HIGH SPEED RAIL (LONDON - WEST MIDLANDS)

Supplementary Environmental Statement 2 and Additional Provision 3 Environmental Statement

Volume 5 | Technical appendices

Addendum 3 to the EIA Scope and Methodology Report

CT-001-000/4

September 2015

SES2 and AP3 ES 3.5.6

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Department for Transport

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HS2 London-West Midlands

Addendum 3 to the EIA Scope and Methodology Report

A report to HS2 Ltd by Arup/AECOM

Contents

List of figures

List of tables

1 Introduction

1.1 Purpose of SMR Addendum 3

1.1.1 The HS2 Scope and Methodology Report (SMR) (refer to the main Environmental Statement (ES), Volume 5: Appendix CT-001-000/1) was published in autumn 2012 and set out the proposed scope and methodology for the Environmental Impact Assessment (EIA) for Phase One (London-West Midlands) of HS2.

1.1.2 An SMR Addendum (refer to the main ES, Volume 5: Appendix CT-001-000/2) was published in November 2013, which outlined where the methodology presented within the SMR had been amended or advanced as a result of:

- legislation or industry best practice guidance changing;
- the methodology undergoing refinement as a result of its application within the EIA; and
- further feedback on the outlined methodology received from stakeholders including statutory bodies following the ongoing application of that methodology.

1.1.3 An SMR Addendum 2 was produced to amend or advance the SMR required for the EIA in support of Additional Provision 2 (AP2) of the hybrid Bill for High Speed Rail between London and the West Midlands. It only covered air quality and focussed on updates and refinements to:

- the establishment of the baseline and definition of the survey;
- the scope of the assessment; and
- the assessment methodology.

1.1.4 This SMR Addendum 3 has been produced to amend or advance the SMR required for the EIA in support of Additional Provision 3 (AP3) of the hybrid Bill for High Speed Rail between London and the West Midlands. SMR Addendum 3 covers two topics – air quality and traffic and transport.

1.1.5 The amendment of the SMR with regard to air quality takes into account new guidance documents that have been published since the submission of the main ES. These documents reflect current best practice as recognised by air quality professionals. This amendment supersedes previous versions of the SMR, technical notes and Addendums.

1.1.6 The amendment of the SMR with regard to traffic and transport relates to:

- assessment of the combined effects arising post 2026 from the Euston Station Stage B1 construction works and operation of HS2 Phase 1; and
- reference to additional guidance - Department for Communities & Local Government, March 2014, Guidance on Travel Plans, transport assessments and statements in decision-taking.

1.1.7 There has been no material change to Part A of the SMR, including the report's introduction, the high level methodology presented within the 'EIA Methodology' section, and the reporting of scheme alternatives. The scope and methodology contained within this SMR Addendum 3 is generally presented in the future tense to emulate the SMR (which, being a consultation document in advance of the EIA, was provided in the future tense).

1.1.8 This SMR Addendum 3 is arranged by topic area in the same order as they were presented within the SMR. It should be noted that for ease of cross reference, the section numbering of the remainder of this document reflects the numbering used within the SMR document. Thus, only section 5 (Air quality) and Section 15 (traffic and transport) of this SMR Addendum 3 document is used.

2 (not used)

3 (not used)

4 (not used)

5 Air quality

5.1 Introduction

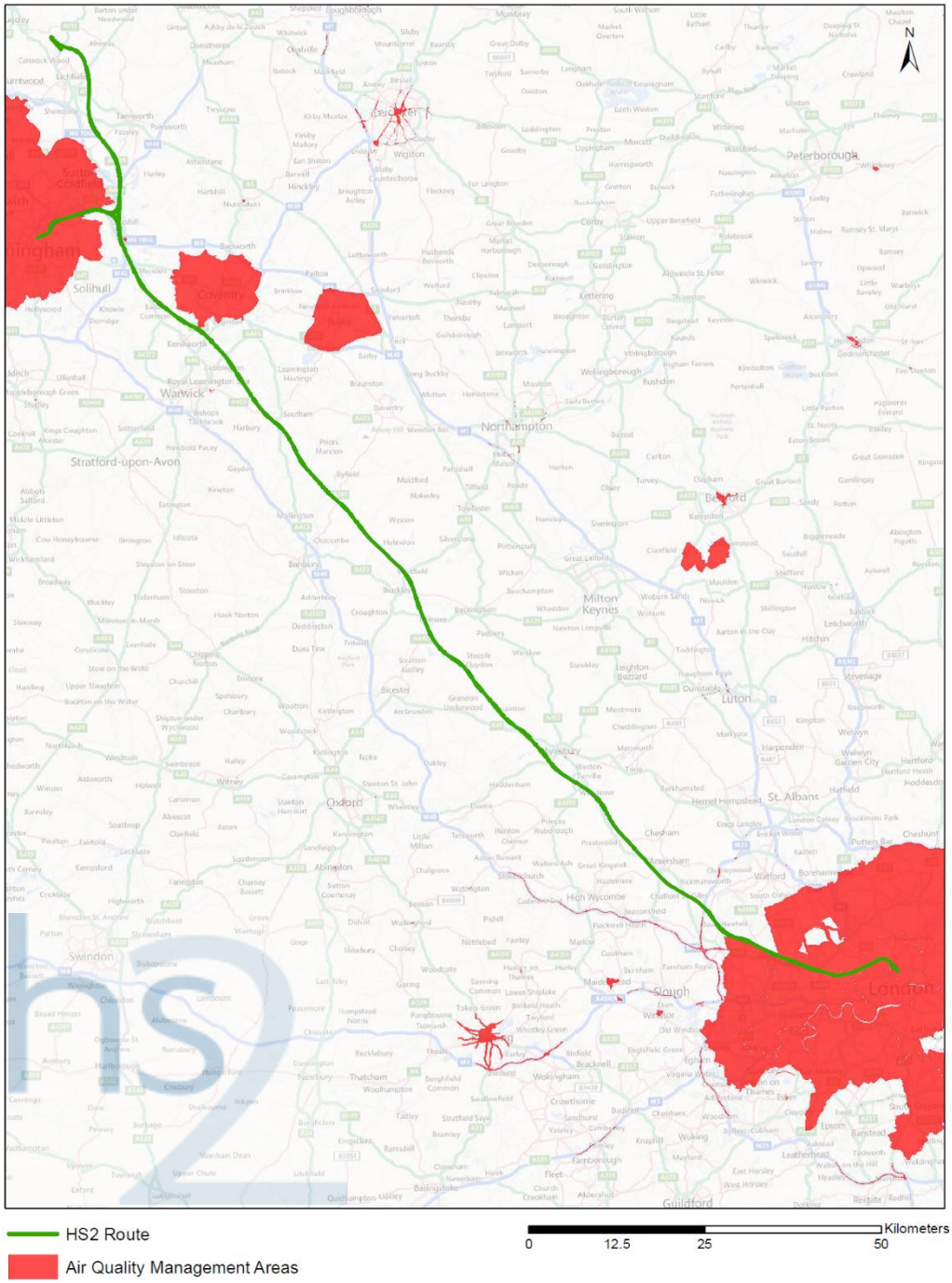
5.1.1 This section of the Report sets out the scope and methodology for assessing the impacts and effects of the Proposed Scheme on air quality during its construction and operation. These activities could result in changes in air quality and therefore need to be assessed in the main ES. Air quality changes would occur during construction as a result of the construction activities and associated traffic movements. During operation, the main changes in air quality would arise as a result of changes to road layouts and traffic flows near the stations/interchanges and where road diversions are required. In addition, changes to air quality during operation are likely to arise from any atmospheric emissions from new buildings (e.g. stations/interchanges and infrastructure maintenance depots) built as part of the Proposed Scheme and potentially from modal shift. The assessment would focus on air pollutants that are likely to arise from the construction and operation of the Proposed Scheme. These pollutants are NO_2, particulate matter (PM_{10}) and dust.

