

9 Air Quality

9.1 Introduction

- 9.1.1 This chapter of the ES assesses the effects of the proposed scheme described in Chapter 3 on air quality within and surrounding the site.
- 9.1.2 The baseline situation is considered before the likely environmental effects of the development are identified, both during the construction and operational phases of the development. Mitigation measures to reduce any negative environmental effects are identified as appropriate, before the residual environmental effects are assessed.
- 9.1.3 The chapter has been prepared by SLR Consulting Ltd, an EIA Quality Mark registered company with the Institute of Environmental Management and Assessment (IEMA). The author is an Associate Member of the Institute of Air Quality Management (AMIAQM) and an Associate Member of the Institution of Environmental Sciences (AMIEEnvSc). The reviewer is a Chartered Environmentalist (CEnv), Member of the Institute of Air Quality Management (MIAQM) and Member of the Institution of Environmental Sciences (MIEEnvSc).
- 9.1.4 The Chapter is supported by the following technical appendices:
- Appendix 9.1 – Air Quality Monitoring Report; and
 - Appendix 9.2 – Air Quality Glossary.

9.2 Assessment Approach

Methodology – Legislative framework and guidance

National Air Quality Strategy

- 9.2.1 The United Kingdom Air Quality Strategy (UK AQS) 2007 for England, Scotland, Wales and Northern Ireland (DEFRA, The Air Quality Strategy for England, Scotland and Northern Ireland, 2007), sets out the Government's policies aimed at delivering cleaner air in the United Kingdom (UK). It provides the overarching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the UK Government and Devolved Administrations to protect and improve human health.

Air Quality Standards

- 9.2.2 The Air Quality Standards Regulations 2010 (the regulations) (Secretary of State, Environmental Protection, 2010) transpose the Ambient Air Quality Directive (2008/50/EC) (European Parliament, 2008) and the Fourth Daughter Directive (2004/107/EC) into UK legislation. The regulations include Limit Values, Target Values, Air Quality Objectives (AQOs), Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQAL) throughout this report).
- 9.2.3 Those relevant to this Air Quality chapter are presented within Table 9.1.

Table 9.1: Relevant Air Quality Assessment Levels

Pollutant	Standard (µg/m³)	Measured as	
Nitrogen dioxide (NO ₂)	40	Annual mean	-
	200	1 hour mean	Not to be exceeded more than 18 times a calendar year
Particulate matter within an aerodynamic diameter of less than 10µm (PM ₁₀) (gravimetric)	40	Annual mean	-
	50	24-hour mean	Not to be exceeded more than 35 times a calendar year
Particulate matter within an aerodynamic diameter of less than 2.5µm (PM _{2.5}) (gravimetric)	25	Annual Mean	-

Local Air Quality Management

9.2.4 Section 82 of the Environment Act 1995 (Part IV) (Government Legislation, 1995) requires local authorities to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any AQALs prescribed in regulations are being achieved or are likely to be achieved in the future.

9.2.5 Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, Local Authorities (LAs), have formal powers to control air quality through a combination of Local Air Quality Management (LAQM) and by use of their wider planning policies.

Applicable Public Exposure

9.2.6 In accordance with the Department for Environment Food and Rural Affairs' (DEFRA) technical guidance on LAQM (LAQM.TG(16)) (DEFRA, 2018), the AQALs should be assessed at locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. A summary of relevant exposure for the objectives presented in Table 9.1 are shown below in Table 9.2.

Table 9.2: Relevant Exposure

Objective Averaging Period	Relevant Locations	Objectives should apply at	Objectives should not apply at
Annual Mean	Where individuals are exposed for a cumulative period of 6-months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices, hotels, gardens of residences, kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

General Nuisance Legislation

9.2.7 Part III of the Environmental Protection Act (EPA) 1990 (as amended) (Parliament of the United Kingdom, 2020) contains the main legislation on Statutory Nuisance and allows LA and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines, amongst other things, smoke, fumes, dust and smells emitted from industrial, trade or business premises so as to be prejudicial to health or a nuisance, as a potential Statutory Nuisance.

9.2.8 Fractions of dust greater than 10µm (i.e. greater than PM₁₀) in diameter typically relate to nuisance effects as opposed to potential health effects and therefore are not covered within the UK AQS. In legislation there are currently no numerical limits in terms of what level of dust deposition constitutes a nuisance.

Local Air Quality Management Technical Guidance LAQM.TG(16)

9.2.9 The Local Air Quality Management Technical Guidance (DEFRA, 2018) was published for use by local authorities in their LAQM review and assessment work. The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

Local Guidance

9.2.10 BMBC published the 'Air Quality and Emissions Good Practice Planning Document' in March 2020 (BMBC, 2020) to support and provide a regulatory air quality framework for the assessment of new developments.

9.2.11 As part of the guidance, the classification of the development is required to determine the appropriate level of assessment, whereby schemes are classified as either 'minor', 'medium' or 'major'. Following the appropriate level of assessment,

requirements for mitigation are outlined based upon the classification of the scheme.

Environmental Protection and Institute of Air Quality Management Guidance

9.2.12 Environmental Protection UK (EPUK) and the IAQM have together published guidance (EPUK & IAQM, 2017) to help ensure that air quality is properly accounted for in the development control process. It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed. Importantly, it sets out a recommended approach to assess the significance of impacts.

9.2.13 The guidance also states that best-practice design and operational measures should be recommended and applied to all developments that require an Air Quality Assessment, to reduce emissions and human exposure to poor air quality. Additional measures are also suggested to off-set emissions, depending on the nature and scale of the development proposals.

Design Manual for Roads and Bridges

9.2.14 The Design Manual for Roads and Bridges (DMRB) LA 105 (Highways England, 2019) states receptors, within 200m of a road source, require further assessment of potential impacts.

9.2.15 If there are no properties or relevant designated sites near the 'affected roads', then the impact of the scheme can be considered neutral in terms of local air quality and no further AQA is required.

