Objective	Annual Mean Concentration (µg/m³)			
		Grid square: 603500, 140500		Grid square: 604500, 140500	
		2019	2040	2019	2040
NO_2	40µg/m³	12.2	7.5	11.1	5.5
PM_{10}	40µg/m³	16.0	11.0	16.3	11.4
$PM_{2.5}$	25µg/m³	9.9	5.3	9.9	5.2

The data in **Table A8.3** shows that all pollutants are below the respective AQS objectives.

In the absence of representative NO_2, PM_{10} and $PM_{2.5}$ monitoring data, the Defra background map concentrations for NO_2, PM_{10} and $PM_{2.5}$ were used

Table A8.4 presents the background concentrations used within the air quality assessment.

[5] Defra Background Mapping data for local authorities, https://uk-air.defra.gov.uk/data/laqm-background-maps

Table A8.4: Background concentrations used in the assessment

Grid Square and Receptors	Pollutant	Annual Mean Concentration (µg/m^3)	
		2019	2026
604500, 140500 Verification AS47 & AS48	NO_2	11.1	7.7
	PM_{10}	16.3	12.1
	$PM_{2.5}$	9.9	5.8
603500, 141500 Receptors 1, 2, 3 & 4	NO_2	15.9	10.2
	PM_{10}	17.4	12.9
	$PM_{2.5}$	11.4	6.7
603500, 140500 Receptor 5	NO_2	12.2	9.9
	PM_{10}	16.0	11.7
	$PM_{2.5}$	9.9	6.0
604500, 141500 Receptor 6	NO_2	13.1	8.8
	PM_{10}	16.9	12.7
	$PM_{2.5}$	10.4	6.1

Model Data Processing

The modelling results were processed to calculate the averaging periods required for comparison with the AQS objectives.

NOx emissions from combustion sources (including vehicle exhausts) comprise principally nitric oxide (NO) and nitrogen dioxide (NO_2). The emitted nitric oxide reacts with oxidants in the air (mainly ozone (O_3)) to form more NO_2. Since only NO_2 is associated with effects on human health, the air quality standards for the protection of human health are based on NO_2 and not total NOx or NO.

ADMS-Roads was run without the Chemistry Reaction option to allow verification (see below). Therefore, a suitable NO_X:NO_2 conversion needed to be applied to the modelled NO_X concentrations. There are a variety of different approaches to dealing with NO_X:NO_2 relationships, a number of which are widely recognised as being acceptable. However, the current approach was developed for roadside sites, and is detailed within LAQM.TG(22).

The LAQM Support website provides a spreadsheet calculator[6] to allow the calculation of NO_2 from NOx concentrations, accounting for the difference between primary emissions of NOx and background NOx, the concentration of O_3, and the different proportions of primary NO_2 emissions, in different years. This approach is only applicable to annual mean concentrations.

Research undertaken in support of LAQM.TG(22) has indicated that the 1-hour mean AQS objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO concentration is less than 60µg/m^3. The 1-hour mean objective is, therefore, not considered further within this assessment where the annual mean NO_2 concentration is predicted to be less than 60µg/m^3.

To calculate the number of PM_{10} 24-hour means exceeding 50µg/m^3 the relationship between the number of 24-hour mean exceedances and the annual mean PM_{10} concentration from LAQM.TG(22) was applied as follows:

6 Defra (2024); NOX to NO2 Calculator, https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/ Version 9.1, August 2024

$$\textbf{Number of Exceedances} = -18.5 + 0.00145 \times (\text{annual mean}^3) + \frac{206}{\text{annual mean.}}$$

Model Verification

Model verification is the process of comparing monitored and modelled pollutant concentrations for the same year, at the same locations, and adjusting modelled concentrations, if necessary, to be consistent with monitoring data. Model verification increases the robustness of modelling results.

Discrepancies between modelled and measured concentrations can arise for a number of reasons, for example:

- traffic data uncertainties;
- background concentration estimates;
- meteorological data uncertainties;
- sources not explicitly included within the model (e.g. car parks and bus stops);
- overall model limitations (e.g. treatment of roughness and meteorological data, treatment of speeds); and
- uncertainty in monitoring data, particularly diffusion tubes.

Verification is the process by which uncertainties such as those described above are investigated and minimised. Disparities between modelling and monitoring results are likely to arise as result of a combination of all the above aspects.

Nitrogen Dioxide

The dispersion model was run to predict annual mean NOx concentrations at the five project specific roadside diffusion tube monitoring locations (as presented in Appendix 9.1 Air Quality Monitoring Report).

