



High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 5: Technical appendices

CA5: South Cheshire

Air quality report (AQ-001-005)



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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 South Cheshire community area (CA5); 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 1² and the Scope and Methodology Report (SMR)³ and its Addendum⁴.

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 South Cheshire area lies within the administrative areas of Cheshire East District Council and Newcastle-under-Lyme Borough Council (NBC).

Cheshire East District Council

- 2.1.2 The Cheshire East Local Plan⁵ is currently under development and it will set out a vision for the development of the District. Saved policies from previous plans, namely the Borough of Crewe and Nantwich Replacement Local Plan⁶ and the Macclesfield Borough Local Plan⁷, are applicable in this area.
- 2.1.3 Policy NE15 on re-use and adaptation of a rural building for a commercial, industrial or recreational use states that the proposed use will not harm the local environment through the creation of noise, dust, smoke, fumes, grit, vibration or any form of water, soil or air pollution.
- 2.1.4 Policy DC62 on renewable energy states that in determining whether applications for renewable energy developments are satisfactory, the council will have regard to the following: whether the process involved would be such as to cause undue loss of amenity to any nearby residents by reason of noise, smell, air pollution, or in any other way.
- 2.1.5 Policy DC3 on amenity states that development, including changes of use, should not significantly injure the amenities of adjoining or nearby residential property or sensitive uses due to noise, vibration, smells, fumes, smoke, soot, ash, dust or grit, environmental pollution, hazardous substances and industrial processes.
- 2.1.6 Policy T1 on integrated transport states that the council will seek to enhance the integration of modes of transport, encourage the use of public transport and ensure that a balance is maintained between safety and movement and the need to protect and enhance the natural and built environment. Proposals for new transportation schemes will be judged against criteria including noise, congestion and pollution are reduced in residential or shopping areas.

Newcastle-under-Lyme Borough Council

- 2.1.7 The Newcastle-under-Lyme Local Development Framework⁸ 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 in-line with national policy.

⁵ Cheshire East Council, *Cheshire East Local Plan*,

http://www.cheshireeast.gov.uk/planning/spatial_planning/cheshire_east_local_plan/cheshire_east_local_plan.aspx.

⁶ Cheshire East Council (2011), *Borough of Crewe and Nantwich Replacement Local Plan*, <http://www.cheshireeast.gov.uk/PDF/En-LDF-CNBCLocalPlan.pdf>.

⁷ Cheshire East Council (2011), *Macclesfield Borough Local Plan*, <http://www.cheshireeast.gov.uk/pdf/Macc-Local-Plan-Combined-Chapters.pdf>.

⁸ 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>.

- 2.1.8 The Core Spatial Strategy⁹, 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.
- 2.1.9 NBC also has a number of saved policies¹⁰ from its Local Plan 2011 (adopted 2003), which continues to form part of their Development Plan. 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.

⁹ 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.

¹⁰ 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 Cheshire East District Council covers most of the South Cheshire area with NBC also lying to the south of this area. Both councils review air quality throughout the area following Defra's local air quality management (LAQM) regime¹¹.

3.1.2 There are four Air Quality Management Areas (AQMAs) within the South Cheshire area which have been declared for exceedances of the annual mean NO₂ standard. These are:

- the Nantwich Road AQMA, extending from the junction with Walthall Street to the junction with Pedley Street (1km from the route of the Proposed Scheme);
- the Nantwich AQMA, encompassing the A534 Hospital Street between the junctions with London Road and Pratchitts Row (6km from the route of the Proposed Scheme);
- the Earle Street Crewe AQMA, encompassing properties adjacent to a stretch of the A532 Earle Street (1.5km from the route of the Proposed Scheme); and
- the Wistaston Road Crewe AQMA, encompassing properties adjacent to a stretch of Wistanton Road (1.8km from the route of the Proposed Scheme).

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-01-105. 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/m³ as an annual mean for nitrogen dioxide (NO₂) and particulate matter (PM₁₀);
- 200µg/m³ one-hour mean for NO₂ not to be exceeded more than 18 times a year (equivalent to the 99.8th percentile of the one-hour mean);
- 50µg/m³ 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/m³ as an annual mean for fine particulate matter (PM_{2.5}).

Continuous monitoring

3.1.5 There are no continuous air quality monitoring sites within the South Cheshire area. There is one continuous air quality monitoring site within Newcastle-under-Lyme

¹¹ In fulfilment of Part IV of the *Environment Act 1995*. London, Her Majesty's Stationary Office

Borough Council and six within Cheshire East District Council, however these have been discounted as they are too far from the Proposed Scheme.

Diffusion tubes

- 3.1.6 Cheshire East District Council undertakes air quality monitoring with the use of passive diffusion tubes as part of its LAQM process, with 134 diffusion tube sites positioned within the Borough. Of these, 14 diffusion tube sites are located within the South Cheshire area.
- 3.1.7 Table 1 summarises the results from the diffusion tube sites that are 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 sites¹²

Site	Ordnance Survey coordinates	Annual mean NO ₂ concentrations (µg/m ³)			
		2012	2013	2014	2015
CE203	370729, 354731	43.8	32.5	42.5	46.7
CE204	370736, 354695	35.6	48.9	38.8	32.4
CE206	370565, 354650	31.0	40.6	30.2	26.0
CE212	370555, 354720	34.2	33.2	37.6	32.9
CE224	370844, 355745	39.9	42.9	39.9	36.2
CE225	370874, 355748	38.2	42.0	41.9	40.0
CE226	371108, 355738	31.2	32.8	32.1	30.0
CE230	370117, 355431	33.1	36.4	31.5	30.8
CE232	370040, 355480	38.5	38.5	38.1	38.7
CE235	370801, 354728	30.2	35.4	31.3	28.4
CE238	370485, 357284	36.2	35.6	32.9	30.3
CE239	369986, 355432	36.2	37.6	40.4	36.2
CE246	370871, 354315	n/a*	n/a	39.9	36.4
CE247	367716, 352868	n/a	n/a	25.9	24.1

* data not available for this year at this location

Background pollutant concentrations

- 3.1.8 Estimates of background air quality were obtained from the Department for Environment, Food and Rural Affairs (Defra) maps¹³. Background concentrations of NO₂, PM₁₀ and PM_{2.5} are within the air quality standards throughout the study area.

¹² Cheshire East Council (2016), *2015 Updating and Screening Assessment*

¹³ Department for Environment, Food and Rural Affairs (Defra) (2013), *Defra Background Pollutant Concentration Maps*, <https://uk-air.defra.gov.uk/data/laqm-background-maps>.

NO₂ annual mean concentrations were in the range 7.6µg/m³ – 22.1µg/m³ in 2016. PM₁₀ and PM_{2.5} annual mean concentrations were in the range 10.9µg/m³ – 16.7µg/m³ and 8.0µg/m³ – 11.8µg/m³ in 2016 respectively.

- 3.1.9 While the diffusion tube sites in Table 1 can be used to indicate trends in concentrations they are not considered to be representative of the 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 South Cheshire area are within the relevant air quality standards.