Clean Air Strategy

9.2.16 The Clean Air Strategy (CAS) (DEFRA, 2019 B), published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

National Planning Policy Framework

9.2.17 The 2019 update to the National Planning Policy Framework (NPPF) (Secretary of State for Ministry of Housing, Communities and Local Government, 2019) describes the policy context in relation to pollutants including air pollutants:

'Para 170: Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of [...] air [...] pollution [...]. Development should, wherever possible, help to improve local environmental conditions such as air [...] quality [...].'

'Para 180: Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.'

9.2.18 Specifically, in terms of development with regards to air quality:

'Para 181: Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'

Planning Practice Guide

9.2.19 The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG) (Secretary of State for Ministry of Housing, Communities and Local Government, 2019) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified."

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species)."

9.2.20 The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that:

'assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality [...] Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact'.

9.2.21 The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this air quality chapter.

Local policy

9.2.22 Barnsley Metropolitan Borough Council's Local Plan (BMBC LP), adopted in 2019, (BMBC, 2019 B) sets out the Council's long-term spatial vision and strategy for the area until 2033, promoting, distributing and delivering sustainable development. A review of the document indicated the following relevant air quality policies:

'Policy AQ1 Development in Air Quality Management Areas

Development which impacts on areas sensitive to air pollution in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development.

We will only allow residential development which impacts on areas sensitive to air pollution, where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.

We will only allow development which impacts on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality, subject to any required mitigation.

Furthermore, development which impacts on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development.'

'Policy Poll 1 Pollution Control and Protection:

Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or any other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or any other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against. Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate'.

Methodology – Data Sources

9.2.23 The desk-based research has been completed by a review of the local air quality data surrounding the site, including data from the latest BMBC Annual Status

Report (ASR) (BMBC, 2019 A) and the UK Air Information Resource (UK-AIR) (DEFRA, 2019 A).

9.2.24 Due to no air quality monitoring undertaken by BMBC within the vicinity of the development site, a period of air quality monitoring was undertaken to establish site-specific baseline NO₂ concentrations as part of this air quality ES chapter. The methodology and results of the air NO₂ monitoring survey are outlined in detail within Appendix 9.1.

Methodology – Assessment Criteria

Construction Dust Assessment

9.2.25 The assessment has been undertaken with reference to IAQM '*Guidance on the assessment of dust from construction and demolition*' (IAQM, 2016).

9.2.26 Descriptors for magnitude of impact (risk of dust effects) and impact significance used in this assessment of construction phase dust are from the IAQM Guidance and are reproduced in Appendix 9.2.

Construction Phase Plant Emissions Assessment

9.2.27 To facilitate construction, Non-Road Mobile Machinery (NRMM) may be used. NRMM refers to mobile machines, transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads.

9.2.28 Pollutants emitted by NRMM that may have the most significant potential effects on local air quality are particulate matter (PM₁₀ and PM_{2.5}), and oxides of nitrogen (NO_x) / NO₂. NRMM emissions associated with construction programmes can adversely affect local air quality.

9.2.29 Emissions from construction phase plant, as NRMM has been screened following LAQM.TG(16) (DEFRA, 2018) guidance.

Dust and Odour Assessment

9.2.30 The assessment of the potential for any residual dust or odour effects, post remediation works, from the contaminated materials which are to be treated during the remediation phase of the proposed scheme has been undertaken.

9.2.31 The assessment has been undertaken in accordance with the IAQM Source-Pathway-Receptor methodology outlined within the Guidance on the Assessment of Odour for Planning (IAQM, 2018).

Vehicular Pollutants Assessment

9.2.32 A screening assessment has been undertaken to identify 'significant changes' in traffic on roads with relevant receptors by reference to EPUK-IAQM (EPUK & IAQM, 2017) indicative criteria, i.e.:

- a change of light duty vehicle (LDV) flows of more than 500 annual average daily traffic (AADT) (outside an AQMA);
- a change of heavy duty vehicle (HDV) flows of more than 100 AADT (outside an AQMA);

- a change of LDV flows of more than 100 AADT (within an AQMA); and/or
- a change of HDV flows of more than 25 AADT (within an AQMA).

9.2.33 Notwithstanding, as a precautionary approach as part of the operational phase assessment all road links irrespective of whether they are in excess of the above 'indicative criteria' have been assessed using dispersion modelling (as described below).

9.2.34 Where change in development trips is below the relevant indicative criteria, effects on air quality are concluded with no further detailed assessment.

9.2.35 Where the operational phase screening assessment has identified that predicted trip generation exceeds the EPUK-IAQM (EPUK & IAQM, 2017) indicative criteria for areas outside of the declared BMBC AQMAs, further assessment of impacts has been undertaken.

9.2.36 Detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS Roads v4.1 air dispersion model, following guidance provided in LAQM.TG(16) (DEFRA, 2018) to predict annual mean concentrations of NO₂ and PM₁₀ at sensitive receptor locations for all scenarios considered. The model requires various input data, including emissions from each section of road (based upon vehicle flows and vehicle type), and the road characteristic (including road width and street canyon height, where applicable). The risk of exceedance of the short-term AQALs and compliance with 1-hour mean NO₂ and 24-hour mean PM₁₀ AQALs has been assessed following LAQM.TG(16) guidance (DEFRA, 2018).

9.2.37 The following scenarios have been modelled:

- Verification / Baseline: 2019 baseline year verified to 2019 local air quality (NO₂) monitoring data;
- Do Minimum (DM): 2030 future opening year, if the scheme is not taken forward; and
- Do Something (DS): 2030 opening year, if the scheme is taken, with associated traffic flows.

9.2.38 Details of the dispersion model set-up, traffic data and verification are provided in Appendix 9.2.

Determining Sensitivity of Receptor

9.2.39 The sensitivity of the receptor to change in annual mean NO₂ and PM₁₀ concentrations associated with change in development trips is presented within Table 9.3, based upon the EPUK & IAQM guidance.

Table 9.3: Operational Phase Sensitivity Descriptors

Sensitivity	Concentration with the Development
Very High	110% or more of AQAL
High	103-109% of AQAL
Medium	95-102% of AQAL
Low	76-94% of AQAL
Negligible	75% or less of AQAL

Determining the Magnitude of Change

9.2.40 The magnitude of change in annual mean NO₂ and PM₁₀ concentrations associated with change in development trips is presented within Table 9.4, based upon the EPUK & IAQM guidance.

