

High Speed Rail (West Midlands - Crewe)

Supplementary Environmental Statement 2 and
Additional Provision 2 Environmental Statement

Volume 5: Technical appendices

CA4: Whitmore Heath to Madeley
Air quality report (AQ-001-004)

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Department for Transport

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Contents

1	Introduction	1
1.1	Structure of this appendix	1
1.2	Scope, methodology, data sources, assumptions and limitations	1
2	Baseline air quality data	3
2.1	Overview	3
2.2	Local air quality monitoring data	3
2.3	Background pollutant concentrations	3
3	Construction dust assessment	5
3.1	Overview	5
3.2	Additional land required and changes to Bill powers for changes to the vertical and horizontal alignment between Hatton South cutting and Madeley Bridleway 1 accommodation green overbridge (AP-004-002)	5
3.3	Additional land required and a change to Bill powers for modifications to the A51 Stone Road/Nantwich Road/A53 Newcastle Road junction (AP2-004-003)	6
4	Air quality assessment – road traffic	8
4.1	Overview	8
4.2	Model verification	8
4.3	Assessment of construction traffic emissions	9
5	References	20

List of tables

Table 1:	Annual mean NO ₂ concentrations recorded at diffusion tube monitoring sites	3
Table 2:	Sensitivity of area to dust soiling and human health effects (AP2-004-002)	5
Table 3:	Dust emission magnitude for dust soiling and human health effects (AP2-004-002)	5
Table 4:	Risk of dust soiling and human health effects (AP2-004-002)	6
Table 5:	Sensitivity of area to dust soiling and human health effects (AP2-004-003)	6
Table 6:	Dust emission magnitude for dust soiling and human health effects (AP2-004-003)	6
Table 7:	Risk of dust soiling and human health effects (AP2-004-003)	7
Table 8:	Comparison of monitored and modelled NO ₂ concentrations	8
Table 9:	Modelled receptors (construction phase) and 2020 background pollutant concentrations	10
Table 10:	Predicted annual mean NO ₂ concentrations and impacts (construction)	12

Table 11: Predicted annual mean PM ₁₀ concentrations and impacts (construction)	14
Table 12: Predicted annual mean PM _{2.5} concentrations and impacts (construction)	16

1 Introduction

1.1 Structure of this appendix

- 1.1.1 This document 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 Whitmore Heath to Madeley community area (CA4).
- 1.1.2 This appendix provides details of changes to the air quality assessment since the production of the High Speed Two (HS2) Phase 2a (West Midlands - Crewe) Environmental Statement (ES)¹ published in July 2017 (the main ES), as well as the Supplementary Environmental Statement (SES1) and Additional Provision Environmental Statement (AP1 ES) published in March 2018².
- 1.1.3 This report should be read in conjunction with Volume 5: Appendix AQ-001-004, which accompanied the main ES.
- 1.1.4 Maps referred to in this appendix are contained in the SES2 and AP2 ES Volume 5: Air quality Map Book, Map Series AQ-01. In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID)³ which accompanies the SES2 and AP2 ES (see BID-AQ-002-000: Traffic data used for the air quality assessment of the SES2 and AP2 ES).
- 1.1.5 In this appendix the scheme is referred to as the AP2 revised scheme, which is the SES2 scheme (i.e. the SES1 scheme, submitted to Parliament in March 2018, with the changes described in the SES2) as amended by the AP2 amendments.
- 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 Report and its Addendum (see main ES Volume 5: Appendix CT-001-001⁴ and Volume 5: Appendix CT-001-002⁵).

¹ HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement*, <https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement>

² HS2 Ltd (2018), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Supplementary Environmental Statement and Additional Provision Environmental Statement*, <https://www.gov.uk/government/collections/hs2-phase-2a-supplementary-environmental-statement-and-additional-provision-environmental-statement>

³ HS2 Ltd (2019), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data to accompany Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement*, <https://www.gov.uk/government/organisations/high-speed-two-limited>

⁴ HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Impact Assessment Scope and Methodology Report, Main ES, Volume 5: Appendix CT-001-001*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627187/E23_EIA_SMR_CT-001-001_WEB.pdf

⁵ HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Impact Assessment Scope and Methodology Report Addendum, Main ES, Volume 5: Appendix CT-001-002*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627188/E24A_CT-001-002_Part_1_WEB.pdf and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627189/E24-B_CT-001-002_Part_B_WEB.pdf

1.2.2 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 July 2017, which was assessed in the main ES;
- 'the SES1 scheme' – the original scheme with the changes described in the SES1 submitted in March 2018;
- 'the AP1 revised scheme' – the SES1 scheme as amended by the AP1 submitted in March 2018;
- 'the SES2 scheme' – the SES1 scheme with the changes described in the SES2; and
- 'the AP2 revised scheme' – the SES2 scheme as amended by the AP2.

