

8.3 Modelling Methodology

Model Inputs

- A1.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5.1). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 12.1) published by Defra (2025a). Model input parameters are summarised in Table A0-1 and, where considered necessary, discussed further below.

Table A0-1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	No
Variable Surface Roughness File Used?	No
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Odiham
Meteorological Data Year	2024
Dispersion Site Surface Roughness Length (m)	0.5
Dispersion Site Minimum MO Length (m)	30
Met Site Surface Roughness Length (m)	0.3
Met Site Minimum MO Length (m)	1
Gradients?	No

- A1.2 AADT flows, the proportions of HDVs, speeds and vehicle fleet composition data for most road links have been provided by Abley Letchford Partnership Ltd, who have undertaken the transport assessment work for the proposed development. The traffic data have been derived from the Wokingham Transport Model and assumes that the SWDR Link Road will be in place in both the with and without development scenarios.

Table A0-2: Summary of Traffic Data used in the Assessment

Road Link	2028 (Without Scheme)		2028 (With Scheme)	
	AADT	%HDV	AADT	%HDV
SWDR Link Road	9,040	1.8	7,827	2.1
Easthampstead Road (East of Site Access B)	4,036	0.4	2,512	0.4
Heathlands Road	5,428	2.7	6,561	2.2
Easthampstead Road	534	1	529	1

Road Link	2028 (Without Scheme)		2028 (With Scheme)	
	AADT	%HDV	AADT	%HDV
B3430 Nine Mile Ride (East)	10,821	1.7	11,365	1.5
SWDR (North of Waterloo Road)	11,262	1.5	11,947	1.4
London Road	30,314	1.3	30,703	1.3
Oak Avenue	7,796	0.1	7,969	0.1
London Road (East of SWDR)	24,004	1.6	24,566	1.6
London Road (West of SWDR)	17,453	1.5	17,552	1.5

A1.3 Figure A0-1 shows the road network included within the model, along with the speed at which each link was modelled.

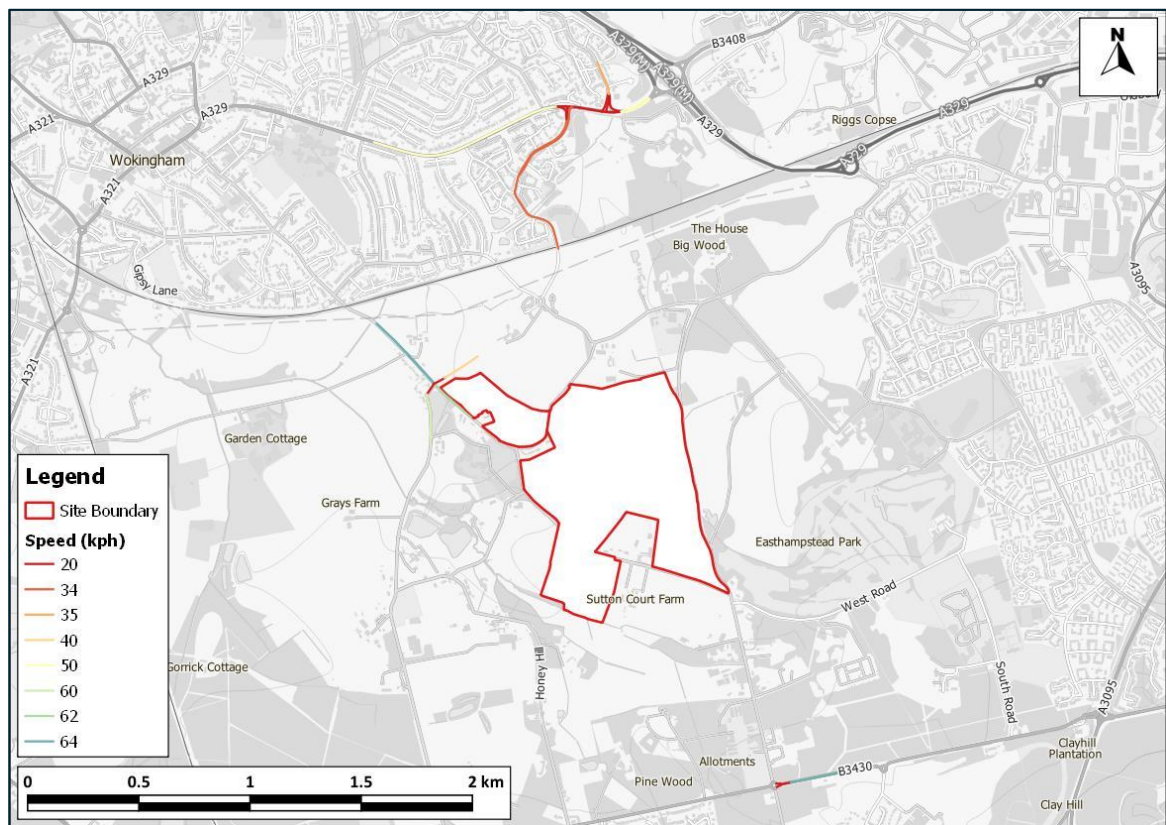


Figure A0-1: Modelled Road Network & Speed

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

A1.4 Hourly sequential meteorological data in sectors of 10 degrees from Odiham for 2024 have been used in the model. The meteorological monitoring station is located at RAF Odiham Airfield, approximately 20 km to the south west of the proposed development. Both the application site and the meteorological monitoring station are located in the south of England where they will be influenced by the effects of inland meteorology over flat-lying topography. The topography of the model