Table 9.4: Operational Phase Magnitude Descriptors

Magnitude Descriptor	Percentage Change in Air Quality Relative to AQAL (%)
Very High	>10
High	6-10
Medium	2-5
Low	1
Negligible	<0.5

Determining the Level of Effect

9.2.41 The level of effect attributed has been assessed based on the magnitude of change due to the proposed scheme and the evaluation of the sensitivity of the affected receptor.

9.2.42 The level of effect of the proposed scheme has been based upon the EPUK-IAQM guidance (EPUK & IAQM, 2017), as presented in Table 9.5. The impact descriptors of the level of effect outlined within the EPUK-IAQM guidance have been altered on the same scale to conform with this ES methodology.

Table 9.5: Level of Effect Descriptors

Level of Effect	EPUK-IAQM Impact Descriptor
Major	Substantial
Moderate	Moderate
Minor	Slight
Negligible	Negligible

9.2.43 The above defined sensitivity of receptors and magnitude of change have been combined to determine the level of effect as outlined in the Matrix below in Table 9.6.

Table 9.6: Operational Phase Level of Effect Matrix

Sensitivity / Concentration with the Development	Magnitude of Change / Percentage Change in Air Quality Relative to AQUAL (%)				
	Negligible / <0.5	Low / 1	Medium / 2 - 5	High / 6 - 10	Very High / >10
Negligible/ 75% or less of AQUAL	Negligible	Negligible	Negligible	Minor	Moderate
Low/ 76-94% of AQUAL	Negligible	Negligible	Minor	Moderate	Moderate
Medium/ 95-102% of AQUAL	Negligible	Minor	Moderate	Moderate	Major

Sensitivity / Concentration with the Development	Magnitude of Change / Percentage Change in Air Quality Relative to AQUAL (%)				
	Negligible / <0.5	Low / 1	Medium / 2 - 5	High / 6 - 10	Very High / >10
High/ 103-109% of AQUAL	Negligible	Moderate	Moderate	Major	Major
Very High/ 110% or more of AQUAL	Negligible	Moderate	Major	Major	Major

9.2.44 The level of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'.

Operational Phase Assessment Effect

9.2.45 The EPUK-IAQM (EPUK & IAQM, 2017) guidance requires a judgment on the significance of the 'effect', this is based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the proposed scheme has adopted best practice to eliminate and minimise emissions.

Site-Suitability Assessment Effect

9.2.46 To determine the significance of predicted air quality impacts based upon a site-suitability assessment, the EPUK-IAQM guidance (EPUK & IAQM, 2017) states:

"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."

Methodology – Scoping and consultation responses

9.2.47 Pre-application discussion was undertaken with the 'public health directorate' department within BMBC in order to agree upon the detailed scope of the assessment methodology (i.e. beyond that level of detail provided as part of the scoping Report). The scope of works was agreed by BMBC on 8th June 2020.

9.2.48 Reference should be made to Table 9.7 for a summary of the consultation and points agreed.

Table 9.7: Summary of Consultation

Body / Organisation	Contact	Date and Form of Consultation	Summary
BMBC, public health directorate	Technical Officer (Pollution Control)	email, dated 5/11/2019 & 8/11/2019 email, dated 8/06/2020	Agreement to scoping of AQ monitoring (refer to Appendix 9.1). Refinement of diffusion tube locations closer to Midland Road-Church Street junction to account for canyon effect. Agreement to detailed scope and inputs to road traffic emissions assessment. Agreement of classification as a 'major' scheme and therefore with carrying out an exposure assessment. Requires inclusion of electrical vehicle charging mitigation. Requires reference within the ES chapter to sensitivity on assessment inputs assessment within the Appendix. Satisfied with details to describe what methods will be deployed to reduce and control dust. Agreement to screen construction vehicle and NRMM against relevant criteria. Requires construction phase assessment and mitigation of pollutants for remnant contamination.

9.2.49 The scope of this assessment is as follows:

- Baseline Evaluation – Assessment of existing air quality in the local area;
- Construction Phase Assessment – Identification and assessment of potential air quality impacts and effects associated with the construction phase of the proposed scheme, primarily dust impacts and suspended particulate matter with an aerodynamic diameter of less than 10 micrometres (PM₁₀);

- Residual Dust and Odour Assessment – Identification and assessment of any potential residual impacts and effects post remediation works utilising the source-pathway-receptor approach;
- Operational phase assessment including assessment of emissions associated with operational phase vehicle operations inclusive of proposed receptors and monitoring sites as receptors; and
- Mitigation Measures – Identification of appropriate mitigation measures for incorporation within the 'design' based upon the above proposed scope.

Methodology – Limitations to the assessment

9.2.50 Reference should be made to Appendices 9.1 and 9.2 for a presentation and discussion of assumptions made within the site-specific air quality monitoring methodology and the assessment of operational phase road traffic emissions, respectively.

9.3 Baseline Conditions

Setting

9.3.1 The site is located to the north east of Royston, Barnsley, at the approximate National Grid Reference (NGR): x437445, y412185. The land parcel is bounded by:

- open countryside and a small number of residential properties to the north;
- Lund Hill Lane to the east;
- Lund Hill Lane to the south; and
- an industrial service railway line to the west.

9.3.2 Primary vehicular access will be via two access points off Lund Hill Lane.

Local Authority Review and Assessment

9.3.3 As required under Section 82 of the Environment Act (Part IV) (Government Legislation, 1995), BMBC has conducted an on-going exercise to review and assess air quality within their administrative area.