2 Baseline air quality data

2.1 Overview

2.1.1 Since the production of the main ES, air quality measurements for the baseline year of 2016 have become available. Background pollutant concentrations provided by the Department for Environment, Food and Rural Affairs (Defra) have also been updated.

2.1.2 This section provides the new baseline information in the Whitmore Heath to Madeley area.

2.2 Local air quality monitoring data

2.2.1 Monitoring sites within the study area that are considered relevant for this assessment are shown in the SES2 and AP2 ES Volume 5: Map AQ-01-104.

Continuous monitoring

2.2.2 There are no continuous air quality monitoring sites within the Whitmore Heath to Madeley area.

Diffusion tubes

2.2.3 There are three diffusion tube sites within the Whitmore Heath to Madeley area considered relevant for the assessment of air quality. Table 1 summarises the results from these diffusion tube sites. Annual mean nitrogen dioxide (NO₂) concentrations were below the air quality standards at all three sites in 2016.

Table 1: Annual mean NO₂ concentrations recorded at diffusion tube monitoring sites⁶

Site	Ordnance Survey coordinates	Annual mean NO ₂ concentrations (µg/m ³)			
		2013	2014	2015	2016
DT3 - Madeley (Collingwood, 3 Newcastle Road)	378116, 345488	36.4	36.3	35.9	31.9
DT28 - Shralebrook (Limbrick Cottage)	377994, 350105	35.3	33.1	32.8	30.8
DT100 - Sainbury's carpark (near to Courts)	384784, 342528	n/a*	n/a*	n/a*	32.1

* data not available for this year at this location

2.3 Background pollutant concentrations

2.3.1 Since the production of the main ES, updated background pollutant concentrations have become available from Defra⁷ for 2016.

2.3.2 The updated background NO₂, PM₁₀⁸ and PM_{2.5}⁹ concentrations are within the air quality standards throughout the study area for the baseline year of 2016. Annual mean NO₂ concentrations in the study area were in the range 6.7µg/m³ – 18.7µg/m³ in

⁶ Newcastle under Lyme Borough Council (2017), 2017 Air Quality Annual Status Report

⁷ Department for Environment, Food and Rural Affairs (Defra), Background mapping data for local authorities - 2015, <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>

⁸ Particulate matter with aerodynamic diameter of less than 10 micrometres.

⁹ Particulate matter with aerodynamic diameter of less than 2.5 micrometres.

2016. Annual mean PM₁₀ and PM_{2.5} concentrations were in the range 10.6µg/m³ – 17.8µg/m³ and 7.2µg/m³ – 10.7µg/m³ in 2016 respectively. The updated background pollutant concentrations are higher at some locations than those reported in the main ES.

3 Construction dust assessment

3.1 Overview

3.1.1 This section provides details of the assessment of dust emissions during construction of the AP2 revised scheme. The assessment is provided separately for each proposed amendment to the design, where it has been identified that the amendment has the potential to change the risk of dust soiling, human health effects or ecological effects compared to the main ES.

3.2 Additional land required and changes to Bill powers for changes to the vertical and horizontal alignment between Hatton South cutting and Madeley Bridleway 1 accommodation green overbridge (AP2-004-002)

Assessed receptors and sensitivity of the area

3.2.1 The assessment of dust soiling and human health effects has been undertaken for the area around the A53 Newcastle Road and Whitmore Heath. Residential dwellings are located within 20m of earthworks, construction and trackout¹⁰ activities in this area. There are no demolition activities in this area. No ecological receptors are located in this area and therefore an assessment of ecological effects from dust generating activities associated with this amendment has not been undertaken.

3.2.2 The sensitivity of the area to dust soiling and human health effects has been defined as shown in Table 2.

Table 2: Sensitivity of area to dust soiling and human health effects (AP2-004-002)

Effect	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium	Medium	High
Human health	n/a	Low	Low	Low

Dust emission magnitude

3.2.3 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 3.

