

Technical Appendix 6.3

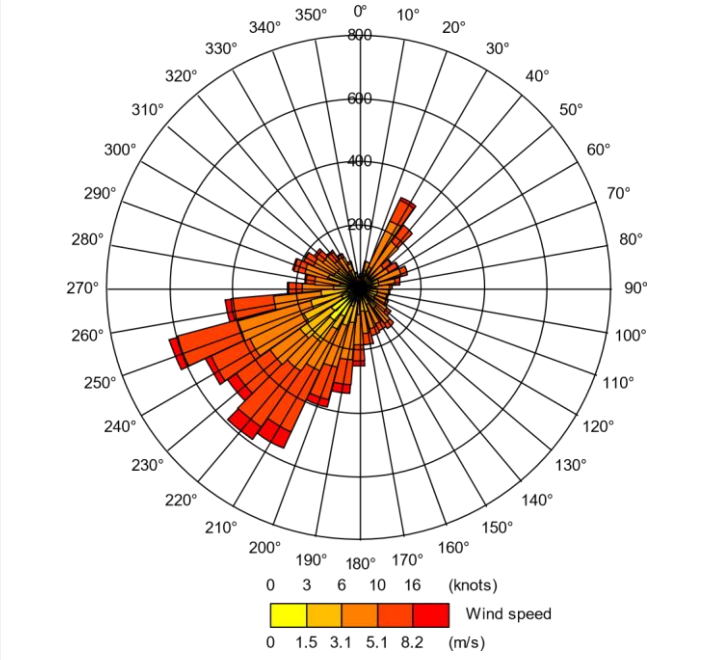
Air Quality Dispersion

Model Methodology



Dispersion Model Parameters

The model requires the user to provide various input data, including vehicle emission derived from the Annual Average Daily Traffic (AADT) flow, the proportion of Heavy duty vehicles (HDV), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed and other model parameters. The model set up parameters are described in Table A6.3-1. [Table A6.3-1: Dispersion Model Inputs](#)

Meteorological Data	2024 meteorological data for Farnborough has been used in the dispersion model. Windrose below: 
ADMS	Version 5.1.0.2
Street Canyon	No canyons included
Time Varying Emission Factors	Based on Department for Transport statistics. Table TRA0307. Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain: 2024.
Latitude	51.3
Surface Roughness	A value of 0.5 for Parkland and open suburbia was used to represent the modelled area. A value of 0.2 for agricultural areas was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 10 for small cities was used to represent the modelled area and the meteorological station site.
Emission Factor Toolkit (EFT)	V13.1 (2VC), March 2025. Road type England Urban.

Emission Factors

Traffic emissions were calculated using the Emission Factor Toolkit (EFT) v13.1 embedded in ADMS model, which utilises nitrogen oxides (NO_x), PM₁₀ and PM_{2.5} emission factors from the European Environment Agency COPERT 5.8 emission tool. The traffic data were entered into the EFT tool, along with speed data to provide combined emission rates for each of the modelled road links.

Conversion of NO_x to NO₂

Defra NO_x to NO₂ calculator¹ v9.1 has been used in conjunction with the ADMS model to obtain a more accurate picture of NO₂ concentrations.

Terrain

The terrain within 200m of the modelled network is relatively flat with slopes less than 10%, and therefore terrain effects have not been included within the modelling. The land cover use within 200m of the modelled road network is dominated by rural and urban fabric and the model has not taken other land cover use changes into account.

Road Traffic

AADT flows and the proportions of HDVs, for roads within the study area and extension of the modelled area, are detailed in Figure A6.1 and presented in Table A6.3, respectively.

The Proposed Development's traffic impacts have been assessed using predicted traffic flows provided by the Applicant's Transport Consultant, i-Transport, calculated based on the interpretation of the Proposed Development area schedule, and traffic surveys. For the 2040 traffic fleet scenarios, the emission factors and backgrounds for 2028 have been used.