9.3.4 This process has indicated that annual mean NO₂ concentrations are above, and likely to remain above the AQAL at locations of relevant public exposure within BMBC's administrative area. As such, 6 AQMAs have been declared throughout the Council's area:

- Barnsley AQMA No. 1 – An area along the M1 between Junction 35a and Junction 38, including Haigh, Darton, Cawthorne Dike, Higham, Dodworth, Gilroyd Rockley, Birdwell, and Tankersley. The area extends 100m either side of the central reservation;
- Barnsley AQMA No. 2 – An area encompassing the A628 from junction 37 of the M1 to Town End roundabout, including part of Summer Lane from Town End roundabout to Wharncliffe Street;

- Barnsley AQMA No. 4 – An area encompassing the southbound carriageway of the A61 Harborough Hill Road from the PC World gyratory to the southbound slip road of the A61 near to its junction with Queens Road;
- Barnsley AQMA No. 5 – An area encompassing the junction of Rotherham Road and Burton Road;
- Barnsley AQMA No. 6 – Incorporating the A616 road through Langsett; and
- Barnsley AQMA No. 7 – Incorporating the southbound carriageway of the A61 Sheffield Road adjacent to the junction with the A6133 Cemetery Road.

9.3.5 The application site is located over 4.5km away from the nearest AQMA - Barnsley AQMA No. 5. Due to the large distance between the proposed scheme and Barnsley AQMA No.5, there is not predicted to be an increase in traffic flows as a result of the proposed scheme above the EPUK-IAQM criteria within this AQMA. Therefore, the AQMA has not been considered further within the air quality assessment.

9.3.6 All other Air Quality Strategy pollutants were below the relevant AQALs at locations of relevant public exposure, and as such no further AQMAs have been declared within the Council's administrative area.

Automatic Air Quality Monitoring

9.3.7 The UK Automatic Urban and Rural Network (AURN) is a countrywide network of air quality monitoring stations operated on behalf of the DEFRA. Monitoring data for AURN sites is available from the UK Air Information Resource (AIR) website (DEFRA, 2019 A).

9.3.8 The closest AURN monitor to the application site is the Barnsley Gawber AURN (NGR: x432524, y407478) located approximately 6.4km south west of the site. The Barnsley Gawber AURN is classified as an 'Urban Background' monitor, defined as:

"An urban location distanced from sources and therefore broadly representative of citywide background conditions".

9.3.9 Given the location of the Barnsley Gawber AURN monitor relative to the distance from the site, the site is not considered to be representative of background concentrations at the application site. Therefore, the Barnsley Gawber AURN has not been considered within the context of this assessment.

9.3.10 In addition to the AURN monitoring network, BMBC undertook automatic continuous monitoring at three locations across the borough during 2018. The closest BMBC monitoring location is situated over 5km from the site and therefore have not been considered representative of conditions at the proposed scheme.

Passive Diffusion Tube Monitoring

9.3.11 Passive diffusion tube monitoring is currently undertaken by BMBC at numerous locations throughout the Council's area as part of their commitment to LAQM. The diffusion tubes are located in areas which are deemed to require further assessment of NO₂ concentrations. Following a review of the latest available BMBC Air Quality Annual Status Report (BMBC, 2019 A), it was identified that no diffusion tube monitoring was undertaken within the vicinity of the site or Royston during 2018. Therefore, SLR has undertaken a site-specific NO₂ diffusion tube monitoring survey to determine baseline NO₂ concentrations at the proposed scheme site and surrounding local area. The agreed scope, methodology and results of the NO₂

diffusion tube monitoring survey can be found in the supporting Technical Appendix 9.1.

9.3.12 Reference should be made to Table 9.8 for a summary of monitored annual mean NO₂ concentrations.

Table 9.8: Monitored 2019 Annual Mean NO₂ Concentrations

Site ID	2019 Annual Mean NO ₂ Concentration (µg/m ³) ^(A)	Percentage of Annual Mean AQAL (%)
DT1	22.6	56.6
DT2	28.6	71.5
DT4	24.1	60.4
DT5	33.8	84.6
DT7	19.9	49.8
Note:		
(A) Results have been annualised and bias adjusted as outlined in Appendix 9.1.		

DEFRA Mapped Background Concentrations

9.3.13 Background pollutant concentration data on a 1km x 1km spatial resolution is provided by DEFRA through the UK-AIR website (DEFRA, 2019 A) and is routinely used to support LAQM and Air Quality Assessments.

9.3.14 Mapped background concentrations of NO₂, PM₁₀ and PM_{2.5} were downloaded for the grid squares containing the proposed scheme and operational phase sensitive receptors based upon the 2017 base year (DEFRA, 2019 A), (as shown in Table 9.9). Mapped background concentrations are presented for 2019 (projected from 2017 mapping base year).

9.3.15 A methodology is presented within LAQM.TG(16) (DEFRA, 2018) to remove individual source sectors from the mapped background concentrations presented as part of the AIR, to present those source sectors which are to be explicitly modelled. This approach avoids double counting of potential source contributions i.e. from existing baseline traffic flows included within the detailed dispersion modelling assessment. NO_x and PM₁₀ proportions from the 'primary A-road road in' sector of the grid square (where relevant), were removed from the 'total' background concentrations downloaded for each respective pollutant from the Air Quality Information Resource.

Table 9.9: DEFRA 2019 mapped background concentrations

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Pollutant	Mapped Background Concentration (µg/m³)	Sector Total to be Removed (µg/m³)	Adjusted Background (µg/m³)
Grid Square: x433500, y410500			
NO ₂	10.8	-	10.3
NO _x	14.6	0.70	13.9
PM ₁₀	10.7	0.01	10.7
Grid Square: x436500, y411500			
NO ₂	10.6	-	10.6
NO _x	14.3	0.00	14.3
PM ₁₀	10.3	0.01	10.3
Grid Square: x437500, y411500			
NO ₂	9.81	-	9.81
NO _x	13.2	0.00	13.2
PM ₁₀	10.4	0.01	10.4
Grid Square: x437500, y412500			
NO ₂	9.19	-	9.19

Pollutant	Mapped Background Concentration ($\mu\text{g}/\text{m}^3$)	Sector Total to be Removed ($\mu\text{g}/\text{m}^3$)	Adjusted Background ($\mu\text{g}/\text{m}^3$)
NO _x	12.3	0.00	12.3
PM ₁₀	10.8	0.01	10.8
Grid Square: x438500, y413500			
NO ₂	9.03	-	9.03
NO _x	12.1	0.00	12.1
PM ₁₀	11.5	0.01	11.5

Future Baseline

9.3.16 To assess the potential impact and effect on air quality arising from change in development trips during the operational phase of the scheme, the 2030 complete development opening year was considered with an appropriate 'do-minimum' scenario. The 'do-minimum' scenario included predicted traffic data should the development not occur, including relevant committed development flows. Reference should be made to Chapter 7: Transport for further details of committed development trip rates.