Local emission sources

- 3.1.10 The main sources of air pollution in the South Cheshire area are emissions from road vehicles and agricultural activities. Major roads within the area include: the M6; the A500 Newcastle Road/Shavington Bypass; the A534 Crewe Road/Nantwich Road; the A531 Newcastle Road; the A51 Nantwich Bypass / London Road; the A5020 Weston Road/University Way/David Whitby Way; the A532 Weston Road; the B5071 Crewe Road/Jack Mills Way/Gresty Road; and local roads serving the settlements of Shavington, Weston, Chorlton, Hough, Wybunbury and Blakelow. Other emission sources include 10 industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely:

- Redhall Farming Ltd, Leighton (permit number BS3662IA);
- ForFarmers UK Limited, Crewe Gates Farm Industrial Estate (permit number YP3734RQ);
- 3D Waste Limited, Maw Green Landfill, Crewe (permit number BS7722ID);
- Viridor Waste Management, Whitehead Landfill (permit number BW2277IM);
- Morning Foods Ltd, North Western Mills, Crewe (permit number JP3431PA);
- Joseph Heler Ltd, Laurels Farm, Hatherton (permit number YP3731PE);
- Ipackchem Ltd, Crewe (permit number BS5126IN);
- Bentley Motors Ltd, Crewe (permit number MP3434LQ);
- United Phosphorus Limited, Sandbach (permit number BS3662IA); and
- WGR Limited, Whittakers Greet Farm, Hunterson (permit number PP3130AB).

- 3.1.11 Contributions to local pollutant concentrations made by these industrial installations are included within background concentrations used in this assessment.

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 South Cheshire 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 Checkley Lane and Grange Farm: there are no demolition activities in this area. Residential dwellings are located within 20m of earthworks, construction and trackout activities;
- area around Den Lane: residential dwellings are located within 100m of demolitions, 50m of earthworks, 200m of construction and 20m of trackout activities;
- area around Delta Junction compound: there are no demolition activities in this area. Residential dwellings are located within 20m of earthworks and trackout activities, and within 350m of construction activities;
- area around Chorlton and Chorlton Lane: there are no demolition activities in this area. Residential dwellings are located within 20m of earthworks and construction activities and within 50m of trackout activities;
- area around Newcastle Road: residential dwellings are located within 50m of demolitions, and 20m of earthworks, construction and trackout activities; and
- area around Weston Lane: residential dwellings are located within 100m of demolitions, 20m of earthworks and trackout activities and 100m of construction activities.

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

Effect	Demolition	Earthworks	Construction	Trackout
Area around Checkley Lane and Grange Farm				
Dust soiling	n/a	Medium	Medium	Medium
Human health	n/a	Low	Low	Low
Area around Den Lane				
Dust soiling	Low	Low	Low	High
Human health	Low	Low	Low	Low

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Effect	Demolition	Earthworks	Construction	Trackout
Area around Delta Junction compound				
Dust soiling	n/a	Medium	Low	Medium
Human health	n/a	Low	Low	Low
Area around Chorlton and Chorlton Lane				
Dust soiling	n/a	Medium	Medium	Low
Human health	n/a	Low	Low	Low
Area around Newcastle Road				
Dust soiling	Low	Medium	Medium	High
Human health	Low	Low	Low	Low
Area around Weston Lane				
Dust soiling	Low	Medium	Low	Medium
Human health	Low	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 Checkley Lane and Grange Farm	n/a	Large	Large	Large
Area around Den Lane	Small	Large	Large	Large
Area around Delta Junction compound	n/a	Large	Large	Large
Area around Chorlton and Chorlton Lane	n/a	Large	Medium	Large
Area around Newcastle Road	Small	Large	Large	Large
Area around Weston Lane	Small	Medium	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.

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Table 4: Risk of dust soiling and human health effects

Effect	Demolition	Earthworks	Construction	Trackout
Area around Checkley Lane and Grange Farm				
Dust soiling	n/a	Medium risk	Medium risk	Medium risk
Human health	n/a	Low risk	Low risk	Low risk
Area around Den Lane				
Dust soiling	Negligible risk	Low risk	Low risk	High risk
Human health	Negligible risk	Low risk	Low risk	Low risk
Area around Delta Junction compound				
Dust soiling	n/a	Medium risk	Low risk	Medium risk
Human health	n/a	Low risk	Low risk	Low risk
Area around Chorlton and Chorlton Lane				
Dust soiling	n/a	Medium risk	Medium risk	Low risk
Human health	n/a	Low risk	Low risk	Low risk
Area around Newcastle Road				
Dust soiling	Negligible risk	Medium risk	Medium risk	High risk
Human health	Negligible risk	Low risk	Low risk	Low risk
Area around Weston Lane				
Dust soiling	Negligible risk	Medium risk	Low risk	Medium risk
Human health	Negligible risk	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 Basford Brook area, where there are no demolition activities scheduled. An ecological receptor (Basford Brook) is located within 50m of earthworks and construction activities, and 20m of trackout activities. There are no further ecological receptors located within the study area. Table 5 presents the sensitivity of the Basford Brook area to ecological effects.

Table 5: Sensitivity of area to ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Basford Brook area	n/a	Low	Low	Low

Dust emission magnitude

- 4.3.2 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
Basford Brook area	Small	Medium	Large	Large

Risk of impacts

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

Table 7: Risk of ecological effects

Area	Demolition	Earthworks	Construction	Trackout
Basford Brook area	n/a	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 South Cheshire area, located near Grange Farm north of Checkley Lane.

5.2 Disamenity dust

- 5.2.1 The borrow pit has an area of 375,000m² 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 12 human receptors within 250m of the borrow pit, namely:
- five residential properties around Fogg Cottages (374460, 347576), these include: Higher Den Farm; the Partridge; the Owl; the Lark; and the Swallow, 115m north-west, downwind of borrow pit;
 - a residential property near Checkley Lane (374660, 346651), 150m east, downwind of borrow pit; and
 - six residential properties near Den Lane (373980, 347824), these include: Nos. 1 to 5 Den Lane and Rose Cottage, 140m west, upwind of borrow pit.
- 5.2.3 There are no ecological receptors within 250m of this site.

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 large mineral extraction emission, 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 the 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 Institute of Air Quality Management (IAQM) mineral dust guidance¹⁴.

¹⁴ IAQM (2016), *Guidance on the assessment of mineral dust impacts for planning*

Meteorological data has 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	Higher Den Farm	70-150	2%	Infrequent
	The Partridge	70-150	2%	Infrequent
	The Owl	70-150	2%	Infrequent
	The Lark	70-150	2%	Infrequent
	The Swallow	70-150	2%	Infrequent
	Checkley Lane	230-330	9%	Moderately Frequent
	1 Den Lane	70-210	7%	Moderately Frequent
	2 Den Lane	70-210	7%	Moderately Frequent
	3 Den Lane	70-210	7%	Moderately Frequent
	4 Den Lane	70-210	7%	Moderately Frequent
	5 Den Lane	70-210	7%	Moderately Frequent
	Rose Cottage	70-210	7%	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 All receptors are residential so are classified as high sensitivity. 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	Higher Den Farm	Infrequent	Intermediate	Ineffective
	The Partridge	Infrequent	Intermediate	Ineffective
	The Owl	Infrequent	Intermediate	Ineffective
	The Lark	Infrequent	Intermediate	Ineffective
	The Swallow	Infrequent	Intermediate	Ineffective
	Checkley Lane	Moderate	Intermediate	Moderate
	1 Den Lane	Moderate	Intermediate	Moderate

Type of receptor	Receptor	Frequency of potentially dusty winds	Distance Category	Pathway effectiveness
	2 Den Lane	Moderate	Intermediate	Moderate
	3 Den Lane	Moderate	Intermediate	Moderate
	4 Den Lane	Moderate	Intermediate	Moderate
	5 Den Lane	Moderate	Intermediate	Moderate
	Rose Cottage	Moderate	Intermediate	Moderate