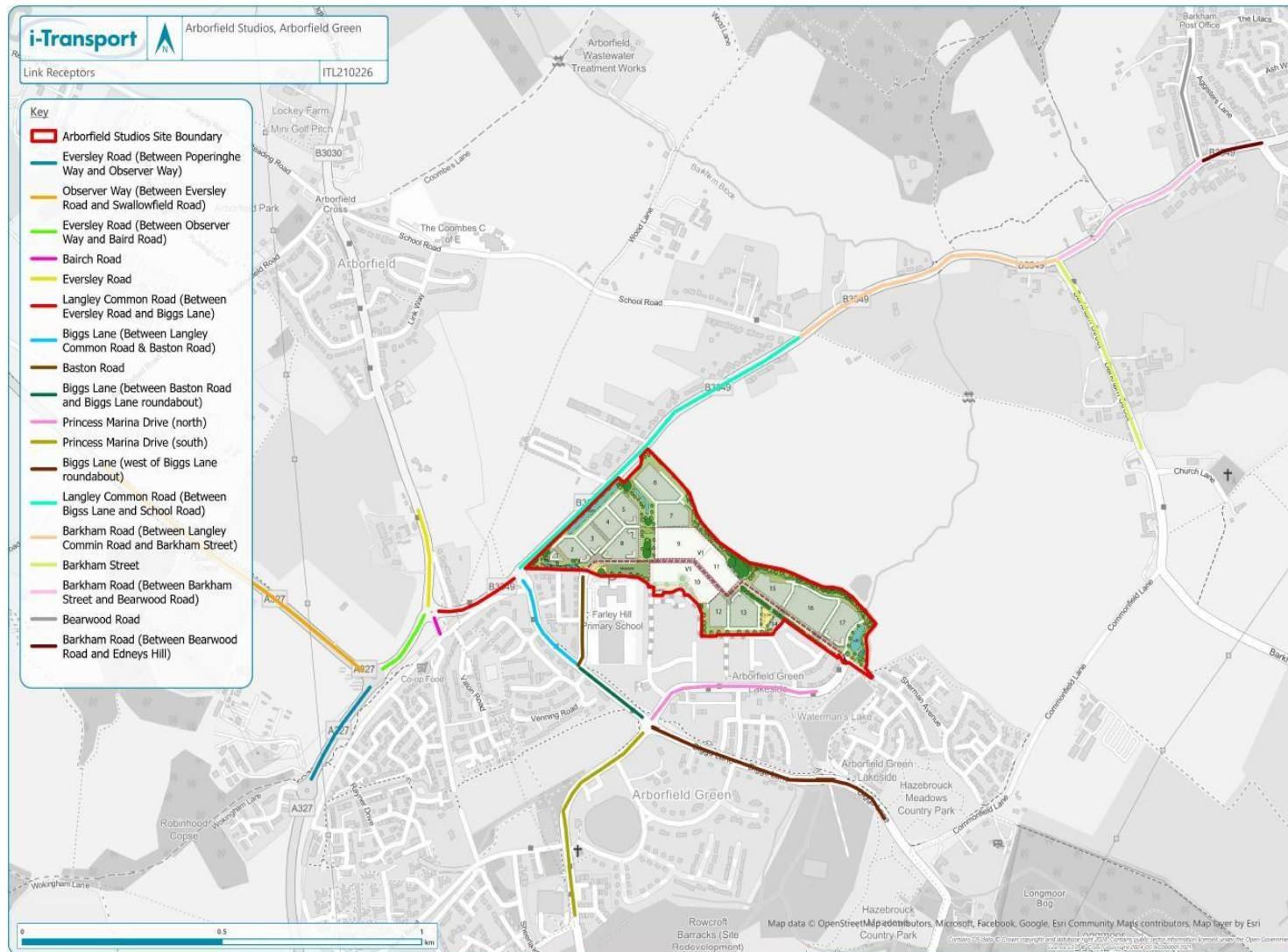


Figure A6.3-1: Road Network ID (Source i-Transport)