The following roadside diffusion tubes were modelled:

- Kenistone, Kingsford Street (AS47); and
- Ransley House (AS48)

These roadside monitoring locations were considered most suitable for model verification. **Table A8.5** compares the modelled and equivalent measured roadside NO_2 concentrations at the diffusion tube sites.

Table A8.5: Annual Mean NO_2 Modelled and Monitored Concentrations

Site ID	Monitored Annual Mean NO_2 (µg/m^3)	Modelled Total Annual Mean NO_2 (µg/m^3)	% Difference
AS47	14.0	15.0	6.9
AS48	13.2	15.2	14.9

Table A8.5 indicates the model over predicts at both diffusion tubes. However, all the results are within 25%, and the monitored concentration at AS47 was within 10%, further adjustment has therefore not been undertaken.

Particulate Matter (PM_{10} and $PM_{2.5}$)

Representative PM_{10} and $PM_{2.5}$ monitoring data is not available for the Application Site and local area. Therefore, an adjustment factor was also not applied to the PM_{10} and $PM_{2.5}$ concentrations.

Statistical Analysis

To confirm the model is performing well, further statistical analysis of the performance of the modelled NO_2 results has been undertaken using the methodology detailed in LAQM.TG(22) Box 7.21: Methods and Formulae for Description of Model Uncertainty. Statistical analysis checks the performance of the model used and the accuracy of the results (observed vs predicted).

The methodology for the calculations is presented in LAQM.TG(22) for the following:

- Correlation Coefficient: This is used to measure the linear relationship between the predicted and observed data. A value of zero means no relationship and a value of 1 means an absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.
- Fractional Bias: this is used to identify if the model shows a systematic tendency to over or under predict. Values very between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.
- Root Mean Square Error: This is used to define the average error or uncertainty of the model. The units of the Root Mean Square Error are the same as the quantities compared.

The results of the statistical calculation are presented in **Table A8.6**.

Table A8.6: Statistical Calculations of Error for the Modelled Results

Statistical Calculation	Perfect Value	Acceptable Variable Tolerance	Unadjusted Model Score
Correlation Coefficient	1	N/A	-1.0
Fractional Bias	0	+2 to -2	-0.10
Root Mean Square Error	0	±10	1.5

Based on the results presented in **Table A8.6**, it is considered that the model is performing well, as the unadjusted model is within the within the acceptable tolerance levels. The statistical analysis confirms that further model adjustment is not necessary.

Verification Summary

Any atmospheric dispersion model study will always have a degree of inaccuracy due to a variety of factors. These include uncertainties in traffic emissions data, the differences between available meteorological data and the specific microclimate at each receptor location, and simplifications made in the model algorithms that describe the atmospheric dispersion and chemical processes. There will also be uncertainty in the comparison of predicted concentrations with monitored data, given the potential for errors and uncertainty in sampling methodology (technique, location, handling, and analysis) as well as processing of any monitoring data.

Whilst systematic under or over prediction can be taken into account through the model verification / adjustment process, random errors will inevitably occur and a level of uncertainty will still exist in corrected / adjusted data.

Model uncertainties arise because of limited scientific knowledge, limited ability to assess the uncertainty of model inputs, for example, emissions from vehicles, poor understanding of the interaction between model and / or emissions inventory parameters, sampling and measurement error associated with monitoring sites and whether the model itself completely describes all the necessary atmospheric processes.

Overall, it is concluded that with the adjustment factors applied to the ADMS-Roads model, the model is performing well and modelled results are considered to be suitable to determine the potential effects of the Proposed Development on local air quality.

Assessor Experience

Name: [redacted]

Years of Experience: 2

Qualifications:

- BSc (Hons) Geography
- MSc Environmental Consultancy

[redacted] is a consultant working within the Air Quality and EIA teams. [redacted] has two years of experience undertaking air quality assessments and nearly three years' experience with the co-ordination of EIAs and preparing Environmental Statements for a range of projects for a variety of clients in both the public and private sector.

Name: [redacted]

Years of Experience: 14

Qualifications:

- CEnv
- BSc (Hons)
- Member of the IAQM
- Full Member of the Institution of Environmental Sciences (IES)

[redacted] has been responsible for the technical delivery of a wide range of air quality projects for a variety of clients in both the public and private sector. These projects include consideration of emissions from both transportation and industrial sources, through both monitoring and modelling, and therefore he has an in depth understanding of the regulatory requirements for these sources and the published technical guidance for their assessment