

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

Volume 5: Appendix AQ-001-OR003

Air quality

Air quality report

Off-route works: Annandale depot

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Department
for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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Contents

1	Introduction	2
1.1	Structure of this appendix	2
1.2	Scope, methodology, data sources, assumptions and limitations	3
2	Baseline air quality data	4
2.1	Existing air quality	4
3	Construction dust assessment	5
4	Assessment of road traffic emissions	6
4.1	Overview	6
4.2	Assessment of construction traffic emissions	6
4.3	Assessment of operational traffic emissions	11
Tables		
	Table 1: Range of background pollutant concentrations	4
	Table 2: Modelled human receptors and background concentrations (construction phase)	7
	Table 3: Predicted annual mean NO ₂ concentrations and impacts (construction phase)	8
	Table 4: Predicted annual mean PM ₁₀ concentrations and impacts (construction phase)	9
	Table 5: Predicted annual mean PM _{2.5} concentrations and impacts (construction phase)	10

1 Introduction

1.1 Structure of this appendix

- 1.1.1 This report is an appendix to the air quality assessment which forms part of Volume 5 of the Supplementary Environmental Statement 2 (SES2) and Additional Provision 2 Environmental Statement (AP2 ES) for the off-route works at Annandale depot.
- 1.1.2 This appendix provides details of changes to the air quality assessment since the High Speed Two (HS2) High Speed Rail (Crewe – Manchester) Environmental Statement (ES) published in 2022¹ (the main ES), and the Supplementary Environmental Statement 1 (SES1) and Additional Provision 1 Environmental Statement (AP1 ES) also published in 2022².
- 1.1.3 This appendix should be read in conjunction with the main ES Volume 5, Appendix: AQ-001-OR003³.
- 1.1.4 In order to differentiate between the original scheme and the subsequent changes, the following terms are used:
- ‘the original scheme’ – the Bill scheme submitted to Parliament in 2022, which was assessed in the main ES;
 - ‘the SES1 scheme’ – the original scheme with any changes described in SES1 that are within the existing powers of the Bill;
 - ‘the AP1 revised scheme’ – the original scheme as amended by SES1 changes and AP1 amendments;
 - ‘the SES2 scheme’ – the original scheme with any changes described in SES1 (submitted in July 2022) and the SES2; and
 - ‘the AP2 revised scheme’ – the original scheme as amended by SES1 and SES2 changes (as relevant) and AP2 amendments.

¹ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

² High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-1-and-additional-provision-1-environmental-statement>.

³ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Air quality report*, Volume 5, Appendix: AQ-001-OR003. Available online at: <https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement>.

- 1.1.5 In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID) which accompanies the SES2 and AP2 ES (see Additional data used in the air quality assessment, BID AQ-002-OR003 SES2 and AP2 ES⁴).
- 1.1.6 Where it has been possible to differentiate the air quality assessment between the SES2 changes and the AP2 amendments, this has been done and presented in this report. However, the assessment of road traffic emissions is a combined assessment of both SES2 changes and AP2 amendments in this area.

1.2 Scope, methodology, data sources, assumptions and limitations

- 1.2.1 The assessment scope, key assumptions and limitations are as set out in the main ES Environmental Impact Assessment Scope and Methodology Report⁵ (see main ES Volume 5: Appendix CT-001-00001).
- 1.2.2 Since the preparation of the main ES, the Department for Environment, Food and Rural Affairs (Defra) has released new versions of tools for undertaking air quality assessments⁶, namely the emissions factors toolkit. This air quality assessment has therefore used the latest available tools.
- 1.2.3 The air quality standards for this assessment are:
- 40µg/m³ as an annual mean for nitrogen dioxide (NO₂);
 - 200µg/m³ one-hour mean NO₂ concentrations, not to be exceeded more than 18 times a year (equivalent to the 99.8th percentile of the one-hour mean);
 - 18µg/m³ as an annual mean for fine particulate matter (PM₁₀);
 - 50µg/m³ 24-hour mean PM₁₀ concentrations, not to be exceeded more than 35 times a year (equivalent to the 90.4th percentile of the 24-hour mean); and
 - 10µg/m³ as an annual mean for very fine particulate matter (PM_{2.5}).