Risk of dust effects

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	Higher Den Farm	Large	Ineffective	Low risk
	The Partridge	Large	Ineffective	Low risk
	The Owl	Large	Ineffective	Low risk
	The Lark	Large	Ineffective	Low risk
	The Swallow	Large	Ineffective	Low risk
	Checkley Lane	Large	Moderate	Medium risk
	1 Den Lane	Large	Moderate	Medium risk
	2 Den Lane	Large	Moderate	Medium risk
	3 Den Lane	Large	Moderate	Medium risk
	4 Den Lane	Large	Moderate	Medium risk
	5 Den Lane	Large	Moderate	Medium risk
	Rose Cottage	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	Higher Den Farm	High	Low risk	Slight Adverse
	The Partridge	High	Low risk	Slight Adverse
	The Owl	High	Low risk	Slight Adverse
	The Lark	High	Low risk	Slight Adverse
	The Swallow	High	Low risk	Slight Adverse
	Checkley Lane	High	Medium risk	Moderate Adverse
	1 Den Lane	High	Medium risk	Moderate Adverse
	2 Den Lane	High	Medium risk	Moderate Adverse
	3 Den Lane	High	Medium risk	Moderate Adverse
	4 Den Lane	High	Medium risk	Moderate Adverse
	5 Den Lane	High	Medium risk	Moderate Adverse
	Rose Cottage	High	Medium risk	Moderate Adverse

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 Impacts

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 maps¹⁵ and the number of sensitive receptors within 1km of the borrow pit were calculated. The IAQM mineral dust guidance¹⁶ notes that if the background PM₁₀ concentrations are under 17µg/m³ then the impacts on human health can be considered not significant.

5.3.2 The PM₁₀ background concentration for 2016 in this area is 9.3µg/m³. The impact for human health effects is therefore not significant.

¹⁵ Department for Environment, Food and Rural Affairs (Defra) (2013), *Defra Background Pollutant Concentration Maps*, <http://uk-air.defra.gov.uk/data/iaqm-background-maps?year=2013>.

¹⁶ IAQM (2016), *Guidance on the assessment of mineral dust impacts for planning*

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 ($\mu\text{g}/\text{m}^3$)	Modelled concentration ($\mu\text{g}/\text{m}^3$)	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 $\pm 25\%$ of the monitored concentrations and there was no systematic over or under prediction, no model adjustment was undertaken. Modelled concentrations of PM₁₀ and PM_{2.5} have not been adjusted.

6.3 Assessment of construction traffic emissions

6.3.1 Construction traffic data used in this assessment are 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 four roads in the South Cheshire 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:

- the M6 motorway;
- the A500 Newcastle Road/Shavington Bypass;
- the A531 Newcastle Road/Main Road; and
- Den Lane.

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 Volume 5: Map AQ-01-105.

6.3.5 Three designated ecological receptors have been identified within 200m of the screened in roads: Black Firs and Cranberry Bog Site of Special Scientific Interest (SSSI), located adjacent to the A531 Newcastle Road; Oakhanger Moss SSSI, located adjacent to the M6; and sections of the Mid Meres and Mosses Phase 2 Ramsar site at both locations (Table 14).

Table 13: Modelled human receptors (construction phase)

Receptor	Description/Location	Ordnance Survey coordinates
5-C-H1	Outline application for residential development (up to 370 units), Offices (B1), local centre comprising food and non-food retail (A1) and restaurant/public house (A3/A4), hotel (C1), car showroom and associated works including construction of new spine (13_0336n).	370829,352734
5-C-H2	Gonsley Green Farm, Blakenhall	372983,348679
5-C-H3	Basford Hall Farm, Basford	371826,352231
5-C-H4	Mill Lane End, Blakenhall	373236,348061
5-C-H5	Casey Lane, Basford	371847,351711
5-C-H6	The Coppice, Wrinehill	374305,346315
5-C-H7	Bridge Cottage, Chorlton	372668,350306
5-C-H8	New Cottages, Chorlton	372534,350201
5-C-H9	Skipton Holme, Chorlton	372021,351360
5-C-H10	Randilow Farm, Checkley	374675,346667
5-C-H11	Dairy Farm, Chorlton	372483,350195
5-C-H12	Basford House, Chorlton	372332,351357
5-C-H13	Heath Farm, Chorlton	372099,351064
5-C-H14	Cypress Cottage, Barthomley	376003,352810
5-C-H15	Scotts Green Cottage, Barthomley	377616,353220
5-C-H16	The Owl, Wrinehill	374009,347826
5-C-H17	Kings Croft, Wrinehill	375286,347125
5-C-H18	Dairyfarm, Wrinehill	374923,347253
5-C-H19	Hillside, Wrinehill	375334,347366
5-C-H20	Newstead, Weston	372753,352603
5-C-H21	Elmsfarm, Balterley	374656,349936
5-C-H22	Old Boundary House, Wrinehill	375379,346981
5-C-H23	Moss Farm, Oakhanger	377084,354514
5-C-H24	Main Road, Weston	373404,352701
5-C-H25	Rose Cottage, Wrinehill	374457,347574

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Table 14: Modelled ecological receptors (construction phase)

Receptor	Description	Distance from road (m)	Ordnance Survey coordinates
5-C-E1a	Black Firs & Cranberry Bog SSSI	5	374666,350059
5-C-E1b	Black Firs & Cranberry Bog SSSI	20	374679,350065
5-C-E1c	Black Firs & Cranberry Bog SSSI	50	374705,350081
5-C-E1d	Black Firs & Cranberry Bog SSSI	100	374749,350107
5-C-E1e	Black Firs & Cranberry Bog SSSI	150	374790,350137
5-C-E2a	Oakhanger Moss SSSI	131	376963,355172
5-C-E2b	Oakhanger Moss SSSI	150	376943,355170
5-C-E2c	Oakhanger Moss SSSI	200	376893,355171
5-C-E3a	Mid Meres & Mosses Phase 2 Ramsar 1	5	374666,350059
5-C-E3b	Mid Meres & Mosses Phase 2 Ramsar 1	20	374679,350065
5-C-E3c	Mid Meres & Mosses Phase 2 Ramsar 1	50	374705,350081
5-C-E3d	Mid Meres & Mosses Phase 2 Ramsar 1	100	374749,350107
5-C-E3e	Mid Meres & Mosses Phase 2 Ramsar 1	150	374790,350137
5-C-E4a	Mid Meres & Mosses Phase 2 Ramsar 2	131	376963,355172
5-C-E4b	Mid Meres & Mosses Phase 2 Ramsar 2	150	376943,355170
5-C-E4c	Mid Meres & Mosses Phase 2 Ramsar 2	200	376893,355171

Background concentrations

6.3.6 The background concentrations used in the assessment are shown in Table 15 and Table 16, taken from the Defra maps.

