Meridian Solar Farm

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Volume 6

Environmental Statement

6.3 ES Appendix 6-2: Quantitative Road Traffic Emissions Assessment Methodology

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1. Quantitative Road Traffic Emissions Assessment Methodology

1.1. Modelling Software

1.1.1. The ADMS (Atmospheric Dispersion Model System) - Roads (version 5)[1] detailed dispersion model was used to assess direct effects from the additional traffic on local air quality during 2031, the year of peak movements attributable to construction activities.

1.1.2. The ADMS-Roads model considers the key variables that influence pollutant emission and dispersion (meteorology, surface roughness, diurnal traffic flows, predicted future traffic mixes and predicted future engine emission standard mixes). Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at a number of locations in the vicinity of the Scheme. The receptors chosen include those that are representative of worst-case exposure locations within the modelled study area).

1.2. Assessment Scenarios

1.2.1. The likely change in concentrations of NO_2, PM_{10} and $PM_{2.5}$ were made for the following scenarios:

- Scenario 1 (S1): 'Peak construction year without development' (2031): the year during which the largest volume of construction traffic attributable to the Scheme will be generated, inclusive of future baseline and traffic from nearby committed and consented developments; and
- Scenario 2 (S2): 'Peak construction year with development' (2031): the year during which the largest volume of construction traffic attributable to the Scheme will be generated, inclusive of future baseline, traffic from nearby committed and consented developments and Scheme construction traffic.

1.3. Traffic Data

1.3.1. The annual average daily traffic (AADT), percentage of heavy-duty vehicles (%HDVs) and vehicle speeds for the local roads of interest were predominantly

[1] CERC, 2025. ADMS-Roads. Available at: https://www.cerc.co.uk/environmental-software/ADMS-Roads-model.html [Accessed 04/11/2025]

obtained from or otherwise generated using a method agreed with the Project Transport Consultants for the Scheme. The ADDT is divided into LDVs and HDVs. LDVs (Light Duty Vehicles) include cars and vans that are less than 3.5 tonnes gross weight, while HDVs (Heavy Duty Vehicles) includes larger vehicles such as lorries and buses than are more than 3.5 tonnes gross weight.

1.3.2. Vehicle speeds were based on the average speeds at each road link where available, otherwise the speed limit was used but sometimes adjusted with reference to the advice on modelling junctions and congestion provided within TG22[2], and professional judgement. Table 1-1 summarises the receptors identified within the study area, and whether they are within 200m of a road exceeding the IAQM guidance screening criteria[3]. For locations where one or more of the IAQM guidance screening criteria is exceeded, the receptor has been included in the Air Quality assessment.

1.3.3. Cumulative traffic data, including trips from committed developments, were incorporated into the cumulative section of the Air Quality Assessment. This ensures that the modelling reflects the combined impact of all relevant traffic sources within the future year scenario.

Table 1-1: Receptors located within the Study Area and surrounding traffic flows

Receptor ID	X Coordinate	Y Coordinate	Within 200m of road with LDV exceedance	Within 200m of road with HDV exceedance
R1	522225	305764	No	Yes
R2	521822	305995	No	No
R3	521780	306065	No	No
R4	524342	309320	No	Yes
R5	526853	310242	No	No

[2] Department for Environment, Food and Rural Affairs (2022). Local Air Quality Management: Technical Guidance (TG22). Available at: https://laqm.defra.gov.uk/wp-content/uploads/2021/03/LAQM-TG22-May-25-v2.1.pdf [Accessed 04/11/2025]

[3] Environmental Protection UK and Institute of Air Quality Management (2017). Land-Use Planning & Development Control Planning for Air Quality. Available at: https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf [Accessed 04/11/2025]

Receptor ID	X Coordinate	Y Coordinate	Within 200m of road with LDV exceedance	Within 200m of road with HDV exceedance
R6	527447	310477	No	No
R7	530584	312238	No	No
R8	530630	312300	No	No
R9	530682	312250	No	No
R10	533129	311811	No	No
R11	533077	311802	No	No
R12	535669	318548	No	No
R13	534887	318365	No	No
R14	534911	318385	No	No
R15	534869	318389	No	No
R16	534306	318187	No	No
R17	534326	318236	No	No
R18	535244	318463	No	No
R19	535262	318433	No	No
R20	530145	317307	No	No
R21	530070	317350	No	No
R22	530128	318314	No	No
R23	529364	318250	No	No
R24	529333	318265	No	No
R25	529400	318266	No	No
R26	526906	318002	No	Yes
R27	526963	318060	No	Yes
R28	526782	318028	No	Yes
R29	526772	318061	No	Yes