⁴ High Speed Two Ltd (2023), High Speed Rail (Crewe – Manchester), *Background Information and Data accompanying Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement, Additional data used in the air quality assessment*, BID AQ-002-OR003 SES2 and AP2 ES . Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-supplementary-environmental-statement-2-and-additional-provision-2-environmental-statement>.

⁵ High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report*, Volume 5, Appendix: CT-001-00001. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement>.

⁶ Department for Environment, Food and Rural Affairs (2022). *Local air quality management*. Available online at: <https://laqm.defra.gov.uk/whatsnew.html>.

2 Baseline air quality data

2.1 Existing air quality

Background pollutant concentrations

- 2.1.1 Estimates of background air quality were obtained from the Defra maps⁷. Background pollutant concentrations are within the air quality standards throughout the study area. Table 1 presents the range of background pollutant concentrations within the Annandale depot area for the existing and future baseline, 2018 background pollutant concentrations remain the same as reported in the main ES.
- 2.1.2 Background pollutant concentrations for the operational year of 2039 have been taken from the Defra background maps for 2030, which is the latest available year of data. The 2030 background maps have been used as representative of the future baseline conditions during operation of the AP2 revised scheme.

Table 1: Range of background pollutant concentrations

Pollutant	Background concentrations ($\mu\text{g}/\text{m}^3$)		
	2018	2026	2039
Annual mean NO _x	7.8 $\mu\text{g}/\text{m}^3$ to 9.7 $\mu\text{g}/\text{m}^3$	5.1 $\mu\text{g}/\text{m}^3$ to 6.0 $\mu\text{g}/\text{m}^3$	4.6 $\mu\text{g}/\text{m}^3$ to 5.3 $\mu\text{g}/\text{m}^3$
Annual mean NO ₂	6.2 $\mu\text{g}/\text{m}^3$ to 7.6 $\mu\text{g}/\text{m}^3$	4.1 $\mu\text{g}/\text{m}^3$ to 4.8 $\mu\text{g}/\text{m}^3$	4.6 $\mu\text{g}/\text{m}^3$ to 5.3 $\mu\text{g}/\text{m}^3$
Annual mean PM ₁₀	9.1 $\mu\text{g}/\text{m}^3$ to 10.6 $\mu\text{g}/\text{m}^3$	8.4 $\mu\text{g}/\text{m}^3$ to 9.9 $\mu\text{g}/\text{m}^3$	4.6 $\mu\text{g}/\text{m}^3$ to 5.3 $\mu\text{g}/\text{m}^3$
Annual mean PM _{2.5}	5.7 $\mu\text{g}/\text{m}^3$ to 6.5 $\mu\text{g}/\text{m}^3$	5.2 $\mu\text{g}/\text{m}^3$ to 5.9 $\mu\text{g}/\text{m}^3$	4.6 $\mu\text{g}/\text{m}^3$ to 5.3 $\mu\text{g}/\text{m}^3$

⁷ Department for Environment, Food and Rural Affairs (Defra) (2018), *Defra Background Pollutant Concentration Maps*. Available online at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.

3 Construction dust assessment

- 3.1.1 There are no changes to the reported data in the main ES, for any of the design elements for the assessment of dust emissions during construction of the AP2 revised scheme.

4 Assessment of road traffic emissions

4.1 Overview

- 4.1.1 This section provides details of the assessment of road traffic emissions during construction of the AP2 revised scheme. The assessment considers the combined effects of SES2 changes and AP2 amendments in this area.

4.2 Assessment of construction traffic emissions

- 4.2.1 The assessment of construction traffic emissions has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2026-2039). However, vehicle emissions and background concentrations have been taken for the first construction year in 2026. One construction scenario has been assessed for air quality to capture peak construction traffic activity at different times in the construction period. It has been assumed that the changes in construction traffic will occur for the whole year. In some cases, this is a conservative approach, as the duration of the peak traffic flows may well be much shorter. This scenario has been assessed against the relevant future baseline case without the AP2 revised scheme.
- 4.2.2 Traffic data in the study area have been screened to identify roads that require further assessment and to confirm the likely effect of the change in emissions from vehicles using these roads during construction of the AP2 revised scheme.
- 4.2.3 Traffic data for construction vehicles using the site haul routes and moving between compounds have also been included in the assessment. Additional roads have also been included in the assessment where relevant to account for their emissions at nearby receptors.