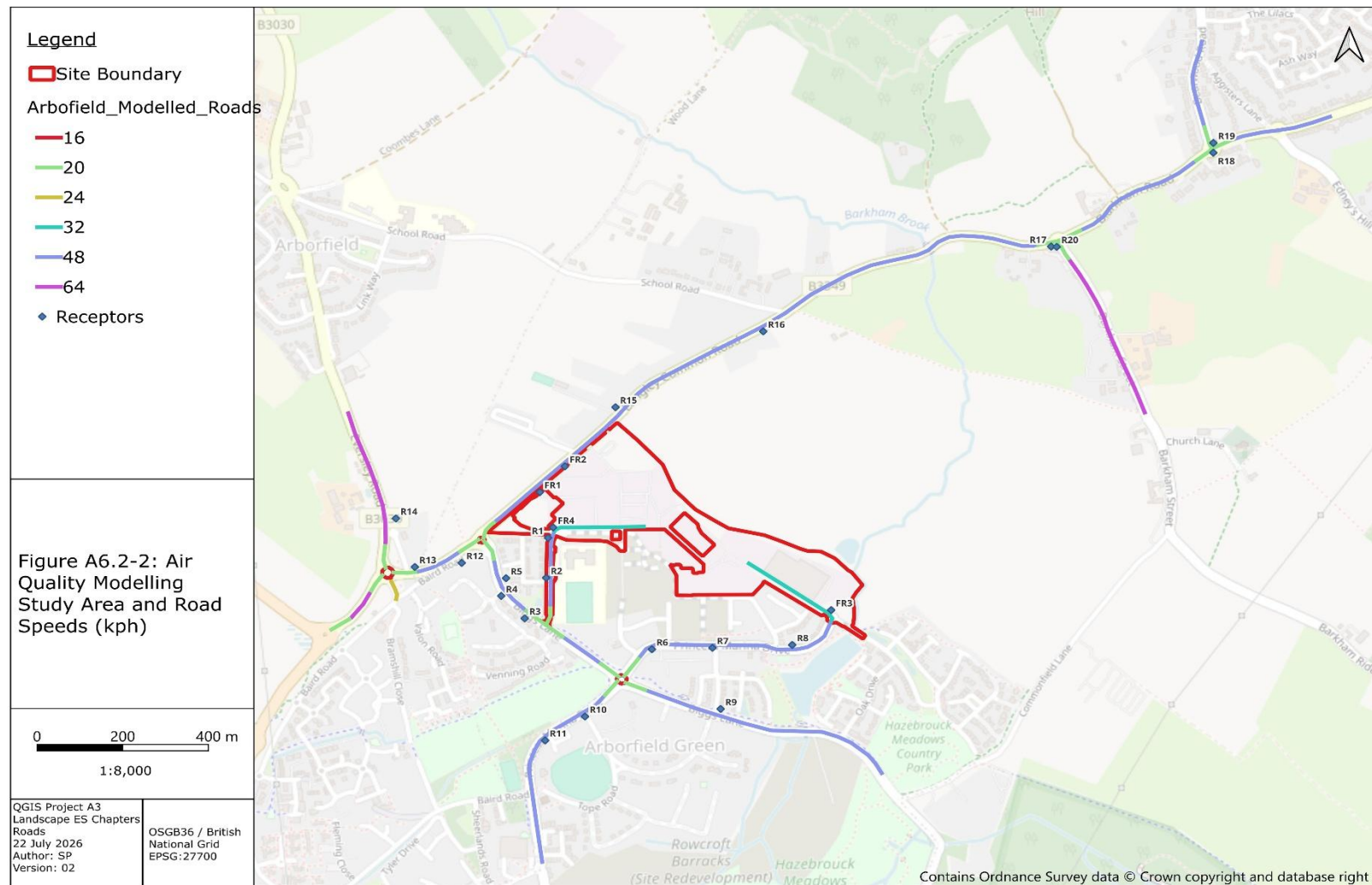


Figure A6.3-2: Modelled Road Network and Speed

Table A6.3-2: Modelled Road Network Traffic flows

Link	2024		Scenario 1: 2040 – Do Something without Arborfield Studios (providing local plan growth and distribution)		Scenario 2: 2040 – Do Something with Arborfield Studios and Barkham Square (Without vehicle connection between Arborfield Studios and Barkham Square)	
	AADT	HGV	AADT	HGV	AADT	HGV
Eversley Road (Between Poperinghe Way and Observer Way)	15312	624	19206	401	19148	406
Eversley Road (Between Observer Way and Baird Road)	15550	531	19183	241	19319	240
Eversley Road (Towards Arborfield Cross)	7795	370	8223	112	8424	113
Langley Common Road (Between Eversley Road and Biggs Lane)	13332	721	17369	212	17643	212
Langley Common Road (Between Biggs Lane and School Road)	10489	404	13216	153	13504	152
Barkham Road (Between School Road and Barkham Street)	10269	374	13726	156	14000	157
Barkham Road (Between Barkham Street and Bearwood Road)	12528	452	17146	198	17486	201
Barkham Road (Between Bearwood Road and Edneys Hill)*	11355	197	15635	260	15832	261
Observer Way	15831	624	19376	362	19542	366
Baird Road	3393	11	696	3	839	3
Biggs Lane (Between Langley Common Road and Baston Road)	7848	352	7874	74	7874	75

Biggs Lane (Between Baston Road and Princess Marina Drive)	7427	299	8107	74	8919	75
Barkham Street	6940	188	9043	72	9201	74
Bearwood Road	8870	147	15661	161	15816	165
Baston Road	1199	0	3526	19	4680	19
Princess Marina Drive North	1389	6	1933	5	2301	5
Princess Marina Drive South	3068	157	4006	12	4425	12
Biggs Lane (east of Princess Marina Drive)	4552	174	5260	39	5492	39

* used as representative for Barkham road next to monitoring sites used for model verification

Model Verification

Nitrogen Dioxide

In order to verify modelled pollutant concentrations generated in the assessment, the model has been run to predict the annual mean road-NOX concentration during 2024 at the diffusion tube sites located along Barkham Road.