5.2 Establishment of baseline and definition of survey

5.2.1 The stations/interchanges and small sections of the route (in London and Birmingham) are located within or in proximity to air quality management areas (AQMA). The majority of the Proposed Scheme runs through a predominantly rural setting where air quality is generally good; and in these sections the route alignment does not pass through AQMAs. Figure 1 shows the Proposed Scheme route map in relation to existing AQMAs.

5.2.2 The vast majority of AQMAs in the UK are designated where NO_2 and PM_{10} concentrations are elevated. This is mostly related to vehicle emissions from heavily trafficked roads. The London Borough of Camden has declared the whole borough as an AQMA for NO_2 and PM_{10}; and Birmingham City Council has declared its entire local authority area as an AQMA for NO_2. Local authorities review the need for AQMAs on a regular basis and therefore, during the assessment process, it is possible that AQMAs that are no longer required are revoked. Similarly, new AQMAs may be declared, or extensions made to existing AQMAs; therefore this will be reviewed throughout the air quality assessment.

Figure 1: HS2 route map in relation to air quality management areas



5.2.3 Under Part 4, Section 82 of the Environment Act 1995 (Local Air Quality Management)[1], local authorities in the UK are required to review and assess local air quality in their areas of jurisdiction and accordingly, they are required to produce annual reports detailing the outcomes of these reviews and assessments. Information relating to existing ambient air quality at the stations/interchanges and along the route alignment of the Proposed Scheme is available from a series of air quality review and assessment reports prepared by local authorities under the Local Air Quality Management (LAQM) regime. The baseline assessment would include collation of

[1] Department for Environment, Food and Rural Affairs (Defra), 1995, *The Environment Act 1995*, The Stationery Office

local air quality monitoring and modelling data from these reports with a focus on NO2 and PM10.

5.2.4 The assessment will review air quality monitoring data available from the national Automatic Urban and Rural Network (AURN) available on the Department for Environment, Food and Rural Affairs (Defra)'s website.[2] The AURN is the UK's largest automatic monitoring network and is the main network used for compliance reporting against the European Union (EU)'s Ambient Air Quality Directives. These sites provide high resolution hourly information which can be downloaded from the website. Some of the AURN sites are located in Greater London; however, the main air quality monitoring network in London is the London Air Quality Network (LAQN) which is managed by the Environmental Research Group, King's College London. Hourly air quality data can be downloaded from the website.[3] The West Midlands Air Quality Group website[4] also contains information relevant to the West Midlands area. It is possible that other local authorities run their own monitoring networks and hold results not available elsewhere, this will be established and data collected during the baseline assessment.

5.2.5 Background air pollutant concentration data is available on Defra's Air Information Resource website.[5] These data comprise estimated background air pollution data for 2011 and projections for future years for a 1km^2 grid for every local authority in the UK. It is acknowledged that there is considerable uncertainty regarding future pollutant concentrations in the UK. It is expected that pollutant concentrations will reduce as a result of continuing emission controls, although the rate of future decreases is uncertain. In this assessment, the current Government guidance will be followed to predict future pollutant concentrations. The assessment of the significance of air quality impacts will be based on an established method taking into account the predicted changes in concentrations as a result of the Proposed Scheme.

5.2.6 With respect to potential air quality effects on vegetation and ecosystems, critical loads for pollutant deposition and critical levels of gaseous pollutant concentrations for the whole of the UK network of protected sites are available from the UK Air Pollution Information System)[6].

5.2.7 Data will be gathered from the above listed sources covering pollutants that are likely to arise from the construction and operation of the Proposed Scheme. These pollutants are NO2, PM10 and PM2.5. With regard to the effect on vegetation and ecosystems, baseline data for NOx and nitrogen deposition would be collated.

5.2.8 Additional air quality monitoring data might be required for model verification although it is expected that sufficient data will already be available [see Section 5.7 (Assumptions) of this Addendum].

[2] Department for Environment, Food and Rural Affairs (Defra); UK-Air; Monitoring Networks; http://uk-air.defra.gov.uk/networks/
[3] King's College London; Environmental Research Group; London Air; www.londonair.org.uk
[4] West Midlands Air Quality Group; http://www.wmair.org
[5] Department for Environment, Food and Rural Affairs (Defra); UK-Air; Air Information Resource; http://uk-air.defra.gov.uk
[6] Air Pollution Information System; http://www.apis.ac.uk

5.3 Consultation

Consultation during the preparation of the appraisal of sustainability

5.3.1 The consultation undertaken during the preparation of the appraisal of sustainability (AoS) indicated that some consultees provided responses related to the air quality effects of the 2011 consultation scheme. The main points highlighted during this consultation were the direct potential effects of the scheme during construction and the direct/indirect effects during operation. Comments regarding air quality were received from two of the local authorities consulted. No other comments directly related to the air quality assessment were received. A summary of the comments are as follows:

- London Borough of Camden responded that the 2011 consultation scheme would result in a number of negative environmental effects including air quality. The Council indicated that the air quality effects during construction were the main concern and it required a detailed quantitative assessment of local air quality and traffic effects of the scheme during construction. These effects would be specifically related to dust and PM10 emissions associated with the demolition and construction works as well as NOx and PM10 vehicle emissions during that phase of works; and
- London Borough of Hillingdon's main concern was with regard to potential air quality effects during the operation phase and whether the 2011 consultation scheme would improve air quality as a result of modal shift. The Council highlighted that the AoS recognised that local air quality improvements from a modal shift from car to rail is not expected to be significant. The Council stated that the AoS did not assess the alternative options to ensure that this modal shift was significant and led to improvement in air quality. The Council also raised concerns regarding local air quality around Heathrow Airport which would suffer from increased passengers accessing the airport by road vehicles, as freed up slots (currently used by short-haul flights) are used by larger planes with larger passenger numbers. Finally, the Council stated that it was unacceptable to propose a high traffic generating scheme in a location where air quality is poor.

Consultation as part of the EIA process

5.3.2 The key consultees to be consulted in relation to air quality assessment methodology are environmental health departments at local authorities where:

- the Proposed Scheme stations/interchanges and infrastructure maintenance depots would be located;
- the Proposed Scheme would pass through;
- significant changes in operational or construction traffic would occur; and
- there are construction activities in general.

5.3.3 In addition, the Greater London Authority (GLA) will be consulted in relation to the air quality assessment methodology and Natural England with respect to ecological effects of changes in air quality.

5.4 Key aspects of the Proposed Scheme for the topic

5.4.1 The main air quality effects from the Proposed Scheme during its construction would arise from:

- emissions associated with site plant and vehicles;
- emissions from construction traffic;
- changes in emissions arising from local diversions; and
- dust arising from activities such as use of haul roads, wind erosion of temporary stockpiles, earth moving operations, and demolition activities.