9.3.17 Mapped background concentrations have been forecast to 2030 (the site's opening year), as presented below in Table 9.10. Background concentration have again been 'adjusted' following the approach outlined within LAQM.TG(16) (DEFRA, 2018) to remove the 'primary A-road road in' sector of the grid square from the 'total' background concentrations.

Table 9.10: DEFRA 2030 mapped background concentrations

Pollutant	Mapped Background Concentration ($\mu\text{g}/\text{m}^3$)	Sector Total to be Removed ($\mu\text{g}/\text{m}^3$)	Adjusted Background ($\mu\text{g}/\text{m}^3$)
Grid Square: x433500, y410500			
NO ₂	7.70	-	7.46

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Pollutant	Mapped Background Concentration ($\mu\text{g}/\text{m}^3$)	Sector Total to be Removed ($\mu\text{g}/\text{m}^3$)	Adjusted Background ($\mu\text{g}/\text{m}^3$)
NO _x	10.2	0.30	9.82
PM ₁₀	10.2	0.01	10.2
Grid Square: x436500, y411500			
NO ₂	7.67	-	7.67
NO _x	10.1	0.00	10.1
PM ₁₀	9.74	0.01	9.74
Grid Square: x437500, y411500			
NO ₂	7.21	-	7.21
NO _x	9.48	0.00	9.48
PM ₁₀	9.82	0.00	9.82
Grid Square: x437500, y412500			
NO ₂	6.74	-	6.75
NO _x	8.82	0.00	8.82
PM ₁₀	10.3	0.01	10.3

Pollutant	Mapped Background Concentration ($\mu\text{g}/\text{m}^3$)	Sector Total to be Removed ($\mu\text{g}/\text{m}^3$)	Adjusted Background ($\mu\text{g}/\text{m}^3$)
Grid Square: x438500, y413500			
NO ₂	6.63	-	6.62
NO _x	8.65	0.00	8.65
PM ₁₀	10.9	0.01	10.9

9.3.18 Mapped background concentrations of NO₂ and PM₁₀ for the above grid squares were applied to the following receptor locations, as identified within Table 9.9 and Table 9.10, and illustrated on Drawing AQ2 in Appendix 9.2.

- R1-R3: x433500, y410500;
- R4-R13, DT1-DT6: x436500, y411500;
- R14-R17, DT7: x437500, y411500;
- R18: x437500, y412500; and
- R19: x438500, y413500.

Sensitive receptors

9.3.19 The following sensitive receptors have been identified and assessed within the ES:

- construction dust sensitive receptors;
- ecologically sensitive receptors; and
- road traffic emissions sensitive receptors (existing receptors).

Ecologically sensitive receptors

9.3.20 In relation to the construction phase assessment, this included consideration of any ecological designation within 50m of the proposed scheme boundary, or 50m of any road projected to witness construction phase road traffic movements, that could potentially be affected by dust from the construction phases of the proposed development.

9.3.21 A search within 50m of the development boundary / road projected to witness construction phase road traffic movements identifies no receptors. The closest ecological designation to the proposed scheme is the Carlton Marsh Local Nature

Reserve (LNR) located approximately 1.5km south of the proposed scheme and therefore unaffected by the construction phase of the proposed scheme.

9.3.22 The Carlton Marsh LNR is situated over 200m from any road expected to witness any additional traffic flows as a result of the proposed scheme. Therefore, Carlton Marsh LNR is considered to be unaffected by the proposed scheme in the operational phase.

Construction dust sensitive receptors

9.3.23 The main receptors likely to be affected by the generation of construction dust are those existing receptors within approximately 350m of the development site boundary and/or within 50m of the route(s) used by vehicles on the public highway, up to 500m from the site entrance(s) (IAQM, 2016). However, for those receptors sited in a downwind location from the development site boundary, potential dust impacts may be witnessed at a distance of greater than 350m on occasion under worst case conditions.

9.3.24 Reference should be made to Drawing AQ1 within Technical Appendix 9.2 for an illustration of buffer zones of all sensitive receptors with the potential to be impacted upon by construction phase dust in accordance with the stated IAQM assessment methodology.

Road traffic emissions sensitive receptors

9.3.25 The sensitive receptor locations considered representative of potential exposure for the Air Quality Assessment are shown in Table 9.11. Where these are referenced within the report text, they are referred to as R1 – R19. Receptors have been modelled at a height of 1.5m above ground level to represent exposure (i.e. breathing) height. Diffusion tube monitoring locations DT1 – DT7 from the period of site-specific air quality monitoring presented in Table 9.8 have been included within the modelling assessment, however as these do not represent relevant exposure, impacts at these locations have not been considered.

9.3.26 Reference should be made to Drawing AQ2 within Appendix 9.2 for an illustration of the location of these receptors relative to the development.

Table 9.11: Operational phase human sensitive receptors

Receptor		NGR (m)		Height (m)
		X	Y	
R1	The Old Police Station	433487.8	410538.7	1.50
R2	Wakefield Road	433409.4	410616.8	1.50
R3	Shaw Lane	433437.4	410554.1	1.50
R4	25 High Street	436042.4	411386.3	1.50

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Receptor		NGR (m)		Height (m)
		X	Y	
R5	12 High Street (Relevant exposure near DT4)	436148.0	411389.5	1.50
R6	Church Street (Relevant exposure near DT2)	436205.3	411414.9	1.50
R7	Church Street (Relevant exposure opposite DT2)	436221.8	411425.6	1.50
R8	2 Station Road	436156.2	411466.3	1.50
R9	Chantry Grove	436356.4	411249.1	1.50
R10	4 Midland Road	436221.2	411464.7	1.50
R11	Parkside Primary Academy	436309.8	411439.2	1.50
R12	87 Midland Road	436572.7	411686.1	1.50
R13	193 Midland Road (Relevant exposure near DT6)	436900.1	411775.9	1.50
R14	317 Midland Road	437240.3	411675.1	1.50
R15	Cross Lane	437277.9	411668.0	1.50
R16	Midland Road (Relevant exposure near DT7)	437270.1	411700.3	1.50
R17	Station Inn	437415.8	411734.0	1.95
R18	Lund Hill Lane	437562.1	412563.7	2.05
R19	Westmead Boarding Kennels and Cattery	438056.0	413193.2	2.00