Table 15: Background 2020 concentrations at assessed receptors

Receptor	Description/Location	Background concentrations in 2020 ($\mu\text{g}/\text{m}^3$)			
		NO _x	NO ₂	PM ₁₀	PM _{2.5}
5-C-H1	Outline application for residential development (up to 370 units), Offices (B ₁), local centre comprising food and non-food retail (A ₁) and restaurant/public house (A ₃ /A ₄), hotel (C ₁), car showroom and associated works including construction of new spine (13_0336n).	13.3	9.9	12.4	8.9
5-C-H2	Gonsley Green Farm, Blakenhall	11.0	8.3	12.6	8.8
5-C-H3	Basford Hall Farm, Basford	14.8	10.8	13.3	9.3
5-C-H4	Mill Lane End, Blakenhall	12.3	9.1	12.9	9.0
5-C-H5	Caseylane, Basford	12.5	9.3	12.9	9.2
5-C-H6	The Coppice, Wrinehill	11.5	8.6	12.6	8.8

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Receptor	Description/Location	Background concentrations in 2020 ($\mu\text{g}/\text{m}^3$)			
		NOx	NO ₂	PM ₁₀	PM _{2.5}
5-C-H7	Bridge Cottage, Chorlton	13.0	9.6	14.2	9.8
5-C-H8	New Cottages, Chorlton	13.0	9.6	14.2	9.8
5-C-H9	Skipton Holme, Chorlton	13.4	9.9	13.0	9.2
5-C-H10	Randilow Farm, Checkley	11.5	8.6	12.6	8.8
5-C-H11	Dairy Farm, Chorlton	13.0	9.6	14.2	9.8
5-C-H12	Basford House, Chorlton	13.4	9.9	13.0	9.2
5-C-H13	Heath Farm, Chorlton	13.4	9.9	13.0	9.2
5-C-H14	Cypress Cottage, Barthomley	14.7	10.8	14.0	9.7
5-C-H15	Scotts Green Cottage, Barthomley	18.8	13.6	15.5	10.5
5-C-H16	The Owl, Wrinehill	12.5	9.3	12.2	8.6
5-C-H17	Kings Croft, Wrinehill	11.8	8.8	12.1	8.6
5-C-H18	Dairyfarm, Wrinehill	12.5	9.3	12.2	8.6
5-C-H19	Hillside, Wrinehill	11.8	8.8	12.1	8.6
5-C-H20	Newstead, Weston	14.1	10.4	13.6	9.6
5-C-H21	Elmsfarm, Balterley	11.3	8.4	12.8	8.9
5-C-H22	Old Boundary House, Wrinehill	12.8	9.5	12.8	8.9
5-C-H23	Moss Farm, Oakhanger	19.3	13.9	15.6	10.6
5-C-H24	Main Road, Weston	13.5	10.0	13.4	9.4
5-C-H25	Rose Cottage, Wrinehill	12.5	9.3	12.2	8.6

Table 16: Background data for ecological sites

Receptor	Distance to road (m)	Description	Sensitive habitat	2020 NOx background concentration ($\mu\text{g}/\text{m}^3$)	2020 NO ₂ background concentration ($\mu\text{g}/\text{m}^3$)	APIS data ¹⁷ (average total nitrogen (N) deposition ($\mu\text{g}/\text{m}^3$))
5-C-E1a to 5-C-E1e	5 to 150	Black Firs & Cranberry Bog SSSI	Broad-leaved, mixed and yew woodland	11.7	8.7	40.40
			Bogs			23.13

¹⁷ Air Pollution Information System, <http://www.apis.ac.uk/>.

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Receptor	Distance to road (m)	Description	Sensitive habitat	2020 NOx background concentration (µg/m ³)	2020 NO2 background concentration (ug/m ³)	APIS data ¹⁷ (average total nitrogen (N) deposition (ug/m ³))
5-C-E2a to 5-C-E2c	131 to 200	Oakhanger Moss SSSI	Broad-leaved, mixed and yew woodland	14.3	10.5	41.55
			Bogs			23.97
5-C-E3a to 5-C-E3e	5 to 150	Mid Meres & Mosses Phase 2 Ramsar 1	n/a	11.7	8.7	
5-C-E4a to 5-C-E3c	131 to 200	Mid Meres & Mosses Phase 2 Ramsar 2	n/a	14.3	10.5	n/a

Assessment results

6.3.7 Table 17, Table 18 and Table 19 provide the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the IAQM / Environmental Protection UK (EPUK) methodology¹⁸. Table 20 provides the summary of the ecological receptor assessment.

Table 17: Predicted annual mean NO₂ concentrations and impacts (construction phase)

Receptor	Description	NO ₂ concentrations (µg/m ³)		Change in NO ₂ concentrations (µg/m ³)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H1	Outline application for residential development (up to 370 units), Offices (B1), local centre comprising food and non-food retail (A1) and restaurant/public house (A3/A4), hotel (C1), car showroom and associated works including construction of new spine (13_0336n).	17.0	17.3	0.3	Negligible	Not significant
5-C-H2	Gonsley Green Farm, Blakenhall	8.4	8.5	0.1	Negligible	Not significant
5-C-H3	Basford Hall Farm, Basford	12.0	12.1	0.1	Negligible	Not significant
5-C-H4	Mill Lane End, Blakenhall	9.3	9.5	0.2	Negligible	Not significant
5-C-H5	Caseylane, Basford	10.0	10.0	0.0	Negligible	Not significant
5-C-H6	The Coppice, Wrinehill	9.0	9.1	0.1	Negligible	Not significant
5-C-H7	Bridge Cottage, Chorlton	9.9	10.0	0.1	Negligible	Not significant
5-C-H8	New Cottages, Chorlton	9.9	10.3	0.4	Negligible	Not significant
5-C-H9	Skipton Holme, Chorlton	11.7	11.8	0.1	Negligible	Not significant

¹⁸ IAQM (2017), *Land-use planning & development control: Planning for air quality*

Receptor	Description	NO ₂ concentrations (µg/m ³)		Change in NO ₂ concentrations (µg/m ³)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H10	Randilow Farm, Checkley	8.8	8.9	0.1	Negligible	Not significant
5-C-H11	Dairy Farm, Chorlton	9.9	10.0	0.1	Negligible	Not significant
5-C-H12	Basford House, Chorlton	11.4	11.5	0.1	Negligible	Not significant
5-C-H13	Heath Farm, Chorlton	10.4	10.5	0.1	Negligible	Not significant
5-C-H14	Cypress Cottage, Barthomley	13.9	14.0	0.1	Negligible	Not significant
5-C-H15	Scotts Green Cottage, Barthomley	23.0	23.2	0.2	Negligible	Not significant
5-C-H16	The Owl, Wrinehill	9.5	9.6	0.1	Negligible	Not significant
5-C-H17	Kings Croft, Wrinehill	10.1	10.4	0.3	Negligible	Not significant
5-C-H18	Dairyfarm, Wrinehill	9.6	9.9	0.3	Negligible	Not significant
5-C-H19	Hillside, Wrinehill	11.9	12.3	0.4	Negligible	Not significant
5-C-H20	Newstead, Weston	12.0	12.1	0.1	Negligible	Not significant
5-C-H21	Elmsfarm, Balterley	9.4	9.5	0.1	Negligible	Not significant
5-C-H22	Old Boundary House, Wrinehill	11.4	11.5	0.1	Negligible	Not significant
5-C-H23	Moss Farm, Oakhanger	30.5	30.9	0.4	Negligible	Not significant
5-C-H24	Main Road, Weston	13.4	13.5	0.1	Negligible	Not significant
5-C-H25	Rose Cottage, Wrinehill	9.5	9.7	0.2	Negligible	Not significant

Table 18: Predicted annual mean PM10 concentrations and impacts (construction phase)