5.4.2 The above aspects would have the potential to cause changes in NO_2 and PM_{10} concentrations and may cause dust deposition at sensitive human receptor locations. In addition, some have the potential to cause changes in NOx concentrations at ecologically sensitive habitats. Ozone will not be considered in this assessment as it is formed at a regional level and the expected changes in pollutant emissions are unlikely to have a significant effect on its formation in the atmosphere.

5.4.3 Air quality effects from the operation of the Proposed Scheme will be categorised into direct and indirect effects. Direct effects would arise from the changes in traffic flows at the Proposed Scheme stations/interchanges and along the route. In addition, there would be potential air quality effects from emissions from buildings.

5.4.4 Indirect effects would arise from changes in emissions brought about by a modal shift from car to rail services, which may have a beneficial effect on air quality.

5.5 Scope of assessment

Spatial scope

5.5.1 Assessment of the effects of emissions arising from local traffic diversions and construction traffic around worksites would be limited to receptors located along roads that meet any of the criteria specified in the Design Manual for Roads and Bridges (DMRB)[7]. These criteria will be applied along the length of the route of the Proposed Scheme to identify where further assessment is required, and comprise:

- road alignment change by 5m or more;
- daily traffic flows change by 1,000 annual average daily traffic (AADT) or more;
- heavy Duty Vehicle (HDV) flows change by 200 AADT or more;
- daily average traffic speed change by 10kph or more; or

[7] Highways Agency, 2007, *Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 Air Quality, HA207/07*, The Stationery Office

- peak hour traffic speed change by 20kph or more.

5.5.2 The assessment of dust emissions arising from construction sites associated with the Proposed Scheme will be carried out in accordance with the Institute of Air Quality Management (IAQM) Guidance[8]. These include areas around worksites where there are sensitive receptors within 350m from the construction site boundary and/or within 50m of the routes used by construction vehicles on the public highway and up to 500m from construction site entrances.

5.5.3 Assessment of nitrogen deposition will be required if there are significant changes in traffic flows within 200m of ecologically sensitive sites. Ecological resources and other ecological issues are contained in Section 9 (Ecology) of the SMR.

Temporal scope

5.5.4 The assessment of air quality effects of construction traffic will be undertaken for the following scenarios:

- future baseline traffic emissions for key years of construction without the Proposed Scheme construction traffic emissions; and
- future baseline traffic emissions for key years of construction with the Proposed Scheme construction traffic emissions.

5.5.5 The assessment of air quality effects due to changes in traffic during operation will be undertaken for the following scenarios:

- future baseline traffic emissions during key years of operation without the Proposed Scheme; and
- future baseline traffic emissions during the year of operation with the Proposed Scheme.

Technical scope

5.5.6 The assessment will not include the transboundary effects of the Proposed Scheme on air quality, as the likely changes in atmospheric emissions would be negligible in this context.

5.6 Assessment methodology

Legislation

5.6.1 The assessment will take into account the following legislation, and any subsequent changes to the legislation:

- Part 4 of the Environment Act 1995;
- The Air Quality (England) (Amendment) Regulations 2002[9] and the Air Quality Standards Regulations 2010[10];

[8] Institute of Air Quality Management (IAQM), 2014, *Guidance on the assessment of dust from demolition and construction*, IAQM
[9] Department for Environment, Food and Rural Affairs, 2002, *The Air Quality (England) (Amendment) Regulations 2002*, The Stationery Office
[10] Department for Environment, Food and Rural Affairs, 2010, *The Air Quality Standards Regulations 2010*, The Stationery Office

- Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe[11]; and
- National Planning Policy Framework (NPPF) 2012 [12]and National Planning Practice Guidance (NPPG) 2014[13].

Guidance

5.6.2 The assessment will take into account the following guidance:

- LAQM Technical Guidance(2009)[14];
- DMRB Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 Air Quality, HA207/07;
- Environmental Protection UK (EPUK)/IAQM guidance on land-use planning and development control[15];
- IAQM guidance on the assessment of dust from demolition and construction[8]; and
- The Control of Dust and Emissions during Construction and Demolition, Supplementary Planning Guidance, July 2014[16].

Air quality standards

5.6.3 Air quality limit values and objectives are quality standards for clean air and to protect human health. These limit values and objectives will be used as assessment criteria for determining the significance of any potential changes in local air quality resulting from the Proposed Scheme. Some pollutants have standards expressed as annual average concentrations and others have standards expressed as 24-hour, 1-hour or 15-minute average concentrations. Some pollutants have standards expressed in terms of both long-term and short-term concentrations.

5.6.4 Table 1 sets out the EU air quality limit values and UK national air quality objectives for the pollutants relevant to this study (NO2 and PM10). Within the community forum area (CFA) reports, the term 'air quality standards' refers to both the English air quality objectives and the air quality limit values introduced in the UK based on EU Directives.

Table 1: UK and EU air quality standards

Pollutant	Averaging Period	Limit Value / Objective
NOx	Annual mean	30 µg/m3
NO2	Annual mean	40 µg/m3

[11] Official Journal of the European Union, 2008, *Directive 2008/50/EC of the European Parliament and of the Council of the 21 May 2008 on ambient air quality and cleaner air for Europe*, EU
[12] Department for Communities and Local Government, 2012, National Planning Policy Framework.
[13] Department for Communities and Local Government, 2014, National Planning Practice Guidance - Air Quality.
[14] Defra, 2009, *Local Air Quality Management Technical Guidance* , Defra
[15] Moorcroft and Barrowcliffe et al., 2015, *Land-use Planning & Development Control: Planning for Air Quality*, Institute of Air Quality Management, London
[16] Greater London Authority, 2014, *The Control of Dust and Emissions during Construction and Demolition, Supplementary Planning Guidance*, Greater London Authority

Pollutant	Averaging Period	Limit Value / Objective
	1 hour mean	200 µg/m^3 *not to be exceeded more than 18 times a year (99.8th percentile)*
PM10	Annual mean	40 µg/m^3
	24 hour mean	50 µg/m^3 *not to be exceeded more than 35 times a year (90.4th percentile)*

Construction effects

Dust emissions

5.6.5 The construction effects will be assessed through an investigation of potential sources of air pollutant emissions from construction activities and through the formulation of appropriate mitigation and control measures. An environmental risk assessment of construction effects will be carried out using the risk-based approach from the IAQM guidance, as described in the Air Quality Technical Note 'Guidance on assessment methodology' (refer to Annex A of this SMR Addendum 3).

5.6.6 The assessment will identify where particular mitigation measures are required to address local issues. These mitigation measures will be detailed in the Local Environmental Management Plans being developed for each local authority area.

Traffic emissions

5.6.7 With regard to assessment of the effects of emissions arising from changes in traffic flows during construction, traffic data will be screened using the DMRB criteria described in paragraph 5.5.1. Following this screening exercise, roads meeting any of these criteria would be subject to a detailed assessment using the DMRB spreadsheet tool and/or an appropriate atmospheric dispersion model (e.g. ADMS-Roads or ADMS-Urban) to investigate the effects of changes in traffic flows. Dispersion modelling would use the latest vehicle emission data from Defra and take into account information in the National Emissions Inventory and London Atmospheric Emissions Inventory, as appropriate. Comparison of the results with and without the construction traffic and local diversions in the future years would allow the effect to be determined. In some cases, it may be more efficient to only use detailed modelling, for instance, where road layouts are complex or there is a large study area.