Receptor		NGR (m)		Height (m)
		X	Y	
DT1	SLR Diffusion Tube Monitoring Location	436357.5	411250.4	2.00
DT2	SLR Diffusion Tube Monitoring Location	436209.2	411411.1	2.00
DT3	SLR Diffusion Tube Monitoring Location	436157.6	411492.3	1.95
DT4	SLR Diffusion Tube Monitoring Location	436146.9	411390.8	2.05
DT5	SLR Diffusion Tube Monitoring Location	436214.1	411486.7	1.95
DT6	SLR Diffusion Tube Monitoring Location	436900.9	411774.8	2.05
DT7	SLR Diffusion Tube Monitoring Location	437270.6	411698.4	2.00

9.4 Assessment of Likely Significant Effects

Likely Significant Effects

9.4.1 The following effects (Table 9.12) are considered significant (prior to the consideration of mitigation, as addressed in Section 9.5) and are reported within this chapter:

Table 9.12: Likely Significant Effects (without mitigation)

Likely Significant Effect	Applicable Phase
Generation of dust due to construction related activities	Construction Phase
Generation of odour and dust due to construction activities following remediation works	Construction Phase
Change in NO ₂ and PM ₁₀ concentrations due to additional vehicle movements associated with the development	Construction and Operational Phase

Construction Phase

9.4.2 All construction activities below are considered to be undertaken after the remediation phase of the scheme has been completed.

9.4.3 Construction activities will include:

- Demolition;
- material import and export;
- temporary stockpiling of materials;
- landscaping works;
- construction of new on-site facilities; and
- associated vehicle movements (including track-out of material by construction phase movements).

9.4.4 The following subsections provide a consideration of potential construction dust and conclude with a determined emission class and risk category, from each of the 4 categories identified by the IAQM Guidance (IAQM, 2016).

9.4.5 As shown in Drawing AQ1 within Appendix 9.2, there are 'human receptors' within 350m of the application site but no designated habitat sites within 50m of the application site boundary or within 50m of the application site entrance / 500m of the roads anticipated to witness construction traffic movements. Therefore, an assessment of construction dust on ecological receptors can be screened out from this assessment but an assessment of construction dust at human receptors is required.

Potential dust emissions magnitude

9.4.6 The land is a former Coke and Chemical Works, with a small number of buildings, structures and infrastructure which will require demolition. It is assumed that the majority of buildings will be demolished during the remediation phase of the proposed scheme. However, to provide a precautionary approach, these have been included within the demolition phase of the main construction phase dust emissions assessment. Total building volume is less than 20,000 m³. Therefore, the dust emission magnitude for demolition is initially considered to be 'small'.

9.4.7 The proposals comprise the development of approximately 500 residential dwellings and associated infrastructure. Site earthworks are required over an area greater than 10,000m². Due to the typical phased nature of construction of residential schemes, the total site area at any given time is expected to be less than the overall site size but likely to remain greater than 10,000m². In addition, given the size of the site, >10 heavy earth moving vehicles are considered to be required on site at once. The dust emission magnitude for earthworks is therefore initially considered to be 'large'.

9.4.8 Taking into account the number of proposed dwellings, total building volume associated with the proposed scheme is predicted to be above 100,000m³. The dust emission magnitude for construction is therefore initially considered to be 'large'.

9.4.9 Construction vehicles are expected to access the site using two access points on Lund Hill Lane. No details were available at the time of assessment on the number of additional HDV movements associated with construction works in each phase, however, taking a conservative approach, the number of predicted outward HDV

movements in any one day could be >50 at any point during construction. The dust emission magnitude for trackout is therefore considered to be 'large'.

9.4.10 A summary of the dust emission magnitude for the four activities is detailed in Table 9.13.

Table 9.13: Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

Construction Phase Sensitivity

Dust Soiling Impacts

9.4.11 The proposed scheme is within a residential locality to the south west, with industrial premises to the west and green land bordering the rest of the site to the north and south. Residential receptors to the south west are located within 20m of the proposed scheme's southern boundary (estimated 1-10 highly sensitivity receptors). Construction generated traffic will enter/exit the site via Lund Hill Lane. There are 10-100 high sensitivity residential receptors within 20m of the potential Trackout. This represents a worst-case approach, accounting for any potential use of the smaller parcel of land to the west of the railway line.

9.4.12 The sensitivity of the area with respect to dust soiling effects on people and property in relation to demolition, earthworks and construction is therefore 'medium' and in relation to trackout activities is 'high'.

Human Health Impacts

9.4.13 The DEFRA 2019 mapped background PM₁₀ concentration (projected from the mapped 2017 base year) for the 1km² grid square containing the development (grid square NGR: x437500, y411500) is estimated to be 10.4µg/m³. This is below 24µg/m³ and therefore is considered 'low' sensitivity.

9.4.14 Given the above information regarding the number of residential receptors within 20m of the site boundary and within 500m from the site entrance on the access

roads, the sensitivity of the area with respect to human health impacts in relation to earthworks, construction and trackout is therefore considered to be 'low'.

9.4.15 A summary of the sensitivity of the surrounding area for the four activities is detailed in Table 9.14.

Table 9.14: Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling Impacts	Medium	Medium	Medium	High
Human Health Impacts	Low	Low	Low	Low

Construction and Demolition risk of impacts (unmitigated)

9.4.16 The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined Table 9.15 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Table 9.15: Risk of Dust Impacts

Potential Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling Impacts	Low Risk	Medium Risk	Medium Risk	High Risk
Human Health Impacts	Negligible	Low Risk	Low Risk	Low Risk

9.4.17 The outcome of the assessment of the potential 'magnitude of dust emissions', and the 'sensitivity of the area' are combined Table 9.15 below to determine the risk of impact which is used to inform the selection of appropriate mitigation.