Table 3: Dust emission magnitude for dust soiling and human health effects (AP2-004-002)

Area	Demolition	Earthworks	Construction	Trackout
AP2-004-002	n/a	Large	Large	Large

Risk of impacts

3.2.4 Taking into consideration the dust emission magnitude of each activity and the sensitivity of the area, the risk of dust effects has been defined as shown in Table 4.

¹⁰ Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.

Table 4: Risk of dust soiling and human health effects (AP2-004-002)

Effect	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium risk	Medium risk	High risk
Human health	n/a	Low risk	Low risk	Low risk

3.2.5 There is no change to the risks of dust soiling and human effects from dust generating activities from those reported in the main ES.

3.2.6 The main ES reported no significant effects on air quality from dust generating activities in this area. With the application of the mitigation measures contained in the draft Code of Construction Practise (CoCP)¹¹, no new or different significant effects are anticipated from dust generating activities associated with this amendment.

3.3 Additional land required and a change to Bill powers for modifications to the A51 Stone Road/Nantwich Road/A53 Newcastle Road junction (AP2-004-003)

Assessed receptors and sensitivity of the area

3.3.1 The assessment of dust soiling and human health effects has been undertaken for the area around the A51/A53 junction. Residential dwellings are located within 20m of earthworks, construction and trackout activities in this area. There are no demolition activities in this area. No ecological receptors are located in this area and therefore an assessment of ecological effects from dust generating activities associated with this amendment has not been undertaken.

3.3.2 The sensitivity of the area to dust soiling and human health effects has been defined as shown in Table 5.

Table 5: Sensitivity of area to dust soiling and human health effects (AP2-004-003)

Effect	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium	Medium	Medium
Human health	n/a	Low	Low	Low

Dust emission magnitude

3.3.3 Each dust generating activity has been assigned a dust emission magnitude as shown in Table 6.

Table 6: Dust emission magnitude for dust soiling and human health effects (AP2-004-003)

Area	Demolition	Earthworks	Construction	Trackout
AP2-004-003	n/a	Medium	Medium	Medium

¹¹ HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement, Draft Code of Construction Practice, Volume 5: Appendix CT-003-000*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627182/E26_CT-003-000_WEB.pdf

Risk of impacts

3.3.4 Taking into consideration the dust emission magnitude of each activity and the sensitivity of the area, the risk of dust effects has been defined as shown in Table 7.

Table 7: Risk of dust soiling and human health effects (AP2-004-003)

Effect	Demolition	Earthworks	Construction	Trackout
Dust soiling	n/a	Medium risk	Medium risk	Low risk
Human health	n/a	Low risk	Low risk	Low risk

3.3.5 In the main ES, there were no dust generating activities assessed in the area around the A51/A53 junction. With the application of the mitigation measures contained in the draft CoCP, no new significant effects are anticipated from dust generating activities associated with this amendment.

4 Air quality assessment – road traffic

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 Model verification

4.2.1 Since the production of the main ES, air quality measurements for the baseline year of 2016 have become available. The model verification has therefore been updated to take account of the 2016 monitoring data.

4.2.2 Model verification was undertaken on a route-wide basis where monitoring sites are located adjacent to the modelled road network. The objectives of the model verification are to evaluate model performance and to determine if model adjustment is required.

4.2.3 Some of the monitoring locations were not considered suitable for model verification, due to missing traffic or monitoring data or other spatial considerations. A total of 21 monitoring sites were included in the verification exercise. The comparison of monitored and modelled NO₂ concentrations is shown in Table 8.

Table 8: Comparison of monitored and modelled NO₂ concentrations

Site	Monitored concentration (µg/m ³)	Modelled concentration (µg/m ³)	Difference [(modelled – monitored)/monitored] *100]
CE206	30.7	22.9	-25.4%
CE225	35.1	25.1	-28.4%
CE247	20.6	20.1	-2.6%
DT28	30.8	32.6	5.9%
2	34.0	49.5	45.5%
5	34.0	21.5	-36.8%
8	33.0	40.7	23.2%
10	27.0	23.4	-13.4%
21	27.0	22.4	-16.9%
26	33.0	31.0	-6.1%
29	25.0	23.4	-6.5%
M6CLAYTON	36.0	46.7	29.6%