5.6.8 This assessment would comply with the requirements of LAQM Technical Guidance and would address the issues related to model verification and sensitivity analysis. This will only be considered in relation to areas where detailed air dispersion modelling is required and it will not be necessary elsewhere on the route of the Proposed Scheme. The approach for assessing traffic emissions is further described in the Air Quality Technical Note 'Guidance on assessment methodology'.

Operational effects

5.6.9 Operational effects due to the diversion of traffic flows at stations/interchanges and along the route of the Proposed Scheme would be assessed using the methodology described in paragraph 5.6.7. The assessment of emissions from other sources, such as emissions from buildings, will be assessed using a detailed dispersion model such as

ADMS if a significant impact is expected. This is further described in the Air Quality Technical Note 'Guidance on assessment methodology'. An initial appraisal will be undertaken that will examine the magnitude and location of the emissions to determine whether dispersion modelling is required.

5.6.10 Where there is a need to carry out assessment of nitrogen deposition near to sensitive sites, this will follow the methodology detailed in Volume 11 of the DMRB. Any changes in nitrogen deposition will also be reported in terms of the percentage change relative to the critical load and level for ecosystem protection. Any potential impacts on ecological systems relating to air quality changes will be addressed in the ecological assessment [see Section 9 (Ecology)].

5.6.11 Defra has published technical guidance for local authorities on when and how emissions from moving and stationary diesel trains should be considered in relation to LAQM duties[17]. In the absence of any other specific guidance, this will be used to inform the assessment of potential air quality impacts from construction related train operations. Defra's guidance addresses locations with relevant exposure where there is risk of exceedance of the annual mean air quality standard for NO_2. Such locations are within 30m of railway tracks but only where the background annual mean NO_2 concentration is above 25µg/m^3. In the context of the Proposed Scheme these locations may occur in the vicinity of temporary railheads where diesel locomotives are used for construction related activities.

Cumulative effects

5.6.12 Cumulative effects will be largely taken into account in the traffic data used for the assessment which will incorporate likely change brought about by other proposed and committed developments both during and following construction. Where there is planned development that includes significant emissions to the atmosphere then these emissions would be included within the air quality modelling undertaken for the Proposed Scheme if these are likely to result in cumulative effects.

5.7 Assumptions

5.7.1 The air quality assessment assumes the following:

- there is available baseline data from the sources mentioned in Section 5.2 (Establishment of baseline and definition of survey);
- transport information required will be provided in consultation with the Transport Consultants;
- any significant ecological impacts from changes in pollutant levels will be identified in the Ecology chapter of the ES; and
- there is an adequate level of detail of construction activities at construction sites.

[17] Defra, *Guidance on Assessing Emissions from Railway Locomotives*, http://laqm.defra.gov.uk/laqm-faqs/faq37.htm

6 (not used)

7 (not used)

8 (not used)

9 (not used)

10 (not used)

11 (not used)

12 (not used)

13 (not used)

14 (not used)

15 Traffic and transport

15.1.1 There are two amendments to the SMR as detailed below in paragraphs 15.2.1 and 15.3.1. There is also an additional section for the technical note, 'Guidance on further development of significance criteria,' as described in Section 15.4.

15.2 Scope of assessment

Temporal scope

15.2.1 Paragraph 15.5.5 supplemented with a further bullet point:

- *combined impacts arising post 2026 from the operation of HS2 Phase 1 and Euston Station construction works.*

15.3 Assessment methodology

Guidance

15.3.1 Paragraph 15.6.4 supplemented with a further bullet point:

- *Department for Communities & Local Government, March 2014, Guidance on Travel Plans, transport assessments and statements in decision-taking*[18].

[18] Department for Communities & Local Government, 2014, *Guidance on Travel Plans, transport assessments and statements in decision-taking.*

15.4 Changes to technical note – Guidance on further development of significance criteria (refer to SMR Addendum, Annex I)

15.4.1 Technical note – Guidance on further development of significance criteria: Annex I within the SMR Addendum supplemented with a new Section 5:

5. Significance criteria for combined post 2026 HS2 operation/Euston station construction

Introduction

15.4.2 *The criteria outlined below in Table 30 will be used to assess the significance of the traffic and transport impacts and effects during the combined post 2026 period of HS2 operation and construction at Euston station.*

Table 30: Criteria for assessment of combined post 2026 HS2 operation/construction at Euston station

Traffic and transport impacts	***Criteria***
Public transport delay	*Table 6 to be applied.*
Disruption at stations/interchanges	*Table 7 to be applied except for permanent impacts/effects where Table 22 is to be applied*
Traffic flows and delays to vehicle occupants (traffic severance)	*Table 9 to be applied except for permanent general (all vehicles) traffic impacts/effects where Table 23 is to be applied*
Traffic flows and delays to vehicle occupants (traffic diversions)	*Table 24 to be applied to impacts/effects lasting 4 weeks or longer*
Traffic flows and delays to vehicle occupants (traffic congestion)	*Table 12 to be applied*
Parking and loading	*Table 13 to be applied*
Vulnerable road user delay, amenity and ambience	*Table 16 to be applied*
Accidents and safety	*Table 17 to be applied*
Severance	*Table 19 to be applied*
Waterways	*As detailed in paragraphs 3.9.3 and 3.9.4*

16 (not used)

17 (not used)

Annex A – Air quality – technical notes

The following revised technical note is appended to this document:

- Guidance on assessment methodology.

HS2 London-West Midlands

Air quality

Technical note – Guidance on assessment methodology

A report to HS2 Ltd by Arup/AECOM

Contents

List of tables

1 Introduction

1.1 Purpose of the note

1.1.1 This technical note provides further information on the assessment of air quality during construction and operation of the Proposed Scheme. The Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR) provided the general methodology to be followed. This note provides a more detailed framework for assessing air quality effects during the construction and operation of the Proposed Scheme.

2 General considerations

2.1 Scenario nomenclature

2.1.1 2012 Current Baseline (for model verification if required).

2.1.2 Selected years within the construction period for the assessment of the effects of construction. The years of assessment will be selected based on the construction programme and when significant effects are expected.

2.1.3 An operational scenario will be assessed for the first full operational year after construction is completed.

2.1.4 For each assessment year, the scenario without the Proposed Scheme in place and the scenario with the Proposed Scheme in place will both be assessed.

2.2 Baseline data

2.2.1 Baseline monitoring data should be reported from the nearest available sites that represent the location under assessment. Where data capture is less than 90% in a year, commentary will be given on how these data may or may not reflect annual mean concentrations.

2.3 Selection and types of receptors

2.3.1 For the assessment of the impacts from dust emissions during construction, sensitive receptors will be chosen following the Institute of Air Quality Management (IAQM) guidance as described in Section 3.

2.3.2 For the assessment of the impacts from roads, receptors will be chosen so the worst affected relevant sensitive exposure (residential properties, schools, hospitals, nursing homes) on each road and at each junction on the assessed road network is represented. If several receptors are present at a junction and it is unclear which of them would be the worst affected receptor, all of the potential worst affected receptors will be modelled. Where there is no sensitive exposure at junctions, receptors will be chosen alongside roads which meet the Design Manual for Roads and

Bridges (DMRB)[1] criteria so that all possible worst case effect locations are represented.

2.3.3 For assessment of car parks, receptors will be chosen near the perimeter of the car park where worst case effects are likely, considering contributions from other modelled sources (car parks and roads). Additionally, receptors included in any combustion plant assessment will be included in the model runs to account for cumulative effects.