Construction Phase Road Traffic Emissions

9.4.18 Detailed information on traffic movements anticipated during construction works was unavailable for the completion of the air quality assessment. However, based on a reasonable understanding of the likely movements associated with a development of this nature, the development quantum is not anticipated to result in a significant increase in movements above the EPUK-IAQM criterion. The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criterion presented within EPUK-IAQM guidance, additional road vehicle trips during the construction phase of the scheme *'can be considered to have insignificant effects'* on air quality.

Construction Phase Plant Emissions

9.4.19 During the construction phase NRMM and plant shall be well maintained; if any emissions of dark smoke occur then the relevant machinery should stop immediately and any problem rectified. In addition, the following controls should apply to NRMM:

- all NRMM should use fuel equivalent to ultralow sulphur diesel;
- all NRMM should comply with either the current or previous EU Directive Staged Emission Standards;
- all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- the on-going conformity of plant retrofitted with DPF, to a defined performance standard; and
- implementation of fuel conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, ensure equipment is properly maintained to ensure efficient fuel consumption.

9.4.20 Successful implementation of the above mitigation measures would ensure that emissions from the construction phase and NRMM used during construction phase result in a 'not significant' effect on air quality.

Operational Phase

Road Traffic Emissions Assessment

9.4.21 This section presents the potential air quality impacts arising from road traffic vehicle emissions associated with the operational phase of the proposed scheme. In summary, the assessment has utilised the following inputs as a precautionary approach:

- 2030 emission factors from v9.0 of the EFT; and
- 2030 mapped background concentrations sourced from the DEFRA mapping study.

9.4.22 Reference should be made to Appendix 9.2 for details of the model verification / model inputs / model output treatments and sensitivity analysis to the dispersion modelling assessment.

NO₂ Annual Mean – Existing Receptors

9.4.23 Predicted annual mean NO₂ concentrations were assessed against the AQAL of 40µg/m³, based upon the existing receptor locations outlined in Table 9.16 and Drawing AQ2 within Appendix 9.2. Diffusion tube monitoring locations have been included within the assessment to demonstrate future trends in NO₂ across the wider area, however as they are not locations of relevant exposure, associated impacts descriptors have not been considered.

Table 9.16: Summary of Predicted Annual Mean NO₂ Concentrations: Road Vehicle Emissions: 2030 Development Opening Year

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Receptor	Predicted 2030 NO ₂ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R1 ^(B)	21.8	22.2	+0.42	1.05
R2 ^(B)	12.3	12.4	+0.12	0.30
R3 ^(B)	17.9	18.2	+0.35	0.88
R4 ^(C)	16.3	17.2	+0.90	2.25
R5 ^(C)	15.0	15.7	+0.72	1.80
R6 ^(C)	18.2	18.8	+0.63	1.58
R7 ^(C)	13.8	14.3	+0.43	1.08
R8 ^(C)	17.2	17.8	+0.59	1.48
R9 ^(C)	13.9	14.2	+0.30	0.75
R10 ^(C)	17.8	19.0	+1.15	2.88
R11 ^(C)	10.2	10.5	+0.25	0.63
R12 ^(C)	14.1	15.2	+1.11	2.78
R13 ^(C)	11.0	12.2	+1.22	3.05
R14 ^(D)	12.1	13.3	+1.25	3.13

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Air Quality

Receptor	Predicted 2030 NO ₂ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
R15 ^(D)	10.4	11.2	+0.81	2.03
R16 ^(D)	12.5	14.1	+1.59	3.98
R17 ^(D)	10.6	11.8	+1.17	2.93
R18 ^(E)	9.16	9.63	+0.47	1.18
R19 ^(F)	13.4	13.9	+0.44	1.10
DT1 ^(B)	13.9	14.3	+0.32	-
DT2 ^(B)	16.9	17.5	+0.56	-
DT3 ^(B)	16.5	17.0	+0.43	-
DT4 ^(B)	14.9	15.6	+0.71	-
DT5 ^(B)	17.3	18.5	+1.18	-
DT6 ^(B)	10.9	12.1	+1.18	-
DT7 ^(C)	12.3	13.9	+1.54	-

Note:

^(A) Scenario modelled as an assumed 2030 development opening year, with 2030 emission factors and 2030 mapped background pollutant concentrations.

^(B) Annual mean concentrations inclusive of 2030 background NO_x concentration of 9.82µg/m³.

Receptor	Predicted 2030 NO ₂ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the AQAL (%)
	'Do-minimum'	'Do-something'		
(C) Annual mean concentrations inclusive of 2030 background NOx concentration of 10.1µg/m ³ .				
(D) Annual mean concentrations inclusive of 2030 background NOx concentration of 9.48µg/m ³ .				
(E) Annual mean concentrations inclusive of 2030 background NOx concentration of 8.82µg/m ³ .				
(F) Annual mean concentrations inclusive of 2030 background NOx concentration of 8.65µg/m ³ .				

9.4.24 As shown in Table 9.16, there are not predicted to be any exceedances of the annual mean NO₂ AQAL at any identified sensitive receptor in both the 'do-minimum' and 'do-something' scenario.

9.4.25 The maximum predicted change in annual mean NO₂ concentrations associated with additional development trips at any modelled receptor of relevant exposure is +1.59µg/m³, representing 3.98% of the AQAL, as predicted at R16 (Residential – Midland Road).

9.4.26 Predicted impacts on annual mean NO₂ concentrations are summarised in Table 9.17, based upon the descriptors presented within Tables 9.3 to 9.6.