SES2 and AP2 ES Appendix AQ-001-004

Site	Monitored concentration (µg/m ³)	Modelled concentration (µg/m ³)	Difference [(modelled – monitored)/monitored] *100]
DT13	35.0	34.0	-2.8%
DT14	39.0	34.7	-11.2%
DT36	38.0	36.8	-3.2%
DT38	37.0	29.3	-20.8%
DT39	39.0	31.7	-18.6%
DT43	41.0	37.9	-7.5%
A38-1	43.0	41.7	-3.0%
A38-2/2(1)	37.6	40.0	6.4%
A38-2A/B	45.1	42.8	-5.2%

4.2.4 As the majority of modelled NO₂ concentrations were within ±25% of the monitored concentrations and there was no systematic under or over prediction, no model adjustment was undertaken. Modelled concentrations of PM₁₀ and PM_{2.5} have not been adjusted.

4.2.5 Therefore, no changes are predicted from the assessment presented in the main ES.

4.3 Assessment of construction traffic emissions

4.3.1 Construction traffic data used in this assessment is detailed in the BID that accompanies the SES₂ and AP₂ ES (see BID-AQ-002-000: Traffic data used for the air quality assessment in the SES₂ and AP₂ ES). The assessment of construction traffic emissions has used traffic data based on an estimate of the average daily flows at the peak year during the construction period (2020-2026). However, vehicle emissions and background concentrations have been taken for the first construction year in 2020.

4.3.2 As set out in SES₂ and AP₂ ES Volume 1, Introduction to the SES₂ and the AP₂ ES, since the production of the main ES, updated background pollutant concentrations⁷ and road vehicle emission factors¹² have become available from Defra. These have been used in this assessment. The updated road vehicle emission factors are higher for nitrogen oxides (NO_x) than those used in the main ES, especially along motorways. Therefore, higher concentrations have been predicted for the future baseline scenario (without the HS₂ scheme). At locations where NO₂ concentrations are predicted to exceed the annual mean air quality standard of 40µg/m³ without the scheme, it is more likely that a small increase in concentrations due to the scheme will result in a significant effect.

¹² Department for Environment, Food and Rural Affairs (Defra), *Emissions Factors Toolkit*, <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

Screening of traffic data

4.3.3 The screening process has identified a total of three roads in the Whitmore Heath to Madeley area for further assessment; these are:

- the M6 motorway;
- the A5182 Trentham Road; and
- the A51 Nantwich Road junction with A53 Newcastle Road.

4.3.4 Traffic data for construction vehicles using the haul roads and moving between compounds has also been included in the assessment. Further roads have been included in the assessment to account for their emissions at nearby receptors.

Receptors assessed and background concentrations

4.3.5 Table 9 presents the sensitive receptors included in this assessment and the background pollutant concentrations for 2020.

4.3.6 No ecological receptors were identified within 200m of the screened in roads within the Whitmore Heath to Madeley area during construction of the AP2 revised scheme.

Table 9: Modelled receptors (construction phase) and 2020 background pollutant concentrations

Receptor	Description/location	Ordnance Survey coordinates	Background concentrations in 2020 ($\mu\text{g}/\text{m}^3$)			
			NOx	NO ₂	PM ₁₀	PM _{2.5}
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	376541,344493	9.2	7.1	11.6	7.7
4-C-H2	Bar Hill, Madeley	376555,343956	8.2	6.4	11.2	7.4
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	379401,341350	8.8	6.8	10.6	7.1
4-C-H4	The Cottage, Smithy Lane, Whitmore	380861,340908	9.8	7.5	11.9	7.8
4-C-H5	Bar Hill, Madeley	376725,344110	9.2	7.1	11.6	7.7
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	377344,342852	8.5	6.5	11.2	7.4
4-C-H7	Highfields, Heath Road, Whitmore	379883,341255	8.8	6.8	10.6	7.1
4-C-H8	Bower End Farm, Bower End Lane, Madeley	376191,344827	9.2	7.1	11.6	7.7
4-C-H9	Limpits Farm House, Heath Road, Whitmore	379955,341410	8.8	6.8	10.6	7.1
4-C-H20	Grange Cottages, Trentham Road, Butterson	384086,341889	15.6	11.7	14.2	8.9