2.3.4 Receptors will be selected based on either their proximity to the combustion source (such as boilers and combined heat and power (CHP) systems) or as the likely most affected receptors. Receptors will include all locations where people might reasonably be (including residential, hotels, nurseries, hospitals, schools, nursing home buildings) and/or ecological receptors if considered sensitive to the pollutant being considered and present on a nationally designated site.

2.3.5 If receptors are present in several directions from the stack, the closest receptor in each direction will be selected. The height above ground of the receptors will be set to the height of opening windows and/or air intakes most similar in height to the stack height. Nearby receptors included in any quantitative road and car park assessment will be included in the model runs to account for cumulative effects.

2.3.6 In addition to modelling at selected discrete receptors, a grid of equally spaced receptors will be modelled incorporating at least 50 x 50 points with a maximum spacing of not more than 1.5 times the minimum stack/flue height being modelled. The grid will be centred on the stack(s) and ensure that the maximum off-site concentration is included (this may require several iterations of the model to ensure the optimal spacing is selected). Several grids may also be used. All discrete receptors do not need to be within the area covered by the receptor grid. Maximum concentrations will be reported as well as those at discrete receptors.

2.3.7 Receptors (gridded and/or discrete) will all be at ground level (zero metres above local ground level) and also at various heights above ground if relevant. Consideration will be given in urban areas where there are many receptors at heights more than two metres above ground to modelling a series of grids at various heights (in order to ensure that exposure of receptors at height are considered. Discrete receptors at height may also be used if an elevated grid is not justified.

2.4 Interfaces

2.4.1 Any results that relate to receptors within an adjacent community forum area (CFA) will be included as part of that CFA report.

2.5 ADMS model parameters

2.5.1 ADMS-Roads meteorological setting will remain as default, except for the surface roughness and minimum Monin-Obukhov length – advice on the relevant values to be

[1] Highways Agency, 2007, *The Design Manual for Roads and Bridges (Volume 11, Section 3, Part 1 Air Quality HA207/07)*

used will be taken from the ADMS-Roads manual[2] based on the characteristics of the study area as shown in Table 1.

2.5.2 Terrain will not be included in dispersion modelling unless justified using professional judgement.

Table 1: Surface roughness values for ADMS

Study area	Surface roughness (m)
Large urban areas	1.5
Cities / woodlands	1.0
Parkland, open suburbia	0.5
Agricultural areas (max)	0.3
Agricultural areas (min)	0.2
Root crops	0.1
Open grassland	0.02
Short grass	0.005

2.6 Model verification

2.6.1 When undertaking an ADMS-Roads assessment, the model will be verified at selected suitable continuous and diffusion tube NO2 monitoring sites in accordance with Local Air Quality Management Technical Guidance[3]. Kerbside sites will not be included in the model verification exercise. Adjustment to the model using the procedure detailed in LAQM Technical Guidance will be made if the average difference between modelled and monitored NO2 concentrations exceeds 25% of monitored concentrations or if there is a consistent under or over prediction. DMRB screening method results will not be subject to verification, as this method will not be used in areas where a significant air quality impact is likely.

2.7 Meteorological data

2.7.1 When dispersion modelling is undertaken, a sensitivity analysis will be performed using five years of hourly sequential meteorological data from a station as indicated below (depending on location). The results for the full assessment will then be presented based on 2012 meteorological data unless the sensitivity analysis justifies another year is likely to lead to results that would materially affect the conclusions of the assessment. Choice of any year other than 2012 will be justified.

[2] Cambridge Environmental Research Consultants, 2014, *ADMS Roads User Guide v3.4*
[3] Defra, Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009

2.7.2 The following meteorological stations (Table 2) will be used in the assessment, unless there are particular local features to suggest another site is more appropriate.

Table 2: Meteorological Data

No.	Meteorological Station	Ordinance Survey (OS) X	Ordinance Survey (OS) Y	Description of Data
1	Heathrow	507733	176810	London Heathrow
2	Elmdon	418242	283593	Elmdon/Birmingham Airport with missing cloud from Coventry

3 Assessment of dust emissions

3.1 Type of assessment required

3.1.1 Emissions of dust and particulates during construction will be assessed following the relevant IAQM guidance[4]. This section provides an interpretation of the guidance for application to the assessment of the Proposed Scheme.

3.1.2 Within the IAQM guidance, an 'impact' is described as a change in pollutant concentrations or dust deposition and an 'effect' is described as the consequence of an impact. The main impacts that may arise during construction are:

- dust deposition, resulting in soiling of surfaces;
- visible dust plumes;
- elevated PM10 concentrations; and
- an increase in NO_2 and PM10 concentrations due to exhaust emissions from vehicles and equipment used on site.

3.1.3 The IAQM guidance considers the potential for dust emissions from dust-generating activities, such as demolition of existing structures, earthworks, construction of new structures and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from the site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the site with dusty materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

3.1.4 For each of these dust-generating activities, the guidance considers three separate effects: annoyance due to dust soiling, harm to ecological receptors and the risk of health effects due to a significant increase in PM10 exposure. The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM10 exposure.

3.1.5 The methodology takes into account the scale to which the above effects are likely to be generated (classed as small, medium or large), along with the levels of background PM10 concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. This is then taken into consideration when deriving the overall risk for the site. Suitable mitigation measures are also proposed to reduce the risk of dust emissions from the site.

3.2 Types of receptors

3.2.1 The IAQM guidance details two types of relevant receptors that will be taken into account in the assessment – human and ecological receptors.

[4] Institute of Air Quality Management, 2014, Guidance on the assessment of dust from demolition and construction, London

3.2.2 A human receptor is defined as any location where a person may experience the annoyance effects of airborne dust or dust soiling, or exposure to PM10 over a time period relevant to the air quality standards. For the purposes of the assessment of the Proposed Scheme this is mainly residential dwellings. The IAQM guidance also directs that some commercial premises may have a particular sensitivity to dust, however, the assessment must take into account the actual situation at premises of this type as they may already have protected their operations against increased dust levels. Some horticultural operations are also considered to be dust sensitive.

3.2.3 An ecological receptor is any habitat that may be sensitive to dust soiling from direct impacts (e.g. excessive dust deposition) or indirect impacts on fauna (foraging habitats).

3.3 Spatial scope of assessment

3.3.1 The IAQM guidance suggests that an assessment is required where there are sensitive receptors within 350m of the boundary of the site (or 50m for ecological receptors), within 50m of the route used by construction vehicles on the public highway and up to 500m from the site entrance. It is acknowledged in the guidance that these values are conservative and hence there is scope for specific criteria to be applied for this assessment.

3.4 Temporal considerations

3.4.1 The assessment of impacts will consider the construction activities throughout the construction period. However, a separate assessment will not be undertaken for every year throughout construction at every site. Nonetheless, the assessment will capture the periods where the risk of adverse impacts are at their highest.

3.4.2 The assessment at each major construction activity will therefore draw upon the construction programme to identify the duration and location of activities that would give rise to air quality impacts. As the IAQM guidance provides a three scale level of risk for various activities that depends on their scale and distances to sensitive receptors, it is likely that the overall risk will change at different times during the construction period.

3.4.3 The assessment will therefore identify the changes in risk of adverse effects throughout the construction period and set out an appropriate level of mitigation to reduce these. The level of mitigation proposed will be consistent with that proposed in the IAQM guidance document and has been detailed within the draft Code of Construction Practice (CoCP). This assessment will identify the periods when there are major changes in the construction activities and assess periods when construction effects may change as a result.