Table 9.17: Summary of Predicted Annual Mean NO₂ Concentrations: Road Vehicle Emissions: 2030 Development Opening Year

Receptor	Sensitivity	Magnitude of Change	Level of Effect
R1	Negligible	Low	Negligible
R2	Negligible	Negligible	Negligible
R3	Negligible	Low	Negligible
R4	Negligible	Medium	Negligible
R5	Negligible	Medium	Negligible

Receptor	Sensitivity	Magnitude of Change	Level of Effect
R6	Negligible	Medium	Negligible
R7	Negligible	Low	Negligible
R8	Negligible	Low	Negligible
R9	Negligible	Low	Negligible
R10	Negligible	Medium	Negligible
R11	Negligible	Low	Negligible
R12	Negligible	Medium	Negligible
R13	Negligible	Medium	Negligible
R14	Negligible	Medium	Negligible
R15	Negligible	Medium	Negligible
R16	Negligible	Medium	Negligible
R17	Negligible	Medium	Negligible
R18	Negligible	Low	Negligible
R19	Negligible	Low	Negligible

9.4.27 As indicated in Table 9.17, the predicted magnitude of change of annual mean NO₂ concentrations is 'Negligible' at one receptor, 'Low' at eight receptors and 'Medium' at all other considered receptors. The predicted sensitivity of the considered receptors with the development is 'Negligible' at all considered sensitive receptors.

Considering Table 9.6, the level of effect at all sensitive receptors is predicted to be 'Negligible'.

NO₂ 1-hour Mean – Existing Receptors

9.4.28 The maximum annual mean NO₂ 'do-something' concentration is 22.2µg/m³ (receptor location R1). Therefore, predicted concentrations are well below the 60µg/m³ indicative criteria and, in accordance with DEFRA guidance, exceedances of the 1-hour mean NO₂ AQAL are considered unlikely.

PM₁₀ Annual Mean – Existing Receptors

9.4.29 Predicted annual mean ground level PM₁₀ concentrations were assessed against the PM_{2.5} AQAL of 25µg/m³, in accordance with EPUK-IAQM guidance (EPUK & IAQM, 2017).

Table 9.18: Summary of Predicted Annual Mean PM₁₀ Concentrations: Road Vehicle Emissions: 2030 Development Opening Year

Receptor	Predicted 2030 PM ₁₀ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the PM _{2.5} AQAL (%)
	'Do-minimum'	'Do-something'		
R1 ^(B)	15.8	16.0	+0.18	0.71
R2 ^(B)	12.3	12.4	+0.05	0.19
R3 ^(B)	14.5	14.6	+0.15	0.59
R4 ^(C)	14.0	14.4	+0.44	1.76
R5 ^(C)	13.1	13.5	+0.33	1.33
R6 ^(C)	14.1	14.4	+0.27	1.08
R7 ^(C)	12.4	12.6	+0.18	0.72
R8 ^(C)	13.5	13.8	+0.25	0.99
R9 ^(C)	12.8	12.9	+0.14	0.58

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Receptor	Predicted 2030 PM ₁₀ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the PM _{2.5} AQAL (%)
	'Do-minimum'	'Do-something'		
R10 ^(C)	13.8	14.3	+0.47	1.88
R11 ^(C)	11.0	11.1	+0.11	0.43
R12 ^(C)	12.9	13.5	+0.53	2.12
R13 ^(C)	11.5	12.1	+0.57	2.30
R14 ^(D)	11.7	12.2	+0.49	1.97
R15 ^(D)	11.2	11.5	+0.34	1.37
R16 ^(D)	12.2	12.9	+0.71	2.85
R17 ^(D)	11.5	12.0	+0.55	2.21
R18 ^(E)	11.4	11.6	+0.22	0.88
R19 ^(F)	12.7	12.8	+0.13	0.50

Note:

(A) Scenario modelled as an assumed 2030 development opening year, with 2030 emission factors and 2030 mapped background pollutant concentrations.

(B) Annual mean concentrations inclusive of 2030 background PM₁₀ concentration of 10.2µg/m³.

(C) Annual mean concentrations inclusive of 2030 background PM₁₀ concentration of 9.74µg/m³.

(D) Annual mean concentrations inclusive of 2030 background PM₁₀ concentration of 9.82µg/m³.

Receptor	Predicted 2030 PM ₁₀ Concentration (µg/m ³) ^(A)		Change (µg/m ³)	Change as a Percentage of the PM _{2.5} AQAL (%)
	'Do-minimum'	'Do-something'		
(E) Annual mean concentrations inclusive of 2030 background PM ₁₀ concentration of 10.2µg/m ³ .				
(F) Annual mean concentrations inclusive of 2030 background PM ₁₀ concentration of 10.9µg/m ³ .				

9.4.30 As shown in Table 9.18, there are not predicted to be any exceedances of the annual mean PM₁₀ AQAL, or the more stringent PM_{2.5} AQAL, at any identified receptor in either scenario. The maximum predicted change in annual mean PM₁₀ concentrations associated with additional development trips at any modelled receptor of relevant exposure is +0.71µg/m³, representing 2.85% of the PM_{2.5} AQAL, as predicted at receptor location R16 (Midland Road).

9.4.31 Predicted impacts assessed against the annual mean PM_{2.5} AQAL are summarised in Table 9.19, based upon the descriptors presented within Tables 9.3 to 9.6.

Table 9.19: Summary of Predicted Annual Mean PM₁₀ Concentrations: Road Vehicle Emissions: 2030 Development Opening Year

Receptor	Sensitivity	Magnitude of Change	Level of Effect
R1	Negligible	Low	Negligible
R2	Negligible	Negligible	Negligible
R3	Negligible	Low	Negligible
R4	Negligible	Medium	Negligible
R5	Negligible	Low	Negligible
R6	Negligible	Low	Negligible
R7	Negligible	Low	Negligible

Receptor	Sensitivity	Magnitude of Change	Level of Effect
R8	Negligible	Low	Negligible
R9	Negligible	Low	Negligible
R10	Negligible	Medium	Negligible
R11	Negligible	Negligible	Negligible
R12	Negligible	Medium	Negligible
R13	Negligible	Medium	Negligible
R14	Negligible	Medium	Negligible
R15	Negligible	Low	Negligible
R16	Negligible	Medium	Negligible
R17	Negligible	Medium	Negligible
R18	Negligible	Low	Negligible
R19	Negligible	Low	Negligible

9.4.32 As indicated in Table 9.19, the predicted magnitude of change of annual mean PM₁₀ concentrations at sensitive receptors is 'Negligible' at two sensitive receptors, 'Low' at 10 sensitive receptors and 'Medium' at seven sensitive receptors, based upon the PM_{2.5} AQUAL. The predicted sensitivity with the development is 'Negligible' at all sensitive receptors based upon the PM_{2.5