SES2 and AP2 ES Appendix AQ-001-004

Receptor	Description/location	Ordnance Survey coordinates	Background concentrations in 2020 ($\mu\text{g}/\text{m}^3$)			
			NOx	NO ₂	PM ₁₀	PM _{2.5}
4-C-H22	Brookfields, Stone Road, Blackbrook	377733,338850	8.3	6.4	11.6	7.6
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	377341,338827	8.3	6.4	11.6	7.6
4-C-H24	End Cottage, Swan Bank, Madeley Heath	378133,345823	17.6	13.0	17.5	10.4
4-C-H25	Morston Drive, Newcastle	384712,342595	19.9	14.7	14.8	9.3
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	377989,350233	14.7	11.0	14.0	8.8
4-C-H28	Collingwood, Newcastle Road, Madeley	378117,345489	17.6	13.0	17.5	10.4
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	378079,347952	14.6	11.0	13.6	8.6
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	380524,343917	10.2	7.8	11.3	7.4
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	376668,338976	8.0	6.2	11.8	7.7
4-C-H35	Four Houses, Baldwins Gate	378141,339294	8.4	6.5	10.8	7.1
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	378036,345458	17.6	13.0	17.5	10.4

Assessment results

4.3.7 Table 10 to Table 12 provide the summary of the modelled pollutant concentrations at the assessed receptors, including the magnitude of change and impact descriptor, and comparison against the main ES.

Table 10: Predicted annual mean NO₂ concentrations and impacts (construction)

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	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	8.1	8.2	0.1	Negligible	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	7.9	8.0	0.1	Negligible	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	7.6	7.7	0.1	Negligible	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	11.1	11.1	0.0	Negligible	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	8.9	9.0	0.1	Negligible	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	7.7	7.7	0.0	Negligible	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	7.7	7.8	0.1	Negligible	Negligible	Not significant
4-C-H8	Bower End Farm, Bower End Lane, Madeley	8.0	8.0	0.0	Negligible	Negligible	Not significant
4-C-H9	Limpits Farm House, Heath Road, Whitmore	7.7	7.8	0.1	Negligible	Negligible	Not significant

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	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H20	Grange Cottages, Trentham Road, Butterton	16.3	16.5	0.2	Negligible	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	8.5	8.5	0.0	Negligible	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	10.4	10.4	0.0	Negligible	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	25.3	25.5	0.2	Negligible	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	24.8	24.8	0.0	Negligible	Negligible	Not significant
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	31.9	32.1	0.2	Negligible	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	43.6	43.9	0.3	Moderate adverse	Negligible	New significant effect
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	18.1	18.1	0.0	Negligible	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	16.1	16.1	0.0	Negligible	Negligible	Not significant
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	7.7	7.8	0.1	Negligible	Negligible	Not significant
4-C-H35	Four Houses, Baldwins Gate	9.4	9.4	0.0	Negligible	Negligible	Not significant

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	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	33.6	33.8	0.2	Negligible	Negligible	Not significant

Table 11: Predicted annual mean PM₁₀ concentrations and impacts (construction)

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	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	11.7	11.7	0.0	Negligible	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	11.4	11.4	0.0	Negligible	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	10.7	10.7	0.0	Negligible	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	12.4	12.4	0.0	Negligible	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	11.8	11.8	0.0	Negligible	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	11.4	11.4	0.0	Negligible	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	10.7	10.7	0.0	Negligible	Negligible	Not significant
4-C-H8	Bower End Farm, Bower End Lane, Madeley	11.7	11.7	0.0	Negligible	Negligible	Not significant

Receptor	Description/location	PM10 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM10 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H9	Limpits Farm House, Heath Road, Whitmore	10.7	10.7	0.0	Negligible	Negligible	Not significant
4-C-H20	Grange Cottages, Trentham Road, Butterton	14.9	14.9	0.0	Negligible	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	11.9	11.9	0.0	Negligible	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	12.1	12.1	0.0	Negligible	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	19.0	19.1	0.1	Negligible	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	16.1	16.1	0.0	Negligible	Negligible	Not significant
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	16.6	16.6	0.0	Negligible	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	21.6	21.7	0.1	Negligible	Negligible	Not significant
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	14.4	14.4	0.0	Negligible	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	12.3	12.3	0.0	Negligible	Negligible	Not significant
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	12.1	12.1	0.0	Negligible	Negligible	Not significant

Receptor	Description/location	PM10 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM10 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H35	Four Houses, Baldwins Gate	11.2	11.2	0.0	Negligible	Negligible	Not significant
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	20.1	20.2	0.1	Negligible	Negligible	Not significant

Table 12: Predicted annual mean PM2.5 concentrations and impacts (construction)

Receptor	Description/location	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	7.8	7.8	0.0	Negligible	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	7.5	7.5	0.0	Negligible	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	7.1	7.1	0.0	Negligible	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	8.1	8.1	0.0	Negligible	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	7.8	7.8	0.0	Negligible	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	7.5	7.5	0.0	Negligible	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	7.1	7.1	0.0	Negligible	Negligible	Not significant
4-C-H8	Bower End Farm, Bower End	7.7	7.8	0.1	Negligible	Negligible	Not significant

Receptor	Description/location	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
	Lane, Madeley						
4-C-H9	Limpits Farm House, Heath Road, Whitmore	7.1	7.1	0.0	Negligible	Negligible	Not significant
4-C-H20	Grange Cottages, Trentham Road, Butterton	9.3	9.4	0.1	Negligible	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	7.8	7.8	0.0	Negligible	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	7.9	7.9	0.0	Negligible	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	11.3	11.4	0.1	Negligible	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	10.1	10.1	0.0	Negligible	Negligible	Not significant
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	10.5	10.5	0.0	Negligible	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	13.0	13.0	0.0	Negligible	Negligible	Not significant
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	9.1	9.1	0.0	Negligible	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	8.0	8.1	0.1	Negligible	Negligible	Not significant

Receptor	Description/location	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Impact descriptor in the main ES	Significance
		2020 without the AP2 revised scheme	2020 with the AP2 revised scheme				
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	7.8	7.8	0.0	Negligible	Negligible	Not significant
4-C-H35	Four Houses, Baldwins Gate	7.4	7.4	0.0	Negligible	Negligible	Not significant
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	12.1	12.1	0.0	Negligible	Negligible	Not significant

- 4.3.8 Annual mean NO₂ concentrations are predicted to be above the air quality standard at one receptor close to the M6 motorway in Madeley. A moderate adverse impact is expected at this receptor in relation to NO₂ concentrations and negligible impacts are expected at all other receptors in this area. Since the annual mean NO₂ concentrations are predicted to be less than 60µg/m³ at all receptors, the hourly mean standard is also expected to be met.
- 4.3.9 Both the annual mean 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 PM₁₀ concentrations are predicted to be less than 35µg/m³, the daily mean standard is also expected to be met. Negligible impacts are predicted at all receptors for annual mean PM₁₀ and PM_{2.5} concentrations.

Assessment of significance

- 4.3.10 One new significant effect is anticipated at a receptor along the M6 in Madeley in relation to annual mean NO₂ concentrations. This is due to a combination of changes in the predicted emissions for the revised future baseline and an increase in construction traffic in this area. However, more than 95% of the increase is a result of the revised future baseline compared to the increase in construction traffic. No new or different significant effects are predicted at other receptors for NO₂ concentrations in the Whitmore Heath to Madeley area.
- 4.3.11 No new or different significant effects are anticipated at any receptor in relation to annual mean PM₁₀ and PM_{2.5} concentrations.

5 References

Department for Environment, Food and Rural Affairs (Defra), *Background mapping data for local authorities - 2015*. Available online at: <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>.

Department for Environment, Food and Rural Affairs (Defra), *Emissions Factors Toolkit*. Available online at: <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>.

HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2a-environmental-statement>.

HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Impact Assessment Scope and Methodology Report, Main ES, Volume 5: Appendix CT-001-001*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627187/E23_EIA_SMR_CT-001-001_WEB.pdf.

HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Impact Assessment Scope and Methodology Report Addendum, Main ES, Volume 5: Appendix CT-001-002*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627188/E24A_CT-001-002_Part_1_WEB.pdf and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627189/E24-B_CT-001-002_Part_B_WEB.pdf.

HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Environmental Statement, Draft Code of Construction Practice, Volume 5: Appendix CT-003-000*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627182/E26_CT-003-000_WEB.pdf.

HS2 Ltd (2018), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Supplementary Environmental Statement and Additional Provision Environmental Statement*. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2a-supplementary-environmental-statement-and-additional-provision-environmental-statement>.

HS2 Ltd (2019), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data to accompany Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement*. Available online at: <https://www.gov.uk/government/organisations/high-speed-two-limited>.

Newcastle under Lyme Borough Council (2017), *2017 Air Quality Annual Status Report*.

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