3.5 Mitigation measures

3.5.1 When undertaking the construction impact assessment the mitigation measures detailed within the draft CoCP will be applied.

3.5.2 The assessment assumes that the 'desirable' measures for 'low risk' sites in the IAQM guidance are in place. These minimum mitigation measures are detailed in Table 3 and are based on the requirements for low risks sites in the IAQM guidance and the Greater London Authority (GLA) Supplementary Planning Guidance[5]. With these measures in place and by examining the intensity of construction activities in some instance, the distances described in paragraph 3.1.1 can be reduced without risk of underestimating the air quality impacts. The guidance also notes that with the application of sufficient mitigation measures, no significant effects would be anticipated from construction activities.

Table 3: Mitigation measures assumed to be applied at all construction sites

Activity	**Mitigation**
Site planning	Machinery, fuel / chemical storage and dust generating activities should not be located close to boundaries and sensitive receptors if at all possible. Erect effective barriers around dusty activities or the site boundary. Avoid site runoff of water or mud.
Haul roads	Use consolidated surfaces on haul roads near to residential areas. Use agreed wet cleaning methods or mechanical road sweepers on all roads during periods of dry weather. Clean road edges and pavements using agreed wet cleaning methods.
Vehicles	All vehicles should switch off engines when stationary - no idling. Clean or wash all vehicles effectively before they leave a site if there is a risk of affecting nearby sensitive receptors. All loads entering and leaving the site to be covered.
Site entrances / exits	Wash or clean all vehicles effectively before leaving the site if it is close to sensitive receptors. Ideally there should be a paved area between the wheel wash and before the public road.
Demolition	Ensure effective water suppression is used during demolition operations. Avoid explosive blasting, using appropriate manual or mechanical alternatives. Bag and remove any biological debris or damp down such material before demolition.
Excavation and earthworks	All dusty activities should be damped down, especially during dry weather. Temporarily cover earthworks if possible. Minimise drop heights to control the fall of materials.
Stockpiles	Make sure that stockpiles exist for the shortest possible time.

[5] Greater London Authority, 2014, The control of dust and emissions during construction and demolition, Supplementary Planning Guidance, Greater London Authority

Activity	Mitigation
Grinding, cutting, sawing	All equipment should use water suppressant or suitable local exhaust ventilation systems.
Chutes and skips	Securely cover skips. Minimise drop heights to control the fall of materials. Regularly damp down surfaces with water.
Off road vehicles and plant	All non-road mobile machinery (NRMM) should use fuel equivalent to ultra-low sulphur diesel (ULSD), especially where a bunkered fuel supply is available. No vehicles or plant will be left idling unnecessarily. NRMM (vehicles and plant) should be well maintained. Should any emissions of dark smoke occur (except during start up) then the relevant machinery should be stopped immediately and any problem rectified before being used. Engines and exhaust systems should be regularly serviced according to manufacturer's recommendations and maintained to meet statutory limits / opacity tests. All vehicles should hold current MOT certificates where required. Vehicle exhausts should be directed away from the ground and positioned so they are not directed at site entrances. Locate plant away from the boundaries close to residential areas.

3.6 Limitations

3.6.1 Non-scheme car park emissions will not be assessed unless professional judgement indicates that they may contribute significantly to the outcome and have not been included in the baseline.

3.6.2 On-road cold start emissions associated with car parks and the developments are assumed to have a very small effect on the emissions from the local road network and should not be included in the assessment.

3.6.3 Emissions from rail brake and track wear during operation are assumed to be negligible and should not be included in the assessment.

3.6.4 Trains and much of the Proposed Scheme infrastructure will be electrically operated. Emissions from power plants used to power the trains and infrastructure are outside the scope of a local air quality assessment and should not be included in the assessment.

4 Assessment of vehicle emissions

4.1 Type of assessment required

4.1.1 All affected roads will be assessed. This includes screening out of roads on which traffic changes are likely to lead to insignificant effects on air quality.

4.1.2 A DMRB scoping assessment of traffic effects will be undertaken where any of the DMRB criteria, as follows, are met and detailed modelling is not required (see paragraph 4.1.5):

- road alignment will change by 5m or more;
- daily traffic flows will change by 1,000 AADT or more;
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more;
- daily average speed will change by 10kph or more; or
- peak hour speed will change by 20kph or more.

4.1.3 In some cases it may be more efficient to only use detailed modelling, for instance where road layouts are complex or there is a large study area.

4.1.4 Consideration will be given as to whether roads that would be screened out using the above criteria are to be included in the assessment. Examples of this are heavily trafficked roads in areas where air quality criteria may or may not be exceeded, but where traffic changes caused by the construction or operation of the Proposed Scheme are small.

4.1.5 Consideration will be given as to whether dispersion modelling using ADMS-Roads will be carried out, taking into account the following criteria.

- roads screened within the assessment are within hotspots located within an air quality management area (AQMA) (not necessarily if the roads are within an AQMA that has been designated over a wider area than where air quality criteria are exceeded);
- where existing or future estimated annual mean NO_2 concentrations are over 36µg/m^3; and
- where existing or future estimated annual mean PM10 concentrations are over 30µg/m^3.

4.2 Spatial scope of assessment

4.2.1 Any quantitative air quality assessment will cover the roads which meet the DMRB criteria and roads which adjoin them to enable the effects at junctions to be assessed.

4.3 Modelled pollutants, model version and emissions factors

4.3.1 Only annual mean NO_2 and PM10 concentrations are required to be modelled. The treatment of short-term statistics is explained in the following paragraphs.

4.3.2 NOx output from either the DMRB Spreadsheet or ADMS-Roads models for both on road sources and car parks will be combined with the background NOx and NO2 concentrations in the Department for Environment, Food and Rural affairs (Defra) NOx to NO2 conversion spreadsheet, available on the Defra website[6], to obtain total roadside and background annual mean NO2 concentrations. Modelled combustion plant NO2 contributions will be added to these values to yield a total annual mean NO2 concentration.

4.3.3 The number of exceedances of the 1-hour NO2 objective will not be reported since it is only likely to be breached if the annual mean NO2 concentrations are over 60µg/m^3. Therefore, this less onerous statistic will not reported, unless there is a very short term activity being examined where high peaks in NO2 concentrations are expected.

4.3.4 To calculate the annual mean PM10 concentrations, the background PM10 concentrations will be added to the roadside concentration output (and any modelled combustion plant output) from the DMRB or ADMS-Roads model. The number of exceedances of the 24-hour PM10 objective should be calculated using the formula in LAQM Technical Guidance, that is:

4.3.5 *No. 24-hour mean exceedances = -18.5 + 0.00145 × annual mean^3 + (206/annual mean)*

4.3.6 The DMRB Spreadsheet version 1.03c (July 2007)[7] available on the Department for Transport (DfT) website will be used for any DMRB spreadsheet assessments.

4.3.7 The most recent versions of ADMS-Roads and ADMS will be used for any dispersion modelling assessment. Emissions suitable for use in the ADMS-Roads model will be generated using the most recent Emission Factors Toolkit (EFT) available at the start of the assessment.