Receptor ID	X Coordinate	Y Coordinate	Within 200m of road with LDV exceedance	Within 200m of road with HDV exceedance
R30	526613	318016	No	No
R31	526596	318045	No	No
R32	526555	317201	No	No
R33	526531	317195	No	No
R34	526579	316385	No	No
R35	526138	314922	No	No
R36	526265	314472	No	No
R37	526243	311596	No	No
R38	524758	314319	No	No
R39	524127	312027	No	No
R40	524212	310945	No	No
R41	524209	310614	No	No
R42	524258	310634	No	No
R43	524259	310592	No	No
R44	524765	310797	No	No
R45	524706	310823	No	No
R46	527166	311594	No	Yes
R47	527849	311838	No	Yes
R48	529177	312567	No	Yes
R49	528394	314486	No	No
R50	527389	314699	No	No
R51	527302	314610	No	No
R52	525128	320100	No	Yes
R53	526288	322757	No	Yes

Receptor ID	X Coordinate	Y Coordinate	Within 200m of road with LDV exceedance	Within 200m of road with HDV exceedance
R54	526206	322781	No	Yes
R55	526413	322780	No	Yes
R56	526706	323917	No	Yes
R57	526329	323786	No	Yes
R58	526893	324162	No	No
R59	529298	325262	No	No
R60	529485	325261	No	No

1.4. Vehicle Emissions Factors

1.4.1. The ADMS-Roads model assesses the mass of pollutants generated along each stretch of modelled road based on inputted 'emissions factors' (g/km/s). Defra's emissions factors toolkit (version 13.0)[4] was used to determine the emissions of oxides of nitrogen (NO_X), PM_{10} and $PM_{2.5}$ from construction traffic along the affected links for 2031, the peak construction year of the Scheme. The 'Rural (not London)' setting was selected for all of the modelled road links, with reference to the 'Emissions Factors Toolkit v13 User Guide'.

1.5. Modelled Receptors

1.5.1. Sensitive existing receptors were selected at a range of locations (including worst-case ones) where members of the public are expected to be present and potentially regularly exposed to air pollutants. Following comparison with the IAQM guidance[3], receptors required to be included in the Air Quality Assessment have been identified. The receptors included are shown in below.

[4] Department for Environment, Food and Rural Affairs (2025) Emissions Factors Toolkit. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/ [Accessed 04/11/2025]

1.5.2. The assessment has assumed that all human health receptors at ground floor level are elevated to 1.5m, to represent the average breathing height for a human. Ecological receptors have been modelled at 0m, to represent ground level.

Table 1-2: List of modelled receptors

Receptor ID	Receptor Type	X Coordinate	Y Coordinate	Modelled Height (m)
R1	Existing residential façade	522225	305764	1.5
R4		524342	309320	1.5
R26		526906	318002	1.5
R27		526963	318060	1.5
R28		526782	318028	1.5
R29		526772	318061	1.5
R46		527166	311594	1.5
R47		527849	311838	1.5
R48		529177	312567	1.5
R52		525128	320100	1.5
R53		526288	322757	1.5
R54		526206	322781	1.5
R55		526413	322780	1.5
R56		526706	323917	1.5
R57		526329	323786	1.5
E1	South Holland Main Drain LWS	526825	315887	0
E2	Lambert Drain LWS	532862	312360.	0
E3	Coronation Channel LWS	526121	322821	0
E4	Wheatmere Drain LWS	526886	318027	0

1.6. Cumulative Effects

1.6.1. The ADMS-Roads model was subsequently rerun to incorporate traffic associated with committed developments, ensuring the assessment reflects the combined impact of all relevant sources within the future year scenario. The updated modelling results are provided in **ES Chapter 6: Air Quality** (Doc Ref. 6.1).

1.7. Meteorological Data

1.7.1. This study used hourly sequential meteorological observation data from Coningsby meteorological station for the calendar year 2024. Coningsby is considered a suitable and representative site because its location, terrain, and weather conditions are broadly similar to those at the development site, ensuring that wind speed, direction, and other atmospheric parameters accurately reflect local dispersion characteristics. A wind rose plot summarising frequency of the occurrences of winds in defined speed bands and frequency that winds blow from each direction (10 degree intervals), is set out in Plate 1.