Receptor	Description	PM10 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM10 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H1	Outline application for residential development (up to 370 units), Offices (B1), local centre comprising food and non-food retail (A1) and restaurant/public house (A3/A4), hotel (C1), car showroom and associated works including construction of new spine (13_0336n).	13.5	13.6	0.1	Negligible	Not significant
5-C-H2	Gonsley Green Farm, Blakenhall	12.6	12.6	0.0	Negligible	Not significant
5-C-H3	Basford Hall Farm, Basford	13.5	13.5	0.0	Negligible	Not significant
5-C-H4	Mill Lane End, Blakenhall	13.0	13.0	0.0	Negligible	Not significant
5-C-H5	Caseylane, Basford	13.0	13.0	0.0	Negligible	Not significant
5-C-H6	The Coppice, Wrinehill	12.7	12.7	0.0	Negligible	Not significant
5-C-H7	Bridge Cottage, Chorlton	14.2	14.2	0.0	Negligible	Not significant
5-C-H8	New Cottages, Chorlton	14.2	14.2	0.0	Negligible	Not significant
5-C-H9	Skipton Holme, Chorlton	13.4	13.4	0.0	Negligible	Not significant
5-C-H10	Randilow Farm, Checkley	12.7	12.7	0.0	Negligible	Not significant
5-C-H11	Dairy Farm, Chorlton	14.2	14.2	0.0	Negligible	Not significant
5-C-H12	Basford House, Chorlton	13.3	13.3	0.0	Negligible	Not significant
5-C-H13	Heath Farm, Chorlton	13.1	13.1	0.0	Negligible	Not significant
5-C-H14	Cypress Cottage, Barthomley	14.6	14.6	0.0	Negligible	Not significant
5-C-H15	Scotts Green Cottage, Barthomley	17.0	17.0	0.0	Negligible	Not significant

Receptor	Description	PM10 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM10 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H16	The Owl, Wrinehill	12.2	12.2	0.0	Negligible	Not significant
5-C-H17	Kings Croft, Wrinehill	12.4	12.4	0.0	Negligible	Not significant
5-C-H18	Dairyfarm, Wrinehill	12.2	12.3	0.1	Negligible	Not significant
5-C-H19	Hillside, Wrinehill	12.8	12.8	0.0	Negligible	Not significant
5-C-H20	Newstead, Weston	13.8	13.8	0.0	Negligible	Not significant
5-C-H21	Elmsfarm, Balterley	13.0	13.0	0.0	Negligible	Not significant
5-C-H22	Old Boundary House, Wrinehill	13.2	13.2	0.0	Negligible	Not significant
5-C-H23	Moss Farm, Oakhanger	18.3	18.3	0.1	Negligible	Not significant
5-C-H24	Main Road, Weston	13.9	14.0	0.1	Negligible	Not significant
5-C-H25	Rose Cottage, Wrinehill	12.2	12.2	0.0	Negligible	Not significant

Table 19: Predicted annual mean PM2.5 concentrations and impacts (construction phase)

Receptor	Description	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H1	Outline application for residential development (up to 370 units), Offices (B1), local centre comprising food and non-food retail (A1) and restaurant/public house (A3/A4), hotel (C1), car showroom and associated works including construction of new spine (13_0336n).	9.6	9.6	0.0	Negligible	Not significant

Receptor	Description	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H2	Gonsley Green Farm, Blakenhall	8.8	8.8	0.0	Negligible	Not significant
5-C-H3	Basford Hall Farm, Basford	9.5	9.5	0.0	Negligible	Not significant
5-C-H4	Mill Lane End, Blakenhall	9.0	9.0	0.0	Negligible	Not significant
5-C-H5	Caseylane, Basford	9.2	9.2	0.0	Negligible	Not significant
5-C-H6	The Coppice, Wrinehill	8.9	8.9	0.0	Negligible	Not significant
5-C-H7	Bridge Cottage, Chorlton	9.8	9.8	0.0	Negligible	Not significant
5-C-H8	New Cottages, Chorlton	9.8	9.8	0.0	Negligible	Not significant
5-C-H9	Skipton Holme, Chorlton	9.4	9.4	0.0	Negligible	Not significant
5-C-H10	Randilow Farm, Checkley	8.8	8.8	0.0	Negligible	Not significant
5-C-H11	Dairy Farm, Chorlton	9.8	9.8	0.0	Negligible	Not significant
5-C-H12	Basford House, Chorlton	9.4	9.4	0.0	Negligible	Not significant
5-C-H13	Heath Farm, Chorlton	9.2	9.2	0.0	Negligible	Not significant
5-C-H14	Cypress Cottage, Barthomley	10.0	10.0	0.0	Negligible	Not significant
5-C-H15	Scotts Green Cottage, Barthomley	11.4	11.4	0.0	Negligible	Not significant
5-C-H16	The Owl, Wrinehill	8.6	8.6	0.0	Negligible	Not significant
5-C-H17	Kings Croft, Wrinehill	8.7	8.8	0.1	Negligible	Not significant
5-C-H18	Dairyfarm, Wrinehill	8.6	8.6	0.0	Negligible	Not significant
5-C-H19	Hillside, Wrinehill	9.0	9.0	0.0	Negligible	Not significant

Receptor	Description	PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)		Change in PM2.5 concentrations ($\mu\text{g}/\text{m}^3$)	Impact descriptor	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme			
5-C-H20	Newstead, Weston	9.8	9.8	0.0	Negligible	Not significant
5-C-H21	Elmsfarm, Balterley	9.0	9.0	0.0	Negligible	Not significant
5-C-H22	Old Boundary House, Wrinehill	9.1	9.1	0.0	Negligible	Not significant
5-C-H23	Moss Farm, Oakhanger	12.2	12.3	0.1	Negligible	Not significant
5-C-H24	Main Road, Weston	9.7	9.7	0.0	Negligible	Not significant
5-C-H25	Rose Cottage, Wrinehill	8.6	8.6	0.0	Negligible	Not significant

Table 20: Predicted annual mean NOx concentrations at ecological sites (construction phase)

Site	Distance to road (m)	NOx concentrations ($\mu\text{g}/\text{m}^3$)		Change in NOx concentrations ($\mu\text{g}/\text{m}^3$)	Comparison against air quality standard ($30\mu\text{g}/\text{m}^3$)	Magnitude of change	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme				
Black Firs & Cranberry Bog SSSI	5	20.3	20.7	0.4	Below standard	Imperceptible	Not significant
Mid Meres & Mosses Phase 2 Ramsar 1	20	16.0	16.2	0.2	Below standard	Imperceptible	Not significant
	50	14.1	14.2	0.1	Below standard	Imperceptible	Not significant
	100	13.2	13.3	0.1	Below standard	Imperceptible	Not significant
	150	12.9	13.0	0.1	Below standard	Imperceptible	Not significant

Site	Distance to road (m)	NOx concentrations ($\mu\text{g}/\text{m}^3$)		Change in NOx concentrations ($\mu\text{g}/\text{m}^3$)	Comparison against air quality standard ($30\mu\text{g}/\text{m}^3$)	Magnitude of change	Significance
		2020 without the Proposed Scheme	2020 with the Proposed Scheme				
Oakhanger Moss SSSI	131	26.2	26.5	0.3	Below standard	Imperceptible	Not significant
Midland Meres & Mosses Phase 2 Ramsar 2	150	24.8	25.0	0.2	Below standard	Imperceptible	Not significant
	200	22.2	22.4	0.2	Below standard	Imperceptible	Not significant

6.3.8 Annual mean concentrations of NO₂, PM₁₀ and PM_{2.5} 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/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.