4.3.8 The assessment will also incorporate HS2 Ltd's policy on the type of heavy goods vehicles (HGVs)[8] to be used, which states: "In order to help mitigate impacts on local air quality, in areas where there is action in place to meet EU limit values through the introduction of Low Emission Zones (such as the London Low Emission Zone), the nominated undertaker will require HGVs entering these designated Zones during construction, for the purposes of transporting excavated material, to be powered by Euro VI (or lower emission) engines". Euro VI engines are required to have substantially lower emissions of NOx and particulate matter than older engines.

4.4 Car parks, stationary idling vehicles

4.4.1 New car parks will be assessed using ADMS-Roads where they meet the Environmental Protection UK (EPUK) criteria for assessment; that is they have more than 100 spaces outside AQMAs or more than 50 spaces inside AQMAs.

4.4.2 Emissions from movements within the car park will be estimated using EFT as indicated above. The travel speed will be set at 5kph and the travel distance within the

[6] Defra, NOx to NO2 calculator, http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc
[7] Department for Transport, Air Quality, http://www.standardsforhighways.co.uk/ha/standards/guidance/air-quality.htm
[8] Heavy Goods Vehicles are defined as those with a weight greater than 3.5 tonnes.

car park will be set to the car park perimeter for surface car parks with half the perimeter distance added for each floor above ground level for multi-storey car parks.

4.4.3 Consideration will be given to the inclusion of places where vehicles may stand with engines idling e.g. taxi stands (use design length of taxi ranks, number of vehicles, duration of stay etc.) and a separate calculation made for these emissions with EFT.

4.4.4 The EXEMPT model, available on the Defra website[9], will be used to estimate cold start emissions from car parks. Cold start emissions should be applied to vehicles which stay over two hours. If this information is not available, all vehicles should be assigned cold start emissions (using a length of stay of 600 min and an assumed ambient temperature of 10°C) as a worst case assessment. The "excess emissions" from the model will be calculated using half the driving distance within the car park (as estimated using the method in the previous paragraph) since cold start emissions will only be applicable to vehicles exiting the car park.

4.4.5 Car parks will be modelled as area sources at ground level for surface cars parks, as volume sources using the height of the car park for multi-storey car parks, or as point sources at ventilation points for mechanically ventilated underground car parks (or at the entrance or openings of the car park if not mechanically ventilated), using emissions calculated for cold start and internal movement emissions uniformly distributed throughout the sources.

4.5 Background concentrations

4.5.1 Data for background concentrations will be taken from the maps available on the Defra website[10] or the GLA pollution mapping[11] where more appropriate and from local monitoring information available in the area. Professional judgment will be used to determine which data is most appropriate to be used for the assessment of each area.

4.5.2 If local monitoring data is not available for the base year of 2012, it will be adjusted using the same factors for the area as those used in the Defra background maps. Local background monitoring data will also be adjusted, if used, for the required assessment years.

4.6 Speeds

4.6.1 Where data exist on actual speeds these will be used. In the absence of actual or modelling traffic speed data, the following speeds will be used (unless justified otherwise):

- 50% of the speed limit on central urban and or congested roads;
- 75% for urban but not congested roads;
- roads within 50m and on junctions (including roundabouts) should have their

[9] Defra, EXEMPT Model, http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#exempt
[10] Defra, Background maps, http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html
[11] Greater London Authority, London Atmospheric Emissions Inventory 2010, http://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2010

speeds adjusted as advised by LAQM Technical Guidance;

- signalled junctions = 15kph;
- small roundabouts (total roundabout length < 150m) = 20kph;
- large roundabouts (total roundabout length > 150m) = 30kph; and
- roads within 50m of roundabouts with traffic lights = 15kph.

4.7 Baseline verification traffic

4.7.1 An existing baseline year of traffic data will be used for the study area. A full assessment of the entire study area will not be required, however, this information will be used to test model performance and undertake model verification in line with guidance in the LAQM Technical Guidance.

4.8 Construction and operational traffic

4.8.1 The construction impact assessment will be carried out for selected years within the construction period on a case by case basis.

4.8.2 Where construction overlaps with operation, operational traffic will be assessed for local air quality for selected years during the construction period. Operational traffic will also be assessed for the full opening year after construction. A scenario without the Proposed Scheme in place, and with the Proposed Scheme in place, will be assessed and compared. A baseline scenario will be assessed for information purposes.

5 Combustion plant assessment

5.1 Type of assessment required

5.1.1 Emissions from buildings will be included in the assessment. Professional judgement will be used to determine the most appropriate method for assessment which will be qualitative or quantitative, including dispersion modelling.

5.1.2 The assessment of stationary combustion plant shall comply with the provisions of the Clean Air Act (1993). In summary:

- plant burning less than 45.4kg/hr of solid fuel or thermal input of liquid of gaseous fuel of less than 366.4kW (or combined plant sharing flues) will be screened out of the assessment; and
- plant falling within the provisions of the Clean Air Act will have their stack/flue sited at a location and height acceptable under the terms of the Act. This will initially be estimated using the D1 method[12].

5.1.3 Where relevant, professional judgement and/or dispersion modelling will be used to suggest design modifications including height and location of flues/stacks, particularly in relation to any adjacent or neighbouring buildings or structures.

5.1.4 Professional judgement will be exercised to ensure that the criteria given above are appropriate e.g. if there are many small boilers that may each fall under the criteria set out above but cumulatively their effect on air quality may be non-negligible, modelling may be deemed appropriate.

5.1.5 Professional judgement will be used as to whether modelling of plant that is not used throughout the year is appropriate (e.g. back-up generators run only for testing other than in the event of power failure).

5.1.6 Dispersion modelling will be undertaken with the atmospheric dispersion model ADMS and/or ADMS-Roads, using the most up to date version as of the date of receipt of the model input data.

5.1.7 Dispersion modelling of point source emissions will be undertaken if one or more of the following conditions are met:

- the height of stack from the D1 determination is not acceptable for some reason (e.g. it is unacceptable to the designers, physical limitations relating to use/access); or
- the combustion plant has the potential to affect air quality where the existing or estimated future annual mean baseline NO_2 concentrations are over 36µg/m3 or PM10 concentrations are over 30µg/m3 (if the source is non-gas fired) and where impacts are likely to be significant.

[12] Her Majesty's Inspectorate of Pollution, 1993, *Technical Guidance Note (Dispersion) D1: Guidelines on Discharge Stack Heights for Polluting Emissions*. London, Her Majesty's Stationery Office

5.1.8 For natural gas fired equipment modelling will only be for NO2. For other fuel types (e.g. biomass) consideration will be given to the inclusion of PM10, PM2.5 and/or SO2.

5.1.9 Where existing or future air quality is likely to exceed the relevant assessment criteria consideration will be given to the modelling of sources that would be excluded using the above criteria.

5.2 Pollutants emissions and model inputs

5.2.1 The D1 and modelling assessments will consider annual mean NOx emissions for gas fired plant and both NOx and PM10 emissions for other fired plant. If a specific combustion plant has not been selected by the energy consultant/mechanical engineer, standard emissions data will be used. Background concentrations for use with the D1 method will be taken from Table 2 of the D1 Technical Guidance[12] using the 'type of district' at the location of the assessed boiler. This information is repeated in Table 4, however, this data will be checked for consistency with available local background concentration information and where good quality local information is available this will be used in preference. To convert locally measured annual mean NO2 concentrations to the 98th percentile values used in D1, a factor of 2.5 will be used.