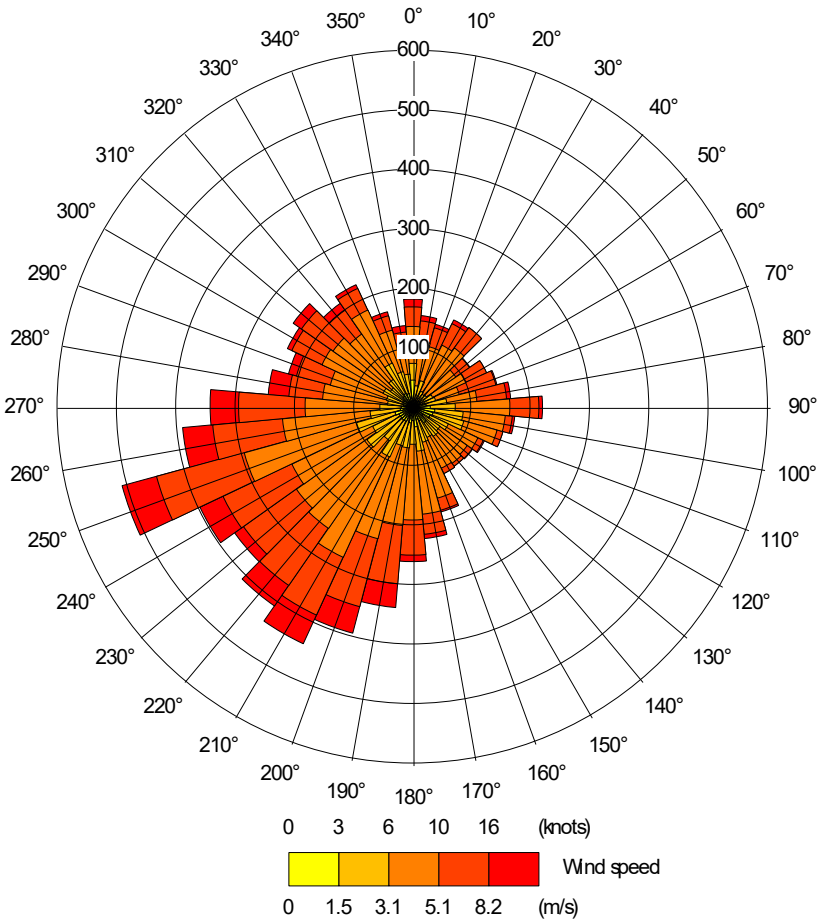

Plate 1: Wind rose from the Coningsby meteorological station during 2024

1.8. Background Concentrations

1.8.1. The total concentration of a pollutant comprises those from the modelled local emission sources and background pollutant concentrations, which are transported into an area by the wind from further away.

1.8.2. The Defra UK-AIR[5] concentration applicable to the assessed year and 1km^2 grid within which each receptor is located has been applied for NO_2, PM_{10} and $PM_{2.5}$.

[5] Defra (2024). Background Mapping Data for Local Authorities. Available at: https://uk-air.defra.gov.uk/data/laqm-background-home [Accessed 04/11/2025]

1.8.3. The annual mean NO_2, PM_{10} and $PM_{2.5}$ background concentrations applied at each of the receptor locations is shown in Table 1-3. Background concentrations for the assessment year of 2031 were applied to the modelled receptor locations.

Table 1-3: Background annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations applied at each of the modelled receptor locations

Modelled Receptor	NO_2	PM_{10}	$PM_{2.5}$
R1	5.4	13.1	5.8
R4	5.1	12.9	5.9
R26	4.5	13.1	5.7
R27	4.5	13.1	5.7
R28	4.5	13.1	5.7
R29	4.5	13.1	5.7
R46	4.7	12.1	5.5
R47	4.7	12.1	5.5
R48	4.5	12.8	5.6
R52	4.7	13.5	5.7
R53	5.0	12.3	5.8
R54	5.0	12.3	5.8
R55	5.0	12.3	5.8
R56	6.0	13.0	6.1
R57	6.0	13.0	6.1
E1	4.5	13.4	5.6
E2	4.5	12.6	5.6
E3	5.0	12.3	5.8
E4	4.5	13.1	5.7

1.9. Summary of Additional Model Inputs

1.9.1. A summary of the additional parameters considered in the dispersion modelling study are outlined in Table 1-4 below.

Table 1-4: Summary of additional model input parameters

Parameter	Input into model
Terrain	The model is based on simple terrain with roads and receptors located at the same height
Road width	Road widths determined based on approximate measurement of roads using online measurement tools.
Canyon heights	There are no road links in the affected road network that have the characteristics of a 'street-canyon'.
Surface roughness	A value of 0.3 at the dispersion site and 0.2 at the meteorological observation station.
Monin-Obukhov Length	A value of 10 metres at the dispersion site and meteorological observation station.

1.10. Model Verification

1.10.1. Model verification refers to checks that are carried out on model performance in relation to roads modelling at a local level. Modelled concentrations are compared with the results of local monitoring and, where there is a disparity between modelled and monitored concentrations of primary pollutants, an adjustment factor is calculated and applied to the final model output.

1.10.2. Based on professional judgement an adjustment factor of 3 has been used to increase initial model outputs for concentrations of NOx, PM_{10} and $PM_{2.5}$. The adjusted NOx concentrations are then used to calculate reported concentrations of NO_2

1.10.3. The approach is considered to be a conservative approach as the modelling method typically requires an adjustment factor of 2 for models of similar sized roads, with simple terrain and no street-canyons.

1.11. Post Processing of Results

1.11.1. At each receptor, the following method was used to estimate total annual mean pollutant concentrations:

- Modelled road NO_x, PM_{10} and $PM_{2.5}$ concentrations were adjusted (as part of model verification) using the method set out above and as per TG22[2];
- The road source NO_2 at each receptor was estimated from the modelled NO_x concentration using version 9.1 of the NO_x to NO_2 calculator[6]; and,
- Adjusted annual mean road NO_2, PM_{10} and $PM_{2.5}$ concentrations were added to the applicable background.

[6] NOx to NO2 calculator v9.1. Available at: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/ [Accessed 04/11/2025]