6.3.9 Negligible impacts are predicted at all receptors for annual mean NO₂, PM₁₀ and PM_{2.5} concentrations.

Assessment of significance

6.3.10 No significant effects are anticipated at any receptor in relation to annual mean NO₂, PM₁₀ and PM_{2.5} 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 five roads in the South Cheshire area exceeding the DMRB thresholds for changes in AADT or daily HGV flows and/or changes in road alignment by 5m or more. These roads include:

- Checkley Lane;
- Den Lane;
- Newcastle Road;
- Chorlton Lane; and
- Casey Lane.

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 21). The location of all receptors is shown Volume 5: Map AQ-01-105.

6.4.5 Two designated ecological sites have been identified as being within 200m of the screened in roads: the Black Firs and Cranberry Bog SSSI, located adjacent to Newcastle Road; and a section of the Mid Meres and Mosses Ramsar (Table 22).

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Table 21: Modelled human receptors (operational phase)

Receptor	Description/Location	Ordnance Survey coordinates
5-O-H1	St Clements Court, Crewe (housing allocation)	372926,347585
5-O-H2	Brook Cottage, Newcastle Road, Hough, Crewe, CW2 5JS	372822,350230
5-O-H3	Wayside, Newcastle Road, Hough, Crewe, CW2 5JR	369666,351324
5-O-H4	Caravan, 6 Casey Lane, Basford, CW2 5NH	369863,351350
5-O-H5	Skipton Holme, Newcastle Road, Chorlton, Crewe, CW2 5NQ	370083,351343
5-O-H6	Dairy House Farm, Weston Lane, Basford, Crewe, CW2 5NJ	370310,351918
5-O-H7	Basford House, Newcastle Road, Chorlton, Crewe, CW2 5NG	370164,351736
5-O-H8	Chorlton Bank Farm, Newcastle Road, Chorlton, Crewe, CW2 5NG	370279,351557
5-O-H9	Dairy Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	372417,352403
5-O-H10	Jubilee Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	370495,352409
5-O-H11	1 New Cottages, Chorlton Lane, Chorlton, Crewe, CW2 5NF	368251,351519
5-O-H12	Bridge Cottage, Chorlton Lane, Chorlton, Crewe, CW2 5NF	368316,351536
5-O-H13	8 Henley Road, Weston, Crewe, CW2 5GD	368982,351303
5-O-H14	4 Mill Lane End, Mill Lane, Blakenhall, Nantwich, CW5 7NP	368987,351335
5-O-H15	The Partridge, Higher Den Farm Barns, Den Lane, Wrinehill, Crewe, CW3 9BX	369416,351301
5-O-H16	Moss House, Den Lane, Wrinehill, Crewe, CW3 9BX	369492,351284
5-O-H17	1, Grange Villas, Checkley Lane, Wrinehill, Crewe, CW3 9DB	369750,351366
5-O-H18	The Coppice, Checkley Lane, Wrinehill, Crewe, CW3 9DB	369999,351374
5-O-H19	Randilow Farmhouse, Checkley Lane, Wrinehill, Crewe, CW3 9DB	370143,351606
5-O-H20	Randilow Cottage, Checkley Lane, Wrinehill, Crewe, CW3 9DB	370162,352007
5-O-H21	Chorlton (housing allocation)	370182,351848
5-O-H22	Chorlton (housing allocation)	370186,351340

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Table 22: Modelled ecological receptors (operational phase)

Receptor	Name	Distance from road (m)	Ordnance Survey coordinates
5-O-E1	Black Firs & Cranberry Bog SSSI	5	374666,350059
5-O-E2	Black Firs & Cranberry Bog SSSI	20	374679,350065
5-O-E3	Black Firs & Cranberry Bog SSSI	50	374705,350081
5-O-E4	Black Firs & Cranberry Bog SSSI	100	374749,350107
5-O-E5	Black Firs & Cranberry Bog SSSI	150	374790,350137
5-O-E6	Mid Meres & Mosses Ramsar	5	374666,350059
5-O-E7	Mid Meres & Mosses Ramsar	20	374679,350065
5-O-E8	Mid Meres & Mosses Ramsar	50	374705,350081
5-O-E9	Mid Meres & Mosses Ramsar	100	374749,350107
5-O-E10	Mid Meres & Mosses Ramsar	150	374790,350137

Background concentrations

6.4.6 The background concentrations used in the assessment are shown in Table 23 and Table 24, taken from the Defra maps.

Table 23: Background 2027 concentrations at assessed receptors

Receptor	Description/Location	Background concentrations in 2027 ($\mu\text{g}/\text{m}^3$)			
		NO _x	NO ₂	PM ₁₀	PM _{2.5}
5-O-H1	St Clements Court, Crewe (housing allocation)	11.5	8.6	13.9	9.6
5-O-H2	Brook Cottage, Newcastle Road, Hough, Crewe, CW2 5JS	11.0	8.2	12.7	9.0
5-O-H3	Wayside, Newcastle Road, Hough, Crewe, CW2 5JR	11.0	8.2	12.7	9.0
5-O-H4	Caravan, 6 Casey Lane, Basford, CW2 5NH	11.0	8.2	12.7	9.0
5-O-H5	Skipton Holme, Newcastle Road, Chorlton, Crewe, CW2 5NQ	11.9	8.9	12.8	9.0
5-O-H6	Dairy House Farm, Weston Lane, Basford, Crewe, CW2 5NJ	12.4	9.2	13.4	9.4
5-O-H7	Basford House, Newcastle Road, Chorlton, Crewe, CW2 5NG	11.9	8.9	12.8	9.0
5-O-H8	Chorlton Bank Farm, Newcastle Road, Chorlton, Crewe, CW2 5NG	11.9	8.9	12.8	9.0
5-O-H9	Dairy Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	11.5	8.6	13.9	9.6
5-O-H10	Jubilee Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	11.5	8.6	13.9	9.6
5-O-H11	1 New Cottages, Chorlton Lane, Chorlton, Crewe, CW2 5NF	11.5	8.6	13.9	9.6
5-O-H12	Bridge Cottage, Chorlton Lane, Chorlton, Crewe, CW2 5NF	11.5	8.6	13.9	9.6
5-O-H13	8 Henley Road, Weston, Crewe, CW2 5GD	11.5	8.6	13.9	9.6
5-O-H14	4 Mill Lane End, Mill Lane, Blakenhall, Nantwich, CW5 7NP	10.9	8.1	12.7	8.8

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5-O-H15	The Partridge, Higher Den Farm Barns, Den Lane, Wrinehill, Crewe, CW3 9BX	9.6	7.2	13.1	8.9
5-O-H16	Moss House, Den Lane, Wrinehill, Crewe, CW3 9BX	9.6	7.2	13.1	8.9
5-O-H17	1, Grange Villas, Checkley Lane, Wrinehill, Crewe, CW3 9DB	10.0	7.6	12.4	8.6
5-O-H18	The Coppice, Checkley Lane, Wrinehill, Crewe, CW3 9DB	10.0	7.6	12.4	8.6
5-O-H19	Randilow Farmhouse, Checkley Lane, Wrinehill, Crewe, CW3 9DB	10.0	7.6	12.4	8.6
5-O-H20	Randilow Cottage, Checkley Lane, Wrinehill, Crewe, CW3 9DB	10.0	7.6	12.4	8.6
5-O-H21	Chorlton (housing allocation)	11.5	8.6	13.9	9.6
5-O-H22	Chorlton (housing allocation)	11.9	8.9	12.8	9.0

Table 24: Background data for ecological sites

Receptor	Distance to road (m)	Description	Sensitive habitat	2027 NO _x background concentration (µg/m ³)	2027 NO ₂ background concentration (µg/m ³)	APIS data ¹⁹ (average total N deposition)
5-O-E1 to 5-O-E5	5 to 150	Black Firs & Cranberry Bog SSSI	Broad-leaved, mixed and yew woodland	10.1	7.6	35.07
			Bogs			20.08
5-O-E6 to 5-O-E10	5 to 150	Mid Meres & Mosses Phase 2 Ramsar	n/a	10.1	7.6	n/a

¹⁹ Air Pollution Information System, <http://www.apis.ac.uk/>.