domain is similar to that around the meteorological monitoring station and measurements from this site are considered to provide the most robust basis to predict meteorology within the model domain. A wind rose for the site for the year 2024 is provided in Figure A6-5. Raw data were provided by the Met Office and processed by AQC for use in ADMS.

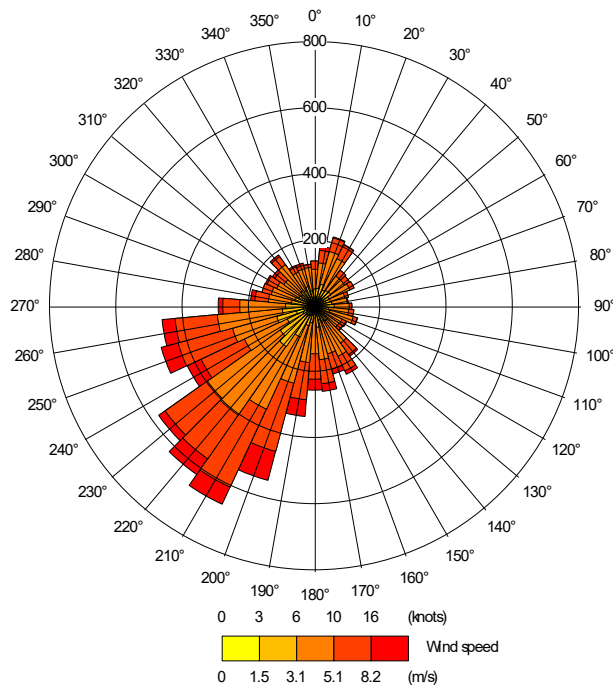


Figure A0-2: Wind Rose

Model Verification

- A1.5 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside nitrogen dioxide concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean nitrogen dioxide concentrations during 2024 Bracknell Forest 58x/y/zC, 91x/y/Z, and 135 diffusion tube monitoring sites located in Crowthorne. These sites have been selected because of their roadside locations, which are broadly similar to roads in proximity to the proposed development.

Background Concentrations

- A1.6 The background annual mean NO₂ concentration used in the model verification was 9.1 µg/m³, having been derived from the national maps using the same approach as described in ES paragraph 8.4.1.

Traffic Data

- A1.7 Traffic flows for the roads adjacent to the monitoring site have been determined from the interactive web-based map provided by the DfT (DfT, 2025). The 2019 AADT flows have been factored forwards to 2024 for model verification purposes using growth factors derived using the TEMPro System v8.1 (DfT, 2023) (a growth factor of 1.0283 has been applied). Flows from the DfT were used as the Wokingham Transport Model used in the Transport Assessment does not include the roads in Crowthorne, which is in Bracknell Forest. Traffic data used in the model verification are summarised in Table A0-3.

Table A0-3: 20XX AADT Traffic Data used in the Model Verification

Road Link	AADT	%HDV
DfT point 944769	12,468	1.2
DfT point 944773	7,446	1.7

Nitrogen Dioxide

- A1.8 Most NO₂ is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂).
- A1.9 The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x. Measured road-NO_x has been calculated from the measured NO₂ concentrations and the predicted background NO₂ concentration using the NO_x from NO₂ calculator (Version 9.1) available on the Defra LAQM Support website (Defra, 2025a).
- A1.10 The unadjusted model has under predicted the road-NO_x contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A0-3). The calculated adjustment factor of 11.85 has been applied to the modelled road-NO_x concentration for each receptor to provide adjusted modelled road-NO_x concentrations.
- A1.11 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO₂ concentration within the NO_x to NO₂ calculator. Figure A0-4 compares final adjusted modelled total NO₂ at each of the monitoring sites to measured total NO₂, and shows a close agreement.