Receptors assessed and background concentrations

- 4.2.4 Details of the assessed receptors used in the assessment remain as reported within the main ES. The 18 human receptors modelled in the main ES have been reused as part of the AP2 revised scheme. One receptor has been added due to changes in the study area. The human receptors and background concentrations are shown in Table 2.
- 4.2.5 No designated ecological receptors were identified within 200m of the screened in roads within the Annandale depot area during operation of the AP2 revised scheme.

Table 2: Modelled human receptors and background concentrations (construction phase)

Receptor	Description/Location	Ordnance Survey coordinates	Background concentrations in 2026 ($\mu\text{g}/\text{m}^3$)			
			NO _x	NO ₂	PM ₁₀	PM _{2.5}
A-C-H001	The Hill, B7076	331317, 568687	6.0	4.8	9.9	5.9
A-C-H002	The Haven	330733, 568953	4.5	3.6	8.5	5.3
A-C-H003	The Haven	330733, 568953	4.5	3.6	8.5	5.3
A-C-H004	The Douglas Steading	330756, 568988	4.5	3.6	8.5	5.3
A-C-H005	The Bracken	330636, 569055	4.7	3.8	8.4	5.2
A-C-H006	Nouthill Farm	329827, 569401	4.3	3.4	9.4	5.7
A-C-H007	Nouthill Cottage	329869, 569465	4.3	3.4	9.4	5.7
A-C-H008	Cranberry Cottage	330538, 569554	4.7	3.8	8.4	5.2
A-C-H009	Redhouse Cottage, B7076	329478, 569591	4.3	3.4	9.4	5.7
A-C-H010	Redhouse Cottage, B7076	329497, 569598	4.3	3.4	9.4	5.7
A-C-H011	Redhouse Farm, B7076	329294, 569663	4.3	3.4	9.4	5.7
A-C-H012	Redhouse Farm, B7076	329284, 569718	4.3	3.4	9.4	5.7
A-C-H013	Cranberry Farm	329270, 569747	4.7	3.8	8.4	5.2
A-C-H014	East Lodge. Mossknowe	330688, 569836	4.1	3.4	8.5	5.3
A-C-H015	Grahamshill Cottage	328724, 569903	4.1	3.4	8.5	5.3
A-C-H016	Mill Forge Hotel (south)	328739, 569966	5.4	4.4	9.1	5.5
A-C-H017	Mill Forge Hotel (north)	328556, 570010	5.4	4.4	9.1	5.5
A-C-H018	Grahamshill Railway Cottages	328590, 570041	5.4	4.4	9.1	5.5
A-C-H019**	Residence off B7076	328858, 570237	4.7	3.8	8.4	5.2

Note: ** Indicates that receptor is new to the SES2 and AP2 ES.

Assessment Results

4.2.6 Table 3 to Table 5 provide the summary of the worst-case modelled pollutant concentrations at each assessed receptor (i.e., the highest modelled concentration at a particular receptor given the different construction traffic scenarios). The magnitude of change and impact descriptor are also provided along with a comparison against the main ES. These were derived for human receptors following the Institute of Air Quality Management (IAQM)/Environmental Protection UK (EPUK) methodology⁸.

⁸ Institute of Air Quality Management (2017), *Land-Use planning & development control: Planning for air quality*, v1.2. Available online at: <https://iaqm.co.uk/guidance/>.

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

SES2 and AP2 ES Volume 5, Appendix: AQ-001-OR003

Air quality

Off-route works: Annandale depot

Air quality report

Table 3: Predicted annual mean NO₂ concentrations and impacts (construction phase)