Assessment results

6.4.7 Table 25, Table 26 and Table 27 provide the summary of the modelled pollutant concentrations for the assessed receptors. The magnitude of change and impact descriptor are also derived following the IAQM / EPUK methodology²⁰. Table 28 provides the summary of the ecological receptor assessment.

Table 25: Predicted annual mean NO₂ concentrations and impacts (operation phase)

Receptor	Description/Location	NO ₂ concentrations (µg/m ³)		Change in NO ₂ concentrations (µg/m ³)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H1	St Clements Court, Crewe (housing allocation)	8.7	8.6	-0.1	Negligible	Not Significant
5-O-H2	Brook Cottage, Newcastle Road, Hough, Crewe, CW2 5JS	8.9	9.2	0.3	Negligible	Not Significant
5-O-H3	Wayside, Newcastle Road, Hough, Crewe, CW2 5JR	9.1	9.5	0.4	Negligible	Not Significant
5-O-H4	Caravan, 6 Casey Lane, Basford, CW2 5NH	8.4	8.4	0.0	Negligible	Not Significant
5-O-H5	Skipton Holme, Newcastle Road, Chorlton, Crewe, CW2 5NQ	9.7	9.2	-0.5	Negligible	Not Significant
5-O-H6	Dairy House Farm, Weston Lane, Basford, Crewe, CW2 5NJ	9.5	9.5	0.0	Negligible	Not Significant
5-O-H7	Basford House, Newcastle Road, Chorlton, Crewe, CW2 5NG	9.5	9.1	-0.4	Negligible	Not Significant
5-O-H8	Chorlton Bank Farm, Newcastle Road, Chorlton, Crewe, CW2 5NG	9.6	9.1	-0.5	Negligible	Not Significant
5-O-H9	Dairy Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	8.6	8.6	0.0	Negligible	Not Significant
5-O-H10	Jubilee Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	8.7	8.7	0.0	Negligible	Not Significant
5-O-H11	1 New Cottages, Chorlton Lane, Chorlton, Crewe, CW2 5NF	8.7	8.6	-0.1	Negligible	Not Significant
5-O-H12	Bridge Cottage, Chorlton Lane, Chorlton, Crewe, CW2 5NF	8.7	8.7	0.0	Negligible	Not Significant

²⁰ IAQM (2017), *Land-use planning & development control: Planning for air quality*

Receptor	Description/Location	NO ₂ concentrations (µg/m ³)		Change in NO ₂ concentrations (µg/m ³)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H13	8 Henley Road, Weston, Crewe, CW2 5GD	8.7	8.7	0.0	Negligible	Not Significant
5-O-H14	4 Mill Lane End, Mill Lane, Blakenhall, Nantwich, CW5 7NP	8.2	8.2	0.0	Negligible	Not Significant
5-O-H15	The Partridge, Higher Den Farm Barns, Den Lane, Wrinehill, Crewe, CW3 9BX	7.3	7.3	0.0	Negligible	Not Significant
5-O-H16	Moss House, Den Lane, Wrinehill, Crewe, CW3 9BX	7.3	7.3	0.0	Negligible	Not Significant
5-O-H17	1, Grange Villas, Checkley Lane, Wrinehill, Crewe, CW3 9DB	7.7	7.7	0.0	Negligible	Not Significant
5-O-H18	The Coppice, Checkley Lane, Wrinehill, Crewe, CW3 9DB	7.7	7.8	0.1	Negligible	Not Significant
5-O-H19	Randilow Farmhouse, Checkley Lane, Wrinehill, Crewe, CW3 9DB	7.6	7.7	0.1	Negligible	Not Significant
5-O-H20	Randilow Cottage, Checkley Lane, Wrinehill, Crewe, CW3 9DB	7.8	8.0	0.2	Negligible	Not Significant
5-O-H21	Chorlton (housing allocation)	8.7	8.7	0.0	Negligible	Not Significant
5-O-H22	Chorlton (housing allocation)	9.4	9.3	-0.1	Negligible	Not Significant

Table 26: Predicted annual mean PM₁₀ concentrations and impacts (operation phase)

Receptor	Description/Location	PM ₁₀ concentrations (µg/m ³)		Change in PM ₁₀ concentrations (µg/m ³)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H1	St Clements Court, Crewe (housing allocation)	14.0	14.0	0.0	Negligible	Not Significant
5-O-H2	Brook Cottage, Newcastle Road, Hough, Crewe, CW2 5JS	12.9	12.9	0.0	Negligible	Not Significant
5-O-H3	Wayside, Newcastle Road, Hough, Crewe, CW2 5JR	13.0	13.0	0.0	Negligible	Not Significant
5-O-H4	Caravan, 6 Casey Lane, Basford, CW2 5NH	12.7	12.7	0.0	Negligible	Not Significant

Receptor	Description/Location	PM10 concentrations (µg/m3)		Change in PM10 concentrations (µg/m3)	Impact descriptor	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H5	Skipton Holme, Newcastle Road, Chorlton, Crewe, CW2 5NQ	13.1	12.9	-0.2	Negligible	Not Significant
5-O-H6	Dairy House Farm, Weston Lane, Basford, Crewe, CW2 5NJ	13.5	13.5	0.0	Negligible	Not Significant
5-O-H7	Basford House, Newcastle Road, Chorlton, Crewe, CW2 5NG	13.0	12.9	-0.1	Negligible	Not Significant
5-O-H8	Chorlton Bank Farm, Newcastle Road, Chorlton, Crewe, CW2 5NG	13.1	12.9	-0.2	Negligible	Not Significant
5-O-H9	Dairy Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	14.0	14.0	0.0	Negligible	Not Significant
5-O-H10	Jubilee Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	14.0	14.0	0.0	Negligible	Not Significant
5-O-H11	1 New Cottages, Chorlton Lane, Chorlton, Crewe, CW2 5NF	14.0	14.0	0.0	Negligible	Not Significant
5-O-H12	Bridge Cottage, Chorlton Lane, Chorlton, Crewe, CW2 5NF	14.0	14.0	0.0	Negligible	Not Significant
5-O-H13	8 Henley Road, Weston, Crewe, CW2 5GD	14.0	14.0	0.0	Negligible	Not Significant
5-O-H14	4 Mill Lane End, Mill Lane, Blakenhall, Nantwich, CW5 7NP	12.7	12.7	0.0	Negligible	Not Significant
5-O-H15	The Partridge, Higher Den Farm Barns, Den Lane, Wrinehill, Crewe, CW3 9BX	13.2	13.2	0.0	Negligible	Not Significant
5-O-H16	Moss House, Den Lane, Wrinehill, Crewe, CW3 9BX	13.2	13.2	0.0	Negligible	Not Significant
5-O-H17	1, Grange Villas, Checkley Lane, Wrinehill, Crewe, CW3 9DB	12.5	12.5	0.0	Negligible	Not Significant
5-O-H18	The Coppice, Checkley Lane, Wrinehill, Crewe, CW3 9DB	12.5	12.5	0.0	Negligible	Not Significant
5-O-H19	Randilow Farmhouse, Checkley Lane, Wrinehill, Crewe, CW3 9DB	12.5	12.5	0.0	Negligible	Not Significant
5-O-H20	Randilow Cottage, Checkley Lane, Wrinehill, Crewe, CW3 9DB	12.5	12.5	0.0	Negligible	Not Significant
5-O-H21	Chorlton (housing allocation)	14.0	14.0	0.0	Negligible	Not Significant
5-O-H22	Chorlton (housing allocation)	13.0	13.0	0.0	Negligible	Not Significant