The model output of road-NOX has been compared with the 'measured' road-NOX. Measured NOX for the monitoring sites was calculated using the NOX to NO₂ calculator.

A primary adjustment factor was determined by comparing the measured road-NOx with the model road-NOx, in line with TG(22) guidance. This factor was then applied to the modelled road-NOX concentration for each receptor to provide adjusted modelled road-NOX concentrations. Total NO₂ concentrations were then determined by combining the adjusted modelled road-NOX concentrations with the 2024 background NO₂ concentration.

A secondary adjustment factor was calculated by comparing the measured road-NO₂ with the model road-NO₂, and the factor was applied to the final NO₂ predicted results.

The results imply that the model was under-predicting the road-NOX contribution. This is a common experience with ADMS and most other models. The adjustment factors and verification results are presented in Tables A6.3-3 and A6.3-4, respectively.

Table A6.3-3: Verification Adjustment Factors

Verification factors	
Primary adjustment factor	2.9562
Secondary adjustment factor	1.0013

RMSE

The root mean square error (RMSE) is used to define the average error or uncertainty of the model. The following RMSE value has been calculated:

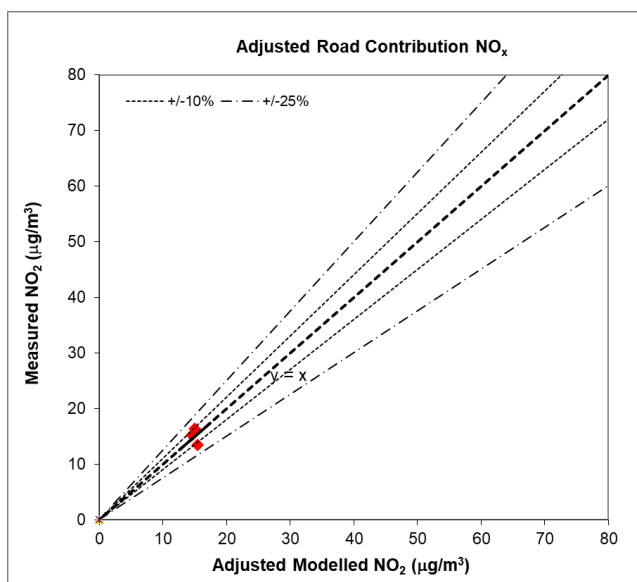
NO₂: 1.48 µg/m³ (4%)

If the RMSE values are higher than $\pm 25\%$ of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. In this case the model is being assessed against the annual mean objective, which is $40 \mu\text{g}/\text{m}^3$ for NO_2 . An RMSE value of less than 25% is obtained and therefore the model behaviour is acceptable.

Based on TG(22) and professional experience, the model is considered to perform well. [Table A6.3-4: Verification Process \(\$\mu\text{g}/\text{m}^3\$ \)](#)

Site	Measured NO_2	Measured Road NO_x	Modelled Roadside NO_x	Ratio Measured NO_x / Modelled road NO_x	Total NO_2 after adjustment	% Difference in NO_2 after adjustment
WOK 805	13.4	11.7	5.4	2.142	15.4	15%
WOK 893	15.2	15.7	4.8	3.290	14.5	-5%
WOK 895	16.4	18.4	5.1	3.590	15.0	-9%

Figure A6.3-3: Comparison of Measured road- NO_2 to unadjusted modelled road- NO_2 concentrations



Particulates (PM₁₀ and PM_{2.5})

PM₁₀ and PM_{2.5} monitoring is not carried out in close proximity to the proposed development site and therefore no PM specific model verification can be undertaken. As recommended in paragraph 7.572 of LAQM TG(22), the NO₂ primary adjustment factor has therefore been applied to PM₁₀ and PM_{2.5} predicted concentrations.

¹ <http://uk-air.defra.gov.uk/assets/documents/reports/ageg/primary-no-trends.pdf>