Receptor	Description/Location	NO ₂ concentrations (µg/m ³)		Change in NO ₂ concentrations (µg/m ³)	Impact descriptor	Impact descriptor in the main ES, or the main ES as amended by SES1 and AP2 ES	Significance
		2026 without the AP2 revised scheme	2026 with the AP2 revised scheme				
A-C-H001	The Hill, B7076	8.1	8.2	0.1	Negligible	Negligible	Not significant
A-C-H002	The Haven	5.0	5.0	< 0.1	Negligible	Negligible	Not significant
A-C-H003	The Haven	5.0	5.0	< 0.1	Negligible	Negligible	Not significant
A-C-H004	The Douglas Steading	4.9	4.9	< 0.1	Negligible	Negligible	Not significant
A-C-H005	The Bracken	4.8	4.9	0.1	Negligible	Negligible	Not significant
A-C-H006	Nouthill Farm	4.5	4.6	0.1	Negligible	Negligible	Not significant
A-C-H007	Nouthill Cottage	4.1	4.2	0.1	Negligible	Negligible	Not significant
A-C-H008	Cranberry Cottage	4.0	4.2	0.2	Negligible	Negligible	Not significant
A-C-H009	Redhouse Cottage, B7076	4.4	4.5	0.1	Negligible	Negligible	Not significant
A-C-H010	Redhouse Cottage, B7076	4.3	4.4	0.1	Negligible	Negligible	Not significant
A-C-H011	Redhouse Farm, B7076	4.6	4.7	0.1	Negligible	Negligible	Not significant
A-C-H012	Redhouse Farm, B7076	4.2	4.3	0.1	Negligible	Negligible	Not significant
A-C-H013	Cranberry Farm	3.9	4.0	0.1	Negligible	Negligible	Not significant
A-C-H014	East Lodge. Mossknowe	4.8	5.0	0.2	Negligible	Negligible	Not significant
A-C-H015	Grahamshill Cottage	4.3	4.4	0.1	Negligible	Negligible	Not significant
A-C-H016	Mill Forge Hotel (south)	6.1	6.4	0.3	Negligible	Negligible	Not significant
A-C-H017	Mill Forge Hotel (north)	5.4	5.5	0.1	Negligible	Negligible	Not significant
A-C-H018	Grahamshill Railway Cottages	4.6	4.7	0.1	Negligible	Negligible	Not significant
A-C-H019**	Residence off B7076	4.3	4.3	< 0.1	Negligible	Not Applicable	Not significant

Note: ** Indicates that receptor is new to the SES2 and AP2 ES.

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

SES2 and AP2 ES Volume 5, Appendix: AQ-001-OR003

Air quality

Off-route works: Annandale depot

Air quality report

Table 4: Predicted annual mean PM₁₀ concentrations and impacts (construction phase)

Receptor	Description/Location	PM ₁₀ concentrations (µg/m ³)		Change in PM ₁₀ concentrations (µg/m ³)	Impact descriptor	Impact descriptor in the main ES, or the main ES as amended by SES1 and AP2 ES	Significance
		2026 without the AP2 revised scheme	2026 with the AP2 revised scheme				
A-C-H001	The Hill, B7076	10.7	10.7	< 0.1	Negligible	Negligible	Not significant
A-C-H002	The Haven	8.8	8.8	< 0.1	Negligible	Negligible	Not significant
A-C-H003	The Haven	8.8	8.8	< 0.1	Negligible	Negligible	Not significant
A-C-H004	The Douglas Steading	8.8	8.8	< 0.1	Negligible	Negligible	Not significant
A-C-H005	The Bracken	8.7	8.7	< 0.1	Negligible	Negligible	Not significant
A-C-H006	Nouthill Farm	9.6	9.7	0.1	Negligible	Negligible	Not significant
A-C-H007	Nouthill Cottage	9.5	9.5	< 0.1	Negligible	Negligible	Not significant
A-C-H008	Cranberry Cottage	8.5	8.5	< 0.1	Negligible	Negligible	Not significant
A-C-H009	Redhouse Cottage, B7076	9.6	9.6	< 0.1	Negligible	Negligible	Not significant
A-C-H010	Redhouse Cottage, B7076	9.6	9.6	< 0.1	Negligible	Negligible	Not significant
A-C-H011	Redhouse Farm, B7076	9.7	9.7	< 0.1	Negligible	Negligible	Not significant
A-C-H012	Redhouse Farm, B7076	9.5	9.6	0.1	Negligible	Negligible	Not significant
A-C-H013	Cranberry Farm	8.5	8.5	< 0.1	Negligible	Negligible	Not significant
A-C-H014	East Lodge. Mossknowe	8.9	9.0	0.1	Negligible	Negligible	Not significant
A-C-H015	Grahamshill Cottage	8.8	8.8	< 0.1	Negligible	Negligible	Not significant
A-C-H016	Mill Forge Hotel (south)	9.6	9.7	0.1	Negligible	Negligible	Not significant
A-C-H017	Mill Forge Hotel (north)	9.4	9.4	< 0.1	Negligible	Negligible	Not significant
A-C-H018	Grahamshill Railway Cottages	9.2	9.2	< 0.1	Negligible	Negligible	Not significant
A-C-H019**	Residence off B7076	8.5	8.6	0.1	Negligible	Not Applicable	Not significant

Note: ** Indicates that receptor is new to the SES2 and A2P ES.

Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement

SES2 and AP2 ES Volume 5, Appendix: AQ-001-OR003

Air quality

Off-route works: Annandale depot

Air quality report

Table 5: Predicted annual mean PM_{2.5} concentrations and impacts (construction phase)

Receptor	Description/Location	PM _{2.5} concentrations (µg/m ³)		Change in PM _{2.5} concentrations (µg/m ³)	Impact descriptor	Impact descriptor in the main ES, or the main ES as amended by SES1 and AP2 ES	Significance
		2026 without the AP2 revised scheme	2026 with the AP2 revised scheme				
A-C-H001	The Hill, B7076	6.4	6.4	< 0.1	Negligible	Negligible	Not significant
A-C-H002	The Haven	5.5	5.5	< 0.1	Negligible	Negligible	Not significant
A-C-H003	The Haven	5.5	5.5	< 0.1	Negligible	Negligible	Not significant
A-C-H004	The Douglas Steading	5.5	5.5	< 0.1	Negligible	Negligible	Not significant
A-C-H005	The Bracken	5.3	5.4	0.1	Negligible	Negligible	Not significant
A-C-H006	Nouthill Farm	5.8	5.9	0.1	Negligible	Negligible	Not significant
A-C-H007	Nouthill Cottage	5.8	5.8	< 0.1	Negligible	Negligible	Not significant
A-C-H008	Cranberry Cottage	5.2	5.2	< 0.1	Negligible	Negligible	Not significant
A-C-H009	Redhouse Cottage, B7076	5.8	5.8	< 0.1	Negligible	Negligible	Not significant
A-C-H010	Redhouse Cottage, B7076	5.8	5.8	< 0.1	Negligible	Negligible	Not significant
A-C-H011	Redhouse Farm, B7076	5.9	5.9	< 0.1	Negligible	Negligible	Not significant
A-C-H012	Redhouse Farm, B7076	5.8	5.8	< 0.1	Negligible	Negligible	Not significant
A-C-H013	Cranberry Farm	5.2	5.2	< 0.1	Negligible	Negligible	Not significant
A-C-H014	East Lodge. Mossknowe	5.5	5.6	0.1	Negligible	Negligible	Not significant
A-C-H015	Grahamshill Cottage	5.4	5.5	0.1	Negligible	Negligible	Not significant
A-C-H016	Mill Forge Hotel (south)	5.8	5.8	< 0.1	Negligible	Negligible	Not significant
A-C-H017	Mill Forge Hotel (north)	5.7	5.7	< 0.1	Negligible	Negligible	Not significant
A-C-H018	Grahamshill Railway Cottages	5.5	5.6	0.1	Negligible	Negligible	Not significant
A-C-H019**	Residence off B7076	5.3	5.3	< 0.1	Negligible	Not Applicable	Not significant

Note: ** Indicates that receptor is new to the SES2 and AP2 ES.

- 4.2.7 The annual mean NO₂, PM₁₀ and PM_{2.5} concentrations are predicted to be within the air quality standards during construction of the AP2 revised scheme. Since the annual mean NO₂ concentrations are predicted to be well below 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM₁₀ concentrations are predicted to be below 35µg/m³, the daily mean standard is also expected to be met.
- 4.2.8 Negligible impacts are predicted at all human receptors in the area for annual mean NO₂, PM₁₀ and PM_{2.5} concentrations.

Assessment of significance

- 4.2.9 No significant effects are anticipated at any receptors in relation to annual mean NO₂, PM₁₀ or PM_{2.5} concentrations.
- 4.2.10 There are no new or different significant effects from the construction of the AP2 revised scheme compared to the main ES.

4.3 Assessment of operational traffic emissions

Operational traffic model

- 4.3.1 There are no changes to the reported data in the main ES, for any of the design elements for the assessment of traffic emissions during the operation of the AP2 revised scheme.

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