Table 27: Predicted annual mean PM2.5 concentrations and impacts (operation phase)

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	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H1	St Clements Court, Crewe (housing allocation)	9.6	9.6	0.0	Negligible	Not Significant
5-O-H2	Brook Cottage, Newcastle Road, Hough, Crewe, CW2 5JS	9.1	9.1	0.0	Negligible	Not Significant
5-O-H3	Wayside, Newcastle Road, Hough, Crewe, CW2 5JR	9.1	9.2	0.1	Negligible	Not Significant
5-O-H4	Caravan, 6 Casey Lane, Basford, CW2 5NH	9.0	9.0	0.0	Negligible	Not Significant
5-O-H5	Skipton Holme, Newcastle Road, Chorlton, Crewe, CW2 5NQ	9.1	9.0	-0.1	Negligible	Not Significant
5-O-H6	Dairy House Farm, Weston Lane, Basford, Crewe, CW2 5NJ	9.5	9.5	0.0	Negligible	Not Significant
5-O-H7	Basford House, Newcastle Road, Chorlton, Crewe, CW2 5NG	9.1	9.0	-0.1	Negligible	Not Significant
5-O-H8	Chorlton Bank Farm, Newcastle Road, Chorlton, Crewe, CW2 5NG	9.1	9.0	-0.1	Negligible	Not Significant
5-O-H9	Dairy Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	9.6	9.6	0.0	Negligible	Not Significant
5-O-H10	Jubilee Farm, Chorlton Lane, Chorlton, Crewe, CW2 5NF	9.6	9.6	0.0	Negligible	Not Significant
5-O-H11	1 New Cottages, Chorlton Lane, Chorlton, Crewe, CW2 5NF	9.6	9.6	0.0	Negligible	Not Significant
5-O-H12	Bridge Cottage, Chorlton Lane, Chorlton, Crewe, CW2 5NF	9.6	9.6	0.0	Negligible	Not Significant
5-O-H13	8 Henley Road, Weston, Crewe, CW2 5GD	9.6	9.6	0.0	Negligible	Not Significant
5-O-H14	4 Mill Lane End, Mill Lane, Blakenhall, Nantwich, CW5 7NP	8.8	8.8	0.0	Negligible	Not Significant
5-O-H15	The Partridge, Higher Den Farm Barns, Den Lane, Wrinehill, Crewe, CW3 9BX	9.0	9.0	0.0	Negligible	Not Significant
5-O-H16	Moss House, Den Lane, Wrinehill, Crewe, CW3 9BX	9.0	9.0	0.0	Negligible	Not Significant
5-O-H17	1, Grange Villas, Checkley Lane, Wrinehill, Crewe, CW3 9DB	8.7	8.7	0.0	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	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme			
5-O-H18	The Coppice, Checkley Lane, Wrinehill, Crewe, CW3 9DB	8.7	8.7	0.0	Negligible	Not Significant
5-O-H19	Randilow Farmhouse, Checkley Lane, Wrinehill, Crewe, CW3 9DB	8.7	8.7	0.0	Negligible	Not Significant
5-O-H20	Randilow Cottage, Checkley Lane, Wrinehill, Crewe, CW3 9DB	8.7	8.7	0.0	Negligible	Not Significant
5-O-H21	Chorlton (housing allocation)	9.6	9.6	0.0	Negligible	Not Significant
5-O-H22	Chorlton (housing allocation)	9.1	9.1	0.0	Negligible	Not Significant

Table 28: Predicted annual mean NOx concentrations at ecological sites (operation phase)

Ecological Site	Distance to road (m)	NOx concentrations ($\mu\text{g}/\text{m}^3$)		Change in NOx concentrations ($\mu\text{g}/\text{m}^3$)	Comparison against air quality standard ($30\mu\text{g}/\text{m}^3$)	Magnitude of change	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme				
Black Firs & Cranberry Bog SSSI	5	15.2	15.2	0.0	Below standard	Imperceptible	Not significant
	20	12.5	12.5	0.0	Below standard	Imperceptible	Not significant
	50	11.3	11.3	0.0	Below standard	Imperceptible	Not significant
	100	10.8	10.8	0.0	Below standard	Imperceptible	Not significant
	150	10.6	10.6	0.0	Below standard	Imperceptible	Not significant
Mid Meres & Mosses Phase 2 Ramsar	5	15.2	15.2	0.0	Below standard	Imperceptible	Not significant
	20	12.5	12.5	0.0	Below standard	Imperceptible	Not significant
	50	11.3	11.3	0.0	Below standard	Imperceptible	Not significant
	100	10.8	10.8	0.0	Below standard	Imperceptible	Not significant

Ecological Site	Distance to road (m)	NOx concentrations ($\mu\text{g}/\text{m}^3$)		Change in NOx concentrations ($\mu\text{g}/\text{m}^3$)	Comparison against air quality standard ($30\mu\text{g}/\text{m}^3$)	Magnitude of change	Significance
		2027 without the Proposed Scheme	2027 with the Proposed Scheme				
	150	10.6	10.6	0.0	Below standard	Imperceptible	Not significant

- 6.4.8 The annual mean NO₂, PM₁₀ and PM_{2.5} 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 less than 60µg/m³, the hourly mean standard is also expected to be met. Similarly, since the annual mean PM₁₀ concentrations are predicted to be less than 35µg/m³, 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 and PM_{2.5} concentrations.
- 6.4.10 NO_x concentrations at the Black Firs & Cranberry Bog SSSI and the Mid Meres & Mosses Ramsar are predicted to be below the air quality standard.

Assessment of significance

- 6.4.11 No significant effects are anticipated at any receptors in relation to annual mean NO₂, PM₁₀ and PM_{2.5} concentrations.
- 6.4.12 For ecological sites, there is considered to be not significant effect if the total predicted NO_x concentrations are below the air quality standard of 30µg/m³ or if the predicted change in NO_x concentrations is less than 0.4µg/m³ when the concentrations are predicted to exceed the air quality standard. If these conditions are not met, then an assessment of N deposition has been undertaken. If the change in N deposition is predicted to be less than 1% of the lower critical load, there is considered to be an insignificant effect. Should the N deposition change by more than 1%, then the assessment of significance has been undertaken by an ecologist and reported within Volume 2²¹, Section 8, Ecology and biodiversity.
- 6.4.13 Since the predicted NO_x concentrations are below the air quality standard, no significant effects are predicted at the Black Firs & Cranberry Bog SSSI or the Mid Meres & Mosses Ramsar sites.

²¹ See ES Volume 2, CA5 South Cheshire Community area report

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