Table 4: D1 – Typical background levels of common pollutants

Type of district	**Background concentrations, mg/m³**	
	NO2*	**PM10**
Major city centre/heavy industrial area	0.17	0.15
Highly developed large urban area	0.12	0.10
Urban area of limited size with parkland or largely rural surroundings	0.09	0.07
Partially developed area	0.07	0.05
Rural area with little development	0.05	0.03

** 98th percentile of hourly means*

5.2.2 Emission characteristics from Table 5 will be used in any boiler dispersion modelling. Boilers of intermediate size will have their characteristics linearly interpolated using a most similar smaller and most similar larger boiler from the table.

Table 5: Combustion plant model inputs for natural gas CHPs (MW thermal input)

Property	**0.5MW**	**1MW**	**2MW**	**5MW**	**10MW**
Stack height (m)	As per D1 or building height +1 m				
Total flow (actual m^3/s)	0.22	0.44	0.87	2.98	5.69
Stack/Flue diameter (m)	0.17	0.24	0.33	0.62	0.85
Exit velocity (m/s)	10				
Discharge temperature (°C)	72	69	69	179	162
NO_2 emissions rate g/s *	0.011	0.022	0.044	0.111	0.222

Based on the Hoval Ultragas (0.5, 1 and 2MW) and Royalist range of boilers (5 and 10MW)
Assumed density of flue gas is the same as nitrogen (1.25 g/l at normal conditions)
** NB this is based on an emission factor of 80mg/kWh, there may be other local authority advice for the particular study area.*

5.2.3 For boilers of intermediate size, emissions will be interpolated and sizes rounded to the nearest 100 kW before interpolation takes place.

5.2.4 Assumptions on NOx to NO_2 conversion ratios for point source plant NOx emissions will be based on the likely oxidation rates to the point of maximum impact. Where no other data exist, Table 6 will be used to determine the NOx to NO_2 oxidation rate for specific distances. It is assumed that the minimum conversion is 10% based on the likely NO_2 percentage in the emissions. Linear interpolation will be undertaken between the distances provided to the nearest 10m.

Table 6: Oxidation rates (derived from Janssen)[13]

Distance from source (m)	Estimated annual mean ozone concentration (ppb)			
	< 20	20-40	40-60	> 60
10	10%	10%	10%	10%
25	10%	10%	10%	10%
50	10%	10%	10%	10%
75	10%	10%	10%	10%
100	10%	10%	10%	10%
200	10%	10%	10%	10%
300	10%	10%	10%	10%
500	10%	10%	10%	14%
750	10%	10%	14%	20%
1,000	10%	10%	18%	26%
1,500	10%	15%	25%	36%
2,000	10%	19%	32%	44%
3,000	14%	27%	43%	57%

Note: Assuming that wind speed is in the range 5-15 m/s and conversion rates are the highest they would be for the range of ozone given. In reality conversion rates to NO2 would be lower than stated.

5.2.5 All combustion plant sharing a common flue or stack will be combined in a manner that preserves an exit velocity of 15m/s (the minimum recommended stack emission velocity).

5.2.6 Only annual mean concentrations will require modelling. The handling of short term statistics is explained in Section 4.3.

[13] Janssen et al., 1987, *A Classification of NO Oxidation Rates in Power Plant Plumes Based on Atmospheric Conditions*

6 Assessment of significance

6.1 Type of assessment required

6.1.1 The significance of effects resulting from the Proposed Scheme on local air quality from vehicle and/or combustion plant emissions will be assessed using the framework described in this section.

6.2 Describing the impacts

6.2.1 Predicted annual mean NO2 and PM10 concentrations will be compared between the 'with' and 'without' Proposed Scheme assessment scenarios. The absolute change in concentrations will be used along with predicted concentrations with the Proposed Scheme to assess local air quality impacts at individual receptors. The impact descriptors are shown in Table 7 and have been adapted from the latest EPUK/IAQM guidance[14]. Changes of less than 0.2µg/m³ (i.e. less than 0.5% of the air quality standard) will be described as 'negligible'.

6.2.2 Where an increase in concentrations has been predicted with the Proposed Scheme, the resulting impact will be described as 'adverse'. Where a decrease in concentrations has been predicted with the Proposed Scheme, the resulting impact will be described as 'beneficial'.

Table 7: Impact descriptors for individual receptors (adapted from the EPUK/IAQM guidance)

Predicted annual mean NO2 / PM10 concentration	**Absolute change in NO2 / PM10 concentrations as a result of the Proposed Scheme**			
	≥ 0.2 and < 0.8µg/m³	**≥ 0.8 and < 2.4µg/m³**	**≥ 2.4 and < 4µg/m³**	**≥ 4µg/m³**
< 30.4µg/m³	Negligible	Negligible	Slight	Moderate
≥ 30.4 and < 38µg/m³	Negligible	Slight	Moderate	Moderate
≥ 38 and < 41.2µg/m³	Slight	Moderate	Moderate	Substantial
≥ 41.2 and <µg/m³	Moderate	Moderate	Substantial	Substantial
≥ 44µg/m³	Moderate	Substantial	Substantial	Substantial

6.3 Significance of effects

6.3.1 The approach used to assess significance described in the EPUK/IAQM guidance is designed to be a measure of the significance of the changes in air quality in terms of compliance with air quality standards and is not intended to be an assessment of any potential health impacts. That is to say, a significant air quality impact determined on the basis of the EPUK/IAQM approach would not necessarily, or usually, denote a significant health impact. However, the assessment method is intended to provide

[14] Moorcroft and Barrowcliffe et al., 2015, *Land-use Planning & Development Control: Planning for Air Quality*, London: Institute of Air Quality Management

information on changes in pollutant concentrations that can be used to assess health effects, by flagging up locations and impacts which may merit further consideration. Health effects are to be considered in a Health Impact Assessment, as advised in the EPUK/IAQM guidance.

Individual receptors

6.3.2 The approach described in Section 6.2 can be used to assess the significance of the predicted changes in pollution concentration at each individual receptor, as shown in Table 8. However, this is not a measure of the overall significance of effects from the Proposed Scheme and/or associated works on local air quality.

Table 8: Significance of potential effects at individual receptors

Impact	**Potential effect**
Negligible impact	Not significant
Slight adverse / beneficial impact	Not significant
Moderate adverse / beneficial impact	Significant
Substantial adverse / beneficial impact	Significant

Overall significance

6.3.3 The overall significance of the air quality effects within a CFA can only be reported where there is a consistent effect at each receptor within the study area. If there is no consistent effect, the significance will need to be reported on a receptor or area basis. Where appropriate, the overall significance of effects from the Proposed Scheme and/or associated works will be assessed for each CFA using professional judgement as required by the EPUK/IAQM guidance. For this project a set of qualitative factors will be taken into consideration as described below. These factors have been compiled from industry guidance and relevant national policies.

- location and number of receptors predicted to have slight, moderate or substantial adverse / beneficial impacts;
- whether exceedances of an air quality standard have been introduced as a result of the Proposed Scheme in an area where none existed before;
- whether existing exceedances of an air quality standard have been predicted to substantially increase or be removed as a result of the Proposed Scheme;
- whether predicted concentrations as a result of the Proposed Scheme are likely to cause a new AQMA to be declared or change the size of an existing AQMA;
- whether the Proposed Scheme and/or associate works are predicted to interfere with local policies and strategies;
- the existing and future air quality conditions without the Proposed Scheme;

- the extent of current and future population exposure to predicted concentrations as a result of the Proposed Scheme; and
- the influence and validity of any assumptions adopted when undertaking the air quality assessment.

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