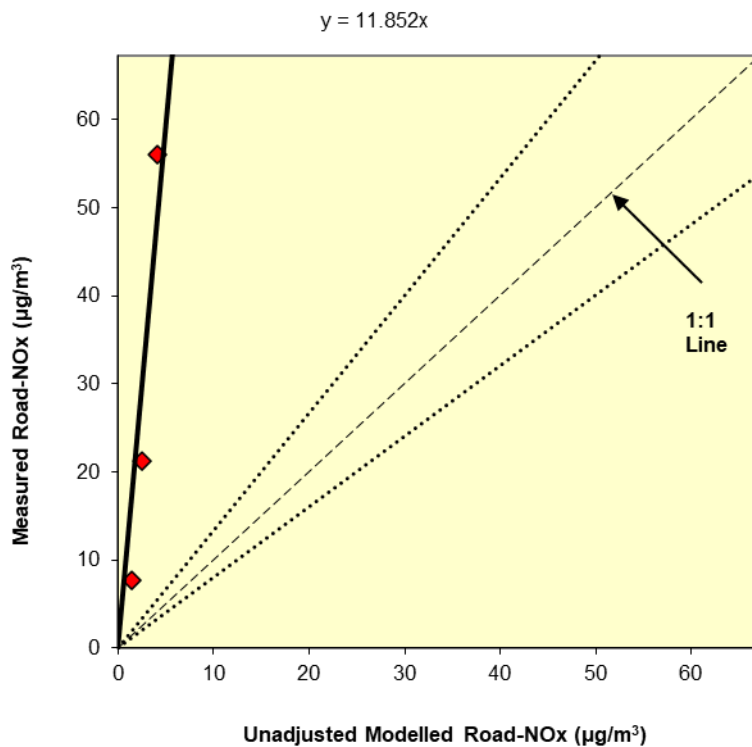


Figure A0-3: Comparison of Measured Road NO_x to Unadjusted Modelled Road NO_x Concentrations. The dashed lines show $\pm 25\%$.

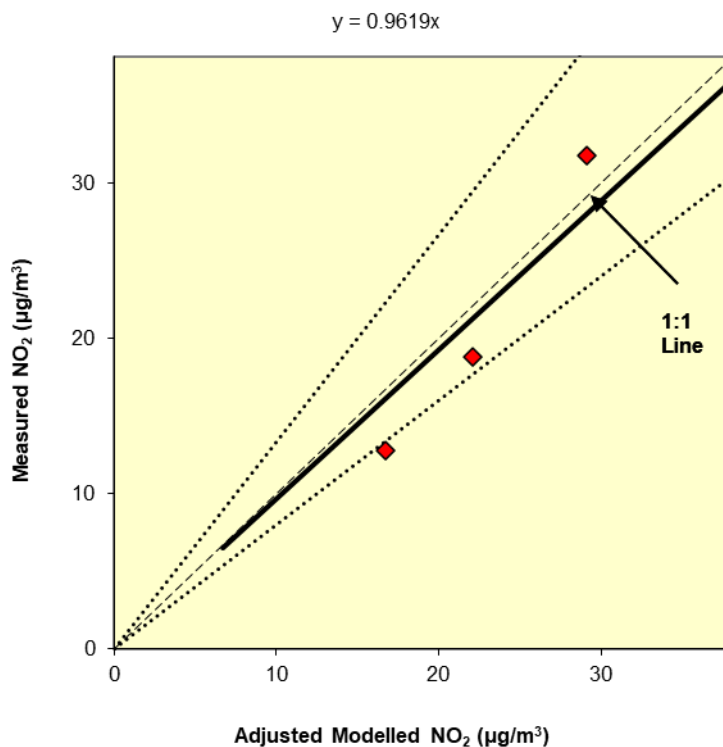


Figure A0-4: Comparison of Measured Total NO₂ to Final Adjusted Modelled Total NO₂ Concentrations. The dashed lines show $\pm 25\%$.

PM₁₀ and PM_{2.5}

- A1.12 The approach described above for NO_x and nitrogen dioxide determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NO_x because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM₁₀ and PM_{2.5} concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured PM_{2.5} in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean PM_{2.5} concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.
- A1.13 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM₁₀ and PM_{2.5} concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for NO_x and NO₂ is not appropriate for PM₁₀ and PM_{2.5}. Historically, many studies have derived a model adjustment factor for NO_x and applied this to PM₁₀ and PM_{2.5}. This is also not appropriate, since there is no reason to expect the same bias in emissions of NO_x, PM₁₀ and PM_{2.5}.

- A1.14 While there is very strong evidence that EFT-based models have consistently under-predicted road-NO_x concentrations in urban areas, there is no equivalent evidence for PM₁₀ and PM_{2.5}. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM₁₀ and PM_{2.5} have thus not been adjusted.

Post-processing

- A1.15 The model predicts road-NO_x concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO₂, has been processed through the NO_x to NO₂ calculator available on the Defra LAQM Support website (Defra, 2025a). The traffic mix within the calculator has been set to "All other urban UK traffic", which is considered suitable for the study area. The calculator predicts the component of NO₂ based on the adjusted road-NO_x and the background NO₂.