E140

High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 5: Technical appendices

CA4: Whitmore Heath to Madeley

Air quality report (AQ-001-004)

July 2017

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Department for Transport

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1 Introduction

1.1.1 This document is the air quality assessment Appendix for the Whitmore Heath to Madeley community area (CA4); it comprises:

- a discussion of relevant policies and guidance (Section 2);
- baseline air quality data (Section 3);
- dust impact evaluation and risk rating (Section 4);
- mineral dust assessment (Section 5); and
- the air quality assessment - road traffic (Section 6).

1.1.2 Maps referred to throughout this appendix are contained in the Volume 5, Air Quality Map Book, Map Series AQ-01.

1.1.3 In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID)[1], (see BID-AQ-002-000: Traffic data used for the air quality assessment).

1.1.4 The assessment scope, key assumptions and limitations and the methodology for determining significance of effects for air quality are set out in Volume 1[2] and the Scope and Methodology Report (SMR)[3] and its Addendum[4].

[1] HS2 Ltd (2017), *High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data,* www.gov.uk/hs2.
[2] See Environmental Statement Volume 1, Introduction to the Environmental Statement
[3] *Environmental Impact Assessment Scope and Methodology Report*, Volume 5: Appendix CT-001-001
[4] *Environmental Impact Assessment Scope and Methodology Report Addendum*, Volume 5: Appendix CT-001-002

2 Relevant policies and guidance

2.1.1 The Whitmore Heath to Madeley area lies within the administrative area of Newcastle-under-Lyme Borough Council (NBC).

Newcastle-under-Lyme Borough Council

2.1.2 The Newcastle-under-Lyme Local Development Framework[5] sets out a vision for the development of the Borough, outlining the key strategic policies to guide where new development will take place, ensuring that they meet local needs and are in-line with national policy.

2.1.3 The Core Spatial Strategy[6], adopted in 2009, sets out a broad framework for the future development of the area. Policy SP3 (Spatial Principles of Movement and Access) seeks to address the environmental impacts of travel, including congestion, air quality and noise pollution.

2.1.4 NBC also has a number of saved policies[7] from its Local Plan 2011 (adopted 2003), which continues to form part of the Development Plan for NBC. Whilst none directly relate to air quality, Policy N3 and N8 outline measures for the protection and enhancement of sensitive habitats from development, such that any adverse effects are minimised.

[5] Newcastle-under-Lyme Borough Council (2009), *Local Development Framework*, https://www.newcastle-staffs.gov.uk/all-services/planning/planning-policy/newcastle-under-lymes-local-development-framework.
[6] City of Stoke-on-Trent and Newcastle-under-Lyme Borough Council (2009), *Core Spatial Strategy 2006 - 2026, Local Development Framework*, https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/SpatialStrategy/Core%20Strategy%20Final%20Version%20-%2028th%20October.pdf.
[7] Newcastle-under-Lyme Borough Council (2007), *Saved Policies of the Newcastle under Lyme Local Plan (Adopted 2003)*, https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/Saved%20Policies%20of%20the%20Newcastle-under-Lyme%20Local%20Plan%20154KB.pdf.

3 Baseline air quality data

3.1 Existing air quality

Local authority review and assessment information

3.1.1 NBC has reviewed air quality throughout the area since 1999, following the Department for Environment, Food and Rural Affairs (Defra) local air quality management regime (LAQM)[8].

3.1.2 There is one Air Quality Management Area (AQMA) within the Whitmore Heath to Madeley area which has been declared for exceedances of the annual mean nitrogen dioxide (NO_2) standard. The AQMA consists of a single dwelling adjacent to the southbound carriageway of the M6, on the A525 Bar Hill Road / Newcastle Road.

Local air quality monitoring data

3.1.3 Monitoring sites within the study area that are considered relevant for this assessment are shown in Volume 5: Map AQ-01-104. The following sections provide a summary of the recorded pollutant concentrations at these sites.

3.1.4 The pollutant concentrations can be compared to the air quality standards:

- 40µg/m^3 as an annual mean for NO_2 and particulate matter (PM10);
- 200µg/m^3 one-hour mean for NO_2 not to be exceeded more than 18 times a year (equivalent to the 99.8th percentile of the one-hour mean);
- 50µg/m^3 24-hour mean for PM10 not to be exceeded more than 35 times a year (equivalent to the 90.4th percentile of the 24-hour mean); and
- 25µg/m^3 as an annual mean for fine particulate matter (PM2.5).

Continuous monitoring

3.1.5 This section summarises the results from the continuous monitoring sites that are considered relevant for the assessment of air quality in this study area.

3.1.6 There is one continuous air quality monitoring site operated by NBC, which is located within Newcastle-under-Lyme town centre. This monitoring site, which measures NO_2 and PM10 concentrations, is at a roadside location adjacent to Queen's Gardens (385046, 346147), approximately 7.2 km north-east of the Proposed Scheme. This site has been discounted as it is too far from the Proposed Scheme and does not represent rural areas.

Diffusion tubes

3.1.7 NBC undertakes air quality monitoring with the use of passive diffusion tube as part of its LAQM process, with 42 diffusion tube sites positioned within the Borough.

[8] In fulfilment of Part IV of the *Environment Act 1995*. London, Her Majesty's Stationary Office

Of these, there is one diffusion tube site located within the Whitmore Heath to Madeley area for monitoring NO2 concentrations.

3.1.8 Table 1 summarises the results from the diffusion tube site that is considered relevant for the assessment of air quality in this study area. At the time of assessment, measurements for 2015 were the latest published annual monitoring baseline data.

Table 1: Annual mean NO2 concentrations recorded at diffusion tube monitoring sites[9]

Site	Ordnance Survey coordinates	Annual mean NO2 concentrations (µg/m^3)			
		2012	2013	2014	2015
DT3 - Madeley (Collingwood, 3 Newcastle Rd)	378116, 345488	39.6	36.4	36.3	35.9

Background pollutant concentrations

3.1.9 Estimates of background air quality were obtained from the Defra maps[10]. Background NO2 and PM10 concentrations are within the air quality standards throughout the study area. Annual mean NO2 concentrations in the study area were in the range 10.2µg/m^3 – 15.2µg/m^3 in 2016. Annual mean PM10 and PM2.5 concentrations were in the range 12.4µg/m^3 – 15.8µg/m^3 and 8.9µg/m^3 – 10.8µg/m^3 in 2016 respectively.

3.1.10 While the continuous monitoring and diffusion tube site (Table 1) can be used to indicate trends in concentrations, they are not considered to be representative of the predominantly rural area through which the Proposed Scheme will pass within the study area. On this basis, the Defra background concentrations maps have been used to characterise the baseline air quality for the study area. These maps indicate the average background pollutant concentrations across the Whitmore Heath to Madeley area are within the relevant air quality standards.

Local emission sources

3.1.11 The main source of pollution within the study area is road vehicles. Major roads include the M6, the A53 Newcastle Road (which continues as the A53 Whitmore Road), the A525 Bar Hill Road, the A51 London Road and the A5182 Trentham Road. Other emission sources include one industrial installation (regulated by the Environment Agency) with a permit for emissions to air; namely, Red Industries Limited, Walleys Quarry Landfill Site (Permit Number DP3734DC).

3.1.12 Contributions to local pollutant concentrations made by this industrial installation are included within background concentrations used in this assessment.

[9] Newcastle-under-Lyme Borough Council (2016), *2016 Air Quality Annual Status Report*, https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Environment/EnvProc/ASR_2016_November_2016.pdf.
[10] Department for Environment, Food and Rural Affairs (Defra) (2013), *Defra Background Pollutant Concentration Maps*, https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013.

4 Construction dust assessment

4.1.1 This section provides details of the assessment of dust emissions during construction of the Proposed Scheme. Due to the elongated nature of the Proposed Scheme and associated dust generating activities, the construction dust assessment has been undertaken in detail for distinct assessment areas in the Whitmore Heath to Madeley area.

4.2 Dust soiling and human health effects

Assessed receptors and sensitivity of the area

4.2.1 The assessment of dust soiling and human health effects has been undertaken for the following areas from south to north. Table 2 presents the sensitivity of each area to dust soiling and human health effects:

- area around Meece Brook: there are no demolition activities in this area. Residential dwellings are located within 350m of earthworks, construction and trackout activities;
- area around A53 Newcastle Road and Whitmore Heath: there are no demolition activities in this area. Residential dwellings are located within 20m of earthworks, construction and trackout activities;
- area around Whitmore Wood: residential dwellings are located within 20m of demolition, earthworks, construction and trackout activities;
- area around Manor Cottages and Hey House: residential dwellings are located within 350m of demolitions, and within 20m of earthworks, construction and trackout activities;
- area around the A525 Bar Hill Road: residential dwellings are located within 100m of demolition, and 20m of earthworks, construction and trackout activities; and
- area around Bowerend Farm, Beechfields and Wrinehill Hall: there are no demolition activities in this area. Residential dwellings are located within 20m of earthworks, construction and trackout activities.

Table 2: Sensitivity of area to dust soiling and human health effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Meece Brook				
Dust soiling	n/a	Low	Low	Low
Human health	n/a	Low	Low	Low
Area around A53 Newcastle Road and Whitmore Heath				
Dust soiling	n/a	Medium	Medium	High
Human health	n/a	Low	Low	Low

Effect	Demolition	Earthworks	Construction	Trackout
Area around Whitmore Wood				
Dust soiling	Medium	Medium	Medium	Medium
Human health	Low	Low	Low	Low
Area around Manor Cottages and Hey House				
Dust soiling	Low	Medium	Medium	Medium
Human health	Low	Low	Low	Low
Area around the A525 Bar Hill Road				
Dust soiling	Low	Medium	Medium	High
Human health	Low	Low	Low	Low
Area around Bowerend Farm, Beechfields and Wrinehill Hall				
Dust soiling	n/a	Medium	Medium	Medium
Human health	n/a	Low	Low	Low

Dust emission magnitude

4.2.2 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

Area	Demolition	Earthworks	Construction	Trackout
Area around Meece Brook	n/a	Large	Large	Large
Area around A53 Newcastle Road and Whitmore Heath	n/a	Large	Large	Large
Area around Whitmore Wood	Small	Large	Medium	Large
Area around Manor Cottages and Hey House	Small	Large	Large	Large
Area around the A525 Bar Hill Road	Small	Large	Large	Large
Area around Bowerend Farm, Beechfields and Wrinehill Hall	n/a	Large	Large	Large

Risk of impacts

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

Table 4: Risk of dust soiling and human health effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Meece Brook				
Dust soiling	n/a	Low risk	Low risk	Low risk
Human health	n/a	Low risk	Low risk	Low risk
Area around A53 Newcastle Road and Whitmore Heath				
Dust soiling	n/a	Medium risk	Medium risk	High risk
Human health	n/a	Low risk	Low risk	Low risk
Area around Whitmore Wood				
Dust soiling	Low risk	Medium risk	Medium risk	Medium risk
Human health	Negligible risk	Low risk	Low risk	Low risk
Area around Manor Cottages and Hey House				
Dust soiling	Negligible risk	Medium risk	Medium risk	Medium risk
Human health	Negligible risk	Low risk	Low risk	Low risk
Area around the A525 Bar Hill Road				
Dust soiling	Negligible risk	Medium risk	Medium risk	High risk
Human health	Negligible risk	Low risk	Low risk	Low risk
Area around Bowerend Farm, Beechfields and Wrinehill Hall				
Dust soiling	n/a	Medium risk	Medium risk	Medium risk
Human health	n/a	Low risk	Low risk	Low risk

4.3 Ecological effects

Assessed receptors and sensitivity of the area

4.3.1 The assessment of ecological effects has been undertaken for the following areas from south to north. Table 5 presents the sensitivity of each area to ecological effects:

- area around Whitmore Wood: an ecological receptor (Whitmore Wood Ancient Woodland and Local Wildlife Site) is located within 50m of demolition activities, and within 20m of earthworks, construction and trackout activities. Two additional ecological receptors (two ancient woodlands to the north of Snape Hall and west of Woodhouse Farm) are also located within 20m of earthworks, construction and trackout activities; and
- area around the A525 Bar Hill Road: there are no construction or trackout activities in this area. An ecological receptor (Barhill Wood Ancient Woodland) is located within 50m of demolition activities and within 20m of earthworks.

4.3.2 Four additional ecological receptors, namely Hey Spink Ancient Woodland and Local Wildlife Site; Grafton's Wood Ancient Woodland; Wrinehill Wood Ancient Woodland;

and The Lum Ancient Woodland, are located further than 50m away from any dust generating activities, and therefore the effects on these ecological receptors are considered to be negligible.

Table 5: Sensitivity of area to ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Area around Whitmore Wood	Low	Low	Low	Low
Area around the A525 Bar Hill Road	Low	Low	Low	Low

Dust emission magnitude

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

Table 6: Dust emission magnitude for ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Area around Whitmore Wood	Small	Large	Medium	Large
Area around the A525 Bar Hill Road	Small	Large	Large	Large

Risk of impacts

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

Table 7: Risk of ecological effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Whitmore Wood	Negligible risk	Low risk	Low risk	Low risk
Area around the A525 Bar Hill Road	Negligible risk	Low risk	Low risk	Low risk

5 Mineral dust assessment

5.1.1 This section provides details of the assessment of mineral dust emissions during construction of the Proposed Scheme from the operations of borrow pits. The use of borrow pits is intended to reduce the need for longer distance transport and import of materials, therefore reducing the volume and impact of road traffic on local roads and communities.

5.1.2 There is one borrow pit in the Whitmore Heath to Madeley area, in the land adjacent to the West Coast Main Line (WCML) and River Lea, located entirely within agricultural land associated with Netherset Hay Farm.

5.2 Disamenity dust

5.2.1 The borrow pit has an area of 280,000m^2 and will be excavated for sands and gravels, which are classified as soft rock in the assessment. The predominant wind direction across this site is south-westerly.

5.2.2 There are four human receptors within 250m of this borrow pit, namely:

- Netherset House (378299, 343397), residential, 118m east, downwind of the borrow pit;
- Netherset Hey (378434, 343397), farm, 187m east, downwind of the borrow pit;
- Netherset Industrial Estate (377634, 343752), commercial, 39m west, downwind of the borrow pit; and
- Hey House (377609, 343332), residential and commercial, 165m south west, upwind of the borrow pit.

5.2.3 One ecological receptor, Hey Sprink Ancient Woodland and Local Wildlife Site (LWS), is located 123m south east, downwind of the borrow pit.

Residual source emissions

5.2.4 The activities assessed for residual source emissions are: site preparation and restoration; mineral extraction; materials handling; on-site transportation, minerals processing; stockpiles and exposed surfaces; and off-site transportation. The residual source emissions can be classified as small, medium or large.

5.2.5 The borrow pit is estimated to have medium mineral extraction emissions, small minerals processing emissions and large residual source emissions for all other activities. The overall residual source emissions for this borrow pit is therefore large.

Pathway effectiveness

5.2.6 To assess pathway effectiveness each receptor within the 250m distance band has been assessed separately, taking into account the frequency of winds likely to impact the receptor. Meteorological data from the past five years has been filtered to identify the percentage of time for dry days when the wind direction could carry dust from the

borrow pit to the receptor. This value represents the frequency and has been classified as: infrequent, moderately frequent, frequent or very frequent using criteria classified by the IAQM mineral dust guidance[11]. Meteorological data have been taken from Shawbury, which is located 31km south-west of the borrow pit in this area. Table 8 presents the details of this assessment.

Table 8: Frequency of potentially dusty winds

Type of receptor	Receptor	Wind direction impacting receptor (degrees)	% yearly winds over 5m/s on dry days	Frequency of potentially dusty winds
Human	Netherset House	190-310	10%	Moderately Frequent
	Netherset Hey	200-300	9%	Moderately Frequent
	Netherset Industrial Estate	40-250	11%	Moderately Frequent
	Hey House	340-360 and 0-140	3%	Infrequent
Ecological	Hey Sprink Ancient Woodland and LWS	230-330	9%	Moderately Frequent

5.2.7 For each receptor, their sensitivity was classified as high, medium or low. The distance of the receptor from the source was measured and the distance category was classified as: close (<100m), intermediate (100 – 200m) or distant (400 – 1000m).

5.2.8 Netherset House and Hey House are both residential so are classified as high sensitivity. Netherset Hey and Netherset Industrial Estate are both farming/commercial so are classified as medium sensitivity receptors. Hey Sprink Ancient Woodland and LWS ecological receptor is classified as low sensitivity due to its non-statutory designation. For each receptor the frequency of potentially dusty winds and the distance category was used to classify the pathway effectiveness using the IAQM mineral guidance, as shown in Table 9.

Table 9: Receptor sensitivity, distance from source and pathway effectiveness

Type of receptor	Receptor	Frequency of potentially dusty winds	Distance Category	Pathway effectiveness
Human	Netherset House	Moderately Frequent	Intermediate	Moderate
	Netherset Hey	Moderately Frequent	Intermediate	Moderate
	Netherset Industrial Estate	Moderately Frequent	Close	Moderate
	Hey House	Infrequent	Intermediate	Ineffective
Ecological	Hey Sprink Ancient Woodland and LWS	Moderately Frequent	Intermediate	Moderate

[11] IAQM (2016), *Guidance on the assessment of mineral dust impacts for planning*

Risk of dust impacts

5.2.9 For each receptor, the residual source emissions and the pathway effectiveness were used to define the risk of dust impacts, as shown in Table 10.

Table 10: Risk of mineral dust impacts

Type of receptor	Receptor	Residual source emissions	Pathway effectiveness	Estimation of Dust Impact Risk
Human	Netherset House	Large	Moderate	Medium Risk
	Netherset Hey	Large	Moderate	Medium Risk
	Netherset Industrial Estate	Large	Moderate	Medium Risk
	Hey House	Large	Ineffective	Low Risk
Ecological	Hey Sprink Ancient Woodland and LWS	Large	Moderate	Medium Risk

Magnitude of dust effects

5.2.10 For each receptor, the risk of dust impacts and the receptor sensitivity was used to define the magnitude of dust effects, as shown in Table 11.

Table 11: Magnitude of dust effect

Type of receptor	Receptor	Receptor sensitivity	Estimation of Dust Impact Risk	Magnitude of Dust Effect
Human	Netherset House	High	Medium Risk	Moderate Adverse
	Netherset Hey	Medium	Medium Risk	Slight Adverse
	Netherset Industrial Estate	Medium	Medium Risk	Slight Adverse
	Hey House	High	Low Risk	Slight Adverse
Ecological	Hey Sprink Ancient Woodland and LWS	Low	Medium Risk	Negligible

5.2.11 With the implementation of basic good practice mitigation measures at the borrow pit site, the magnitude of dust effect will be negligible at all receptors.

5.3 Human health effects

5.3.1 To assess the impacts of borrow pits on human health, the background PM10 concentration for the centre of the borrow pit was obtained from the Defra background maps[12] and the number of sensitive receptors within 1km of the borrow pit were calculated. The IAQM mineral dust guidance[13] notes that if the background PM10 concentrations are under 17µg/m^3 then the effects on human health can be considered not significant.

[12] Department for Environment, Food and Rural Affairs (Defra) (2013), Defra Background Pollutant Concentration Maps, http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013.
[13] IAQM (2016), *Guidance on the assessment of mineral dust impacts for planning*

5.3.2 The PM10 background concentration for 2016 at the receptors is 13.9µg/m^3. The impact for human health effects is therefore not significant.

6 Air quality assessment - road traffic

6.1 Overall assessment approach

6.1.1 The air quality assessment for road related emissions has used the approach described in the SMR and its Addendum.

6.2 Model inputs and verification

Model parameters

6.2.1 The ADMS-Roads model was used to predict pollutant concentrations from changes in construction traffic emissions. A surface roughness of 0.5m was used for this area and a surface roughness of 0.2m was used for the meteorological site. A minimum Monin-Obukhov length of 10m and latitude of 53 degrees were used in the assessment. Meteorological data from the Shawbury site was used for the year 2016.

Model verification

6.2.2 Verification was undertaken for the year 2015 comparing monitored and modelled NO2 concentrations (since monitoring data for 2016 was not available at the time of the assessment) on a route-wide basis. Traffic data provided was assumed to be representative of 2015. The results of this comparison are shown in Table 12.

6.2.3 Model verification was undertaken 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.

6.2.4 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 16 monitoring sites were included in the verification exercise, spread across the entire route.

Table 12: Comparison of monitored and modelled NO2 concentrations

Site	Monitored concentration (µg/m^3)	Modelled concentration (µg/m^3)	Difference [(modelled - monitored)/monitored] * 100
A38-2/2(1) – Lichfield DC	32.6	38.2	17%
A38-2A/B – Lichfield DC	42.2	40.6	-4%
1 – Stafford BC	37.0	48.9	32%
21 – Stafford BC	27.0	29.8	10%
29 – Stafford BC	24.0	23.8	-1%
DT13 – Stoke-on-Trent CC	41.6	47.3	14%
DT14 – Stoke-on-Trent CC	40.6	47.1	16%
DT24 – Stoke-on-Trent CC	42.4	35.3	-17%
DT36 – Stoke-on-Trent CC	42.1	49.7	18%

Site	Monitored concentration (µg/m^3)	Modelled concentration (µg/m^3)	Difference [(modelled - monitored)/monitored] * 100
DT37 – Stoke-on-Trent CC	43.6	34.9	-20%
DT38 – Stoke-on-Trent CC	34.7	34.1	-2%
DT39 – Stoke-on-Trent CC	38.3	29.1	-24%
DT40 – Stoke-on-Trent CC	38.7	38.4	-1%
DT41 – Stoke-on-Trent CC	37.3	39.2	5%
DT43 – Stoke-on-Trent CC	38.4	41.2	7%
DT55 – Stoke-on-Trent CC	40.7	44.0	8%

6.2.5 As the majority of modelled NO2 concentrations were within ±25% of the monitored concentrations and there was no systematic over or under prediction, no model adjustment was undertaken. Modelled concentrations of PM10 and PM2.5 have not been adjusted.

6.3 Assessment of construction traffic emissions

6.3.1 Construction traffic data used in this assessment is detailed in the Background Information and Data (BID) (see BID-AQ-002-000: Traffic data used for the air quality assessment). 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.

Screening of traffic data

6.3.2 The screening process identified a total of five roads in the Whitmore Heath to Madeley area exceeding the Design Manual for Roads and Bridges (DMRB) thresholds for changes in annual average daily traffic (AADT) and/or changes in daily heavy goods vehicles (HGVs) flows. These roads include:

- M6 motorway;
- A51 London Road;
- A5182 Trentham Road;
- A525 Bar Hill Road; and
- A53 Newcastle Road.

6.3.3 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

6.3.4 Sensitive receptors have been selected from an OS AddressBase Premium database. The receptors consist of residential properties, schools and care homes within 200m

of the screened in roads and represent worst-case exposure locations (Table 13). The location of all receptors is shown in Volume 5: Map AQ-01-104.

6.3.5 No designated ecological receptors were identified within 200m of the screened in roads within the Whitmore Heath to Madeley area during construction of the Proposed Scheme.

Table 13: Modelled receptors (construction phase)

Receptor	Description/Location	Ordnance Survey coordinates
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	376541,344493
4-C-H2	Bar Hill, Madeley	376555,343956
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	379401,341350
4-C-H4	The Cottage, Smithy Lane, Whitmore	380861,340908
4-C-H5	Bar Hill, Madeley	376725,344110
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	377344,342852
4-C-H7	Highfields, Heath Road, Whitmore	379883,341255
4-C-H8	Bower End Farm, Bower End Lane, Madeley	376191,344827
4-C-H9	Limpits Farm House, Heath Road, Whitmore	379955,341410
4-C-H10	Snape Hall House, Common Lane, Whitmore	379727,340639
4-C-H11	Appleton Drive, Whitmore	379698,340393
4-C-H12	The Coppice, Common Lane, Whitmore	379810,340599
4-C-H13	Blackbirds Nest, Baldwins Gate	379340,340133
4-C-H14	Heath Cottages, Coneygreave Lane, Whitmore	379805,340494
4-C-H15	Redhills Farm, Baldwins Gate	378626,339739
4-C-H16	Malt Kiln Cottages, Whitmore	381062,340924
4-C-H17	The White House, Heath Road, Whitmore	379759,340714
4-C-H18	The Gables, Weymouth, Market Drayton	374612,340274
4-C-H19	Hawthorne Cottages, Baldwins Gate	378934,339962
4-C-H20	Grange Cottages, Trentham Road, Butterton	384086,341889
4-C-H21	The Square, Woore	373088,342289
4-C-H22	Brookfields, Stone Road, Blackbrook	377733,338850
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	377341,338827
4-C-H24	End Cottage, Swan Bank, Madeley Heath	378133,345823
4-C-H25	Morston Drive, Newcastle	384712,342595
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	377989,350233

Receptor	Description/Location	Ordnance Survey coordinates
4-C-H27	Holly House, Bar Hill Road, Onneley	375118,343103
4-C-H28	Collingwood, Newcastle Road, Madeley	378117,345489
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	378080,347952
4-C-H30	Holly Cottage, Pipe Gate, Market Drayton	373661,341023
4-C-H31	The Chalway, London Road, Woore	373115,342168
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	380524,343917
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	376668,338976
4-C-H34	Sidway Lodge, Sidway, Market Drayton	375956,339448
4-C-H35	Four Houses, Baldwins Gate	378141,339294
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	378036,345458
4-C-H37	St Helier Close, Newcastle Under Lyme	383522,343263
4-C-H38	Rose Cottage, Newcastle Road, Woore	373623,342355
4-C-H39	Oak Cottage, London Road, Irelands Cross, Woore	373377,341655
4-C-H40	Nantwich Road, Woore	373008,342385
4-C-H41	Bar Hill House, Bar Hill Road, Onneley	375778,343372

Background concentrations

6.3.6 The background concentrations used in the assessment are shown in Table 14 taken from the Defra maps.

Table 14: Background 2020 concentrations at assessed receptors

Receptor	Description/Location	Background concentrations in 2020 (µg/m^3)			
		NOx	NO2	PM10	PM2.5
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	12.8	9.5	12.8	9.0
4-C-H2	Bar Hill, Madeley	11.6	8.7	12.5	8.8
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	12.2	9.1	12.0	8.5
4-C-H4	The Cottage, Smithy Lane, Whitmore	13.3	9.8	13.2	9.2
4-C-H5	Bar Hill, Madeley	12.8	9.5	12.8	9.0
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	12.0	8.9	12.5	8.7
4-C-H7	Highfields, Heath Road, Whitmore	12.2	9.1	12.0	8.5
4-C-H8	Bower End Farm, Bower End Lane, Madeley	12.8	9.5	12.8	9.0
4-C-H9	Limpits Farm House, Heath Road, Whitmore	12.2	9.1	12.0	8.5

Receptor	Description/Location	Background concentrations in 2020 (µg/m^3)			
		NOx	NO2	PM10	PM2.5
4-C-H10	Snape Hall House, Common Lane, Whitmore	13.5	9.9	12.5	8.9
4-C-H11	Appleton Drive, Whitmore	13.5	9.9	12.5	8.9
4-C-H12	The Coppice, Common Lane, Whitmore	13.5	9.9	12.5	8.9
4-C-H13	Blackbirds Nest, Baldwins Gate	13.5	9.9	12.5	8.9
4-C-H14	Heath Cottages, Coneygreave Lane, Whitmore	13.5	9.9	12.5	8.9
4-C-H15	Redhills Farm, Baldwins Gate	11.4	8.5	12.1	8.5
4-C-H16	Malt Kiln Cottages, Whitmore	12.6	9.4	13.1	9.1
4-C-H17	The White House, Heath Road, Whitmore	13.5	9.9	12.5	8.9
4-C-H18	The Gables, Weymouth, Market Drayton	10.2	7.7	12.4	8.6
4-C-H19	Hawthorne Cottages, Baldwins Gate	11.4	8.5	12.1	8.5
4-C-H20	Grange Cottages, Trentham Road, Butterton	18.1	13.1	15.9	10.6
4-C-H21	The Square, Woore	10.5	7.9	12.4	8.9
4-C-H22	Brookfields, Stone Road, Blackbrook	11.1	8.3	12.8	8.9
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	11.1	8.3	12.8	8.9
4-C-H24	End Cottage, Swan Bank, Madeley Heath	17.7	12.8	17.6	11.7
4-C-H25	Morston Drive, Newcastle	21.7	15.4	16.4	11.0
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	16.4	12.0	15.3	10.2
4-C-H27	Holly House, Bar Hill Road, Onneley	11.2	8.4	12.0	8.5
4-C-H28	Collingwood, Newcastle Road, Madeley	17.7	12.8	17.6	11.7
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	16.5	12.1	14.8	10.0
4-C-H30	Holly Cottage, Pipe Gate, Market Drayton	10.3	7.7	12.0	8.6
4-C-H31	The Chalway, London Road, Woore	10.5	7.9	12.4	8.9
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	13.5	10.0	12.7	8.9
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	10.9	8.1	12.9	8.9
4-C-H34	Sidway Lodge, Sidway, Market Drayton	10.3	7.8	12.3	8.6
4-C-H35	Four Houses, Baldwins Gate	11.4	8.5	12.1	8.5
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	17.7	12.8	17.6	11.7

Receptor	Description/Location	Background concentrations in 2020 (µg/m^3)			
		NOx	NO2	PM10	PM2.5
4-C-H37	St Helier Close, Newcastle Under Lyme	18.0	13.0	15.2	10.3
4-C-H38	Rose Cottage, Newcastle Road, Woore	10.5	7.9	12.4	8.9
4-C-H39	Oak Cottage, London Road, Irelands Cross, Woore	10.3	7.7	12.0	8.6
4-C-H40	Nantwich Road, Woore	10.5	7.9	12.4	8.9
4-C-H41	Bar Hill House, Bar Hill Road, Onneley	11.2	8.4	12.0	8.5

Assessment results

6.3.7 Table 15, Table 16 and Table 17 provide the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptors are also derived following the Institute of Air Quality Management (IAQM) / Environmental Protection UK (EPUK) methodology[14].

Table 15: Predicted annual mean NO2 concentrations and impacts (construction phase)

Receptor	Description/Location	NO2 concentrations (µg/m^3)		Change in NO2 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	10.3	10.3	0.1	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	9.8	9.9	0.1	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	9.8	9.9	0.1	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	12.4	12.5	0.1	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	10.8	11.1	0.3	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	9.8	9.8	0.1	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	9.9	10.0	0.1	Negligible	Not significant
4-C-H8	Bower End Farm, Bower End Lane, Madeley	10.2	10.4	0.2	Negligible	Not significant
4-C-H9	Limpits Farm House, Heath Road, Whitmore	9.9	10.0	0.1	Negligible	Not significant
4-C-H10	Snape Hall House, Common Lane, Whitmore	11.2	11.3	0.1	Negligible	Not significant
4-C-H11	Appleton Drive, Whitmore	13.0	13.1	0.1	Negligible	Not significant

[14] IAQM (2017), *Land-use planning & development control: Planning for air quality*

Receptor	Description/Location	NO_2 concentrations ($\mu g/m^3$)		Change in NO_2 concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H12	The Coppice, Common Lane, Whitmore	12.6	12.7	0.1	Negligible	Not significant
4-C-H13	Blackbirds Nest, Baldwins Gate	14.9	15.0	0.1	Negligible	Not significant
4-C-H14	Heath Cottages, Coneygreave Lane, Whitmore	12.8	12.9	0.1	Negligible	Not significant
4-C-H15	Redhills Farm, Baldwins Gate	11.1	11.2	0.1	Negligible	Not significant
4-C-H16	Malt Kiln Cottages, Whitmore	12.4	12.6	0.2	Negligible	Not significant
4-C-H17	The White House, Heath Road, Whitmore	11.0	11.0	0.0	Negligible	Not significant
4-C-H18	The Gables, Weymouth, Market Drayton	8.7	8.8	0.1	Negligible	Not significant
4-C-H19	Hawthorne Cottages, Baldwins Gate	10.2	10.3	0.1	Negligible	Not significant
4-C-H20	Grange Cottages, Trentham Road, Butterton	16.6	17.0	0.4	Negligible	Not significant
4-C-H21	The Square, Woore	10.9	11.1	0.2	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	10.0	10.0	0.0	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	11.3	11.5	0.2	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	22.4	22.5	0.1	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	23.2	23.3	0.1	Negligible	Not significant
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	28.7	28.8	0.1	Negligible	Not significant
4-C-H27	Holly House, Bar Hill Road, Onneley	9.9	10.0	0.1	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	37.5	37.8	0.3	Negligible	Not significant
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	17.5	17.5	0.0	Negligible	Not significant

Receptor	Description/Location	NO_2 concentrations ($\mu g/m^3$)		Change in NO_2 concentrations ($\mu g/m^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H30	Holly Cottage, Pipe Gate, Market Drayton	9.0	9.1	0.1	Negligible	Not significant
4-C-H31	The Chalway, London Road, Woore	10.4	10.5	0.1	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	16.3	16.3	0.0	Negligible	Not significant
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	9.3	9.4	0.1	Negligible	Not significant
4-C-H34	Sidway Lodge, Sidway, Market Drayton	9.0	9.1	0.1	Negligible	Not significant
4-C-H35	Four Houses, Baldwins Gate	10.8	10.9	0.1	Negligible	Not significant
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	29.4	29.6	0.2	Negligible	Not significant
4-C-H37	St Helier Close, Newcastle Under Lyme	20.7	20.8	0.1	Negligible	Not significant
4-C-H38	Rose Cottage, Newcastle Road, Woore	9.1	9.2	0.1	Negligible	Not significant
4-C-H39	Oak Cottage, London Road, Irelands Cross, Woore	9.9	10.0	0.1	Negligible	Not significant
4-C-H40	Nantwich Road, Woore	9.6	9.6	0.0	Negligible	Not significant
4-C-H41	Bar Hill House, Bar Hill Road, Onneley	9.9	10.0	0.1	Negligible	Not significant

Table 16: Predicted annual mean PM10 concentrations and impacts (construction phase)

Receptor	Description/Location	PM10 concentrations (µg/m^3)		Change in PM10 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	12.9	12.9	0.0	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	12.7	12.7	0.0	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	12.1	12.1	0.0	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	13.7	13.8	0.1	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	13.0	13.0	0.0	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	12.6	12.6	0.0	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	12.1	12.1	0.0	Negligible	Not significant
4-C-H8	Bower End Farm, Bower End Lane, Madeley	12.9	12.9	0.0	Negligible	Not significant
4-C-H9	Limpits Farm House, Heath Road, Whitmore	12.1	12.1	0.0	Negligible	Not significant
4-C-H10	Snape Hall House, Common Lane, Whitmore	12.7	12.8	0.1	Negligible	Not significant
4-C-H11	Appleton Drive, Whitmore	13.1	13.1	0.0	Negligible	Not significant
4-C-H12	The Coppice, Common Lane, Whitmore	13.0	13.0	0.0	Negligible	Not significant
4-C-H13	Blackbirds Nest, Baldwins Gate	13.5	13.5	0.0	Negligible	Not significant
4-C-H14	Heath Cottages, Coneygreave Lane, Whitmore	13.1	13.1	0.0	Negligible	Not significant
4-C-H15	Redhills Farm, Baldwins Gate	12.6	12.6	0.0	Negligible	Not significant
4-C-H16	Malt Kiln Cottages, Whitmore	13.7	13.7	0.0	Negligible	Not significant
4-C-H17	The White House, Heath Road, Whitmore	12.7	12.7	0.0	Negligible	Not significant

Receptor	Description/Location	PM10 concentrations (µg/m^3)		Change in PM10 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H18	The Gables, Weymouth, Market Drayton	12.6	12.6	0.0	Negligible	Not significant
4-C-H19	Hawthorne Cottages, Baldwins Gate	12.4	12.4	0.0	Negligible	Not significant
4-C-H20	Grange Cottages, Trentham Road, Butterton	16.5	16.6	0.1	Negligible	Not significant
4-C-H21	The Square, Woore	12.9	13.0	0.1	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	13.2	13.2	0.0	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	13.4	13.4	0.0	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	19.2	19.2	0.0	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	17.7	17.7	0.0	Negligible	Not significant
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	17.9	17.9	0.0	Negligible	Not significant
4-C-H27	Holly House, Bar Hill Road, Onneley	12.3	12.4	0.0	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	21.8	21.8	0.0	Negligible	Not significant
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	15.7	15.7	0.0	Negligible	Not significant
4-C-H30	Holly Cottage, Pipe Gate, Market Drayton	12.3	12.3	0.0	Negligible	Not significant
4-C-H31	The Chalway, London Road, Woore	12.9	13.0	0.1	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	13.6	13.6	0.0	Negligible	Not significant
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	13.1	13.1	0.0	Negligible	Not significant
4-C-H34	Sidway Lodge, Sidway, Market Drayton	12.5	12.6	0.1	Negligible	Not significant
4-C-H35	Four Houses, Baldwins Gate	12.5	12.6	0.1	Negligible	Not significant

Receptor	Description/Location	PM10 concentrations (µg/m^3)		Change in PM10 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	20.4	20.4	0.0	Negligible	Not significant
4-C-H37	St Helier Close, Newcastle Under Lyme	16.4	16.4	0.0	Negligible	Not significant
4-C-H38	Rose Cottage, Newcastle Road, Woore	12.7	12.7	0.0	Negligible	Not significant
4-C-H39	Oak Cottage, London Road, Irelands Cross, Woore	12.4	12.5	0.1	Negligible	Not significant
4-C-H40	Nantwich Road, Woore	12.8	12.8	0.0	Negligible	Not significant
4-C-H41	Bar Hill House, Bar Hill Road, Onneley	12.3	12.3	0.0	Negligible	Not significant

Table 17: Predicted annual mean PM2.5 concentrations and impacts (construction phase)

Receptor	Description/Location	PM2.5 concentrations (µg/m^3)		Change in PM2.5 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H1	Moorhall Farm, Bower End Lane, Madeley	9.1	9.1	0.0	Negligible	Not significant
4-C-H2	Bar Hill, Madeley	8.9	8.9	0.0	Negligible	Not significant
4-C-H3	Snape Hall Cottage, Snape Hall Road, Whitmore	8.6	8.6	0.0	Negligible	Not significant
4-C-H4	The Cottage, Smithy Lane, Whitmore	9.5	9.5	0.0	Negligible	Not significant
4-C-H5	Bar Hill, Madeley	9.1	9.2	0.0	Negligible	Not significant
4-C-H6	Manor Farm Cottage, Manor Road, Madeley	8.8	8.8	0.0	Negligible	Not significant
4-C-H7	Highfields, Heath Road, Whitmore	8.6	8.6	0.0	Negligible	Not significant

Receptor	Description/Location	PM2.5 concentrations (µg/m^3)		Change in PM2.5 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H8	Bower End Farm, Bower End Lane, Madeley	9.1	9.1	0.0	Negligible	Not significant
4-C-H9	Limpits Farm House, Heath Road, Whitmore	8.6	8.6	0.0	Negligible	Not significant
4-C-H10	Snape Hall House, Common Lane, Whitmore	9.1	9.1	0.0	Negligible	Not significant
4-C-H11	Appleton Drive, Whitmore	9.3	9.3	0.0	Negligible	Not significant
4-C-H12	The Coppice, Common Lane, Whitmore	9.2	9.2	0.0	Negligible	Not significant
4-C-H13	Blackbirds Nest, Baldwins Gate	9.5	9.5	0.0	Negligible	Not significant
4-C-H14	Heath Cottages, Coneygreave Lane, Whitmore	9.2	9.3	0.1	Negligible	Not significant
4-C-H15	Redhills Farm, Baldwins Gate	8.8	8.8	0.0	Negligible	Not significant
4-C-H16	Malt Kiln Cottages, Whitmore	9.4	9.5	0.1	Negligible	Not significant
4-C-H17	The White House, Heath Road, Whitmore	9.0	9.0	0.0	Negligible	Not significant
4-C-H18	The Gables, Weymouth, Market Drayton	8.7	8.8	0.1	Negligible	Not significant
4-C-H19	Hawthorne Cottages, Baldwins Gate	8.7	8.7	0.0	Negligible	Not significant
4-C-H20	Grange Cottages, Trentham Road, Butterton	11.0	11.1	0.1	Negligible	Not significant
4-C-H21	The Square, Woore	9.2	9.2	0.0	Negligible	Not significant
4-C-H22	Brookfields, Stone Road, Blackbrook	9.1	9.1	0.0	Negligible	Not significant
4-C-H23	Swan Inn Farm, Nantwich Road, Blackbrook	9.2	9.2	0.0	Negligible	Not significant
4-C-H24	End Cottage, Swan Bank, Madeley Heath	12.6	12.6	0.0	Negligible	Not significant
4-C-H25	Morston Drive, Newcastle	11.8	11.8	0.0	Negligible	Not significant

Receptor	Description/Location	PM2.5 concentrations (µg/m^3)		Change in PM2.5 concentrations (µg/m^3)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
4-C-H26	Old Peel Cottage, Limbrick Road, Audley	11.9	11.9	0.0	Negligible	Not significant
4-C-H27	Holly House, Bar Hill Road, Onneley	8.7	8.7	0.0	Negligible	Not significant
4-C-H28	Collingwood, Newcastle Road, Madeley	14.2	14.3	0.1	Negligible	Not significant
4-C-H29	Moss Rose Cottage, Heighley Lane, Betley	10.5	10.5	0.0	Negligible	Not significant
4-C-H30	Holly Cottage, Pipe Gate, Market Drayton	8.7	8.7	0.0	Negligible	Not significant
4-C-H31	The Chalway, London Road, Woore	9.2	9.2	0.0	Negligible	Not significant
4-C-H32	Orchard Cottage, Three Mile Lane, Keele	9.5	9.5	0.0	Negligible	Not significant
4-C-H33	Bay Tree Cottage, Nantwich Road, Blackbrook	9.0	9.1	0.1	Negligible	Not significant
4-C-H34	Sidway Lodge, Sidway, Market Drayton	8.7	8.7	0.0	Negligible	Not significant
4-C-H35	Four Houses, Baldwins Gate	8.8	8.8	0.0	Negligible	Not significant
4-C-H36	The Cottages, Ferneyhoughs Bank, Newcastle Road, Madeley	13.4	13.4	0.0	Negligible	Not significant
4-C-H37	St Helier Close, Newcastle Under Lyme	11.0	11.0	0.0	Negligible	Not significant
4-C-H38	Rose Cottage, Newcastle Road, Woore	9.1	9.1	0.0	Negligible	Not significant
4-C-H39	Oak Cottage, London Road, Irelands Cross, Woore	8.8	8.8	0.0	Negligible	Not significant
4-C-H40	Nantwich Road, Woore	9.1	9.1	0.0	Negligible	Not significant
4-C-H41	Bar Hill House, Bar Hill Road, Onneley	8.7	8.7	0.0	Negligible	Not significant

6.3.8 Annual mean concentrations of NO2, PM10 and PM2.5 are predicted to be within the air quality standards with and without construction of the Proposed Scheme. Since the annual mean NO2 concentrations are predicted to be well below 60µg/m^3, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM10 concentrations are predicted to be below 35µg/m^3, the daily mean standard is also expected to be met.

6.3.9 Negligible impacts are predicted at all receptors for annual mean NO2, PM10, PM2.5 concentrations.

Assessment of significance

6.3.10 No significant effects are anticipated at any receptor in relation to annual mean NO2, PM10 and PM2.5 concentrations.

6.4 Assessment of operational traffic emissions

6.4.1 Operational traffic data used in this assessment is detailed in the Background Information and Data (BID) (see BID-AQ-002-000: Traffic data used for the air quality assessment). For the assessment of traffic on the highway network, data for the year 2027 was used as the operational year of the Proposed Scheme.

Screening of traffic data

6.4.2 The screening process identified a total of three roads in the Whitmore Heath to Madeley area exceeding the DMRB thresholds for changes in AADT or daily HGV flows and/or changes in road alignment by 45m or more. These roads include:

- A53 Newcastle Road;
- Manor Road; and
- A525 Bar Hill Road.

6.4.3 Further roads have been included in the assessment to account for their emissions at nearby receptors.

Receptors assessed

6.4.4 Sensitive receptors have been selected from an OS AddressBase Premium database. The receptors consist of residential properties, schools and care homes within 200m of the screened in roads and represent worst-case exposure locations (Table 18). The location of all receptors is shown Volume 5: Map AQ-01-104.

6.4.5 No designated ecological receptors were identified within 200m of the screened in roads within the Whitmore Heath to Madeley area during operational of the Proposed Scheme.

Table 18: Modelled receptors (Operational phase)

Receptor	Description/Location	Ordnance Survey coordinates
4-O-H1	Rookery Barn, Station Road, Madeley	377272,344049
4-O-H2	Bar Hill, Madeley	376555,343956
4-O-H3	Snape Hall House, Common Lane, Whitmore	379727,340639
4-O-H4	The Coppice, Common Lane, Whitmore	379810,340599
4-O-H5	Fair-Green Road, Baldwins Gate	379699,340204
4-O-H6	Woodcroft, Red Lane, Madeley	376997,343980
4-O-H7	Heath Cottages, Coneygreave Lane, Whitmore	379805,340494
4-O-H8	Bitterns Wood Cottage, Manor Road, Madeley	377347,342858
4-O-H9	Bar Hill, Madeley	376725,344110
4-O-H10	The Barn House, Bar Hill, Madeley	376444,343648
4-O-H11	The White House, Heath Road, Whitmore	379759,340714
4-O-H12	Monument Lodge, Manor Road, Madeley	377224,344023
4-O-H13	Mallard Close, Madeley	377097,344221
4-O-H14	The Hill, Whitmore	380131,340709

Background concentrations

6.4.6 The background concentrations used in the assessment are shown in Table 19 taken from the Defra maps.

Table 19: Background 2027 concentrations at assessed receptors

Receptor	Description/Location	Background concentrations in 2027 (µg/m^3)			
		NOx	NO2	PM10	PM2.5
4-O-H1	Rookery Barn, Station Road, Madeley	11.9	8.9	13.1	9.2
4-O-H2	Bar Hill, Madeley	10.1	7.6	12.3	8.6
4-O-H3	Snape Hall House, Common Lane, Whitmore	11.8	8.8	12.3	8.7
4-O-H4	The Coppice, Common Lane, Whitmore	11.8	8.8	12.3	8.7
4-O-H5	Fair-Green Road, Baldwins Gate	11.8	8.8	12.3	8.7
4-O-H6	Woodcroft, Red Lane, Madeley	10.1	7.6	12.3	8.6
4-O-H7	Heath Cottages, Coneygreave Lane, Whitmore	11.8	8.8	12.3	8.7
4-O-H8	Bitterns Wood Cottage, Manor Road, Madeley	10.4	7.8	12.3	8.5

Receptor	Description/Location	Background concentrations in 2027 (µg/m^3)			
		NOx	NO2	PM10	PM2.5
4-O-H9	Bar Hill, Madeley	11.2	8.4	12.6	8.8
4-O-H10	The Barn House, Bar Hill, Madeley	10.1	7.6	12.3	8.6
4-O-H11	The White House, Heath Road, Whitmore	11.8	8.8	12.3	8.7
4-O-H12	Monument Lodge, Manor Road, Madeley	11.9	8.9	13.1	9.2
4-O-H13	Mallard Close, Madeley	11.9	8.9	13.1	9.2
4-O-H14	The Hill, Whitmore	11.6	8.6	13.0	9.0

Assessment results

6.4.7 Table 20, Table 21 and Table 22 provide the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptors are also derived following the IAQM / EPUK methodology[15].

Table 20: Predicted annual mean NO2 concentrations and impacts (operation phase)

Receptor	Description/Location	NO2 concentrations (µg/m^3)		Change in NO2 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H1	Rookery Barn, Station Road, Madeley	9.1	9.1	0.0	Negligible	Not Significant
4-O-H2	Bar Hill, Madeley	7.9	7.8	-0.1	Negligible	Not Significant
4-O-H3	Snape Hall House, Common Lane, Whitmore	9.1	9.1	0.0	Negligible	Not Significant
4-O-H4	The Coppice, Common Lane, Whitmore	10.0	9.9	0.1	Negligible	Not Significant
4-O-H5	Fair-Green Road, Baldwins Gate	9.0	9.0	0.0	Negligible	Not Significant
4-O-H6	Woodcroft, Red Lane, Madeley	7.7	7.7	0.0	Negligible	Not Significant
4-O-H7	Heath Cottages, Coneygreave Lane, Whitmore	10.1	10.1	0.0	Negligible	Not Significant
4-O-H8	Bitterns Wood Cottage, Manor Road, Madeley	8.0	8.0	0.0	Negligible	Not Significant
4-O-H9	Bar Hill, Madeley	8.8	8.6	-0.2	Negligible	Not Significant
4-O-H10	The Barn House, Bar Hill, Madeley	8.8	8.8	0.0	Negligible	Not Significant
4-O-H11	The White House, Heath Road, Whitmore	9.0	9.0	0.0	Negligible	Not Significant
4-O-H12	Monument Lodge, Manor Road, Madeley	9.1	9.1	0.0	Negligible	Not Significant

[15] IAQM (2017), *Land-use planning & development control: Planning for air quality*

Receptor	Description/Location	NO2 concentrations (µg/m^3)		Change in NO2 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H13	Mallard Close, Madeley	9.5	9.5	0.0	Negligible	Not Significant
4-O-H14	The Hill, Whitmore	9.2	9.2	0.0	Negligible	Not Significant

Table 21: Predicted annual mean PM10 concentrations and impacts (operation phase)

Receptor	Description/Location	PM10 concentrations (µg/m^3)		Change in PM10 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H1	Rookery Barn, Station Road, Madeley	13.2	13.2	0.0	Negligible	Not Significant
4-O-H2	Bar Hill, Madeley	12.4	12.4	0.0	Negligible	Not Significant
4-O-H3	Snape Hall House, Common Lane, Whitmore	12.4	12.4	0.0	Negligible	Not Significant
4-O-H4	The Coppice, Common Lane, Whitmore	12.6	12.6	0.0	Negligible	Not Significant
4-O-H5	Fair-Green Road, Baldwins Gate	12.4	12.4	0.0	Negligible	Not Significant
4-O-H6	Woodcroft, Red Lane, Madeley	12.3	12.3	0.0	Negligible	Not Significant
4-O-H7	Heath Cottages, Coneygreave Lane, Whitmore	12.7	12.7	0.0	Negligible	Not Significant
4-O-H8	Bitterns Wood Cottage, Manor Road, Madeley	12.3	12.3	0.0	Negligible	Not Significant
4-O-H9	Bar Hill, Madeley	12.7	12.6	-0.1	Negligible	Not Significant
4-O-H10	The Barn House, Bar Hill, Madeley	12.7	12.7	0.0	Negligible	Not Significant
4-O-H11	The White House, Heath Road, Whitmore	12.4	12.4	0.0	Negligible	Not Significant
4-O-H12	Monument Lodge, Manor Road, Madeley	13.2	13.2	0.0	Negligible	Not Significant

Receptor	Description/Location	PM10 concentrations (µg/m^3)		Change in PM10 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H13	Mallard Close, Madeley	13.3	13.3	0.0	Negligible	Not Significant
4-O-H14	The Hill, Whitmore	13.2	13.2	0.0	Negligible	Not Significant

Table 22: Predicted annual mean PM2.5 concentrations and impacts (operation phase)

Receptor	Description/Location	PM2.5 concentrations (µg/m^3)		Change in PM2.5 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H1	Rookery Barn, Station Road, Madeley	9.2	9.2	0.0	Negligible	Not Significant
4-O-H2	Bar Hill, Madeley	8.6	8.6	0.0	Negligible	Not Significant
4-O-H3	Snape Hall House, Common Lane, Whitmore	8.8	8.8	0.0	Negligible	Not Significant
4-O-H4	The Coppice, Common Lane, Whitmore	8.9	8.9	0.0	Negligible	Not Significant
4-O-H5	Fair-Green Road, Baldwins Gate	8.8	8.8	0.0	Negligible	Not Significant
4-O-H6	Woodcroft, Red Lane, Madeley	8.6	8.6	0.0	Negligible	Not Significant
4-O-H7	Heath Cottages, Coneygreave Lane, Whitmore	9.0	9.0	0.0	Negligible	Not Significant
4-O-H8	Bitterns Wood Cottage, Manor Road, Madeley	8.6	8.6	0.0	Negligible	Not Significant
4-O-H9	Bar Hill, Madeley	8.9	8.8	-0.1	Negligible	Not Significant
4-O-H10	The Barn House, Bar Hill, Madeley	8.8	8.8	0.0	Negligible	Not Significant
4-O-H11	The White House, Heath Road, Whitmore	8.8	8.8	0.0	Negligible	Not Significant
4-O-H12	Monument Lodge, Manor Road, Madeley	9.2	9.2	0.0	Negligible	Not Significant

Receptor	Description/Location	PM2.5 concentrations (µg/m^3)		Change in PM2.5 concentrations (µg/m^3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
4-O-H13	Mallard Close, Madeley	9.3	9.3	0.0	Negligible	Not Significant
4-O-H14	The Hill, Whitmore	9.1	9.1	0.0	Negligible	Not Significant

6.4.8 The annual mean NO2, PM10 and PM2.5 concentrations are predicted to be within the air quality standards with and without operation of the Proposed Scheme. Since the annual mean NO2 concentrations are predicted to be well below 60µg/m^3, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM10 concentrations are predicted to be below 35µg/m^3, the daily mean standard is also expected to be met.

6.4.9 Negligible impacts are predicted at all receptors for annual mean NO2, PM10, PM2.5 concentrations.

Assessment of significance

6.4.10 No significant effects are anticipated at any receptor in relation to annual mean NO2, PM10 and PM2.5 concentrations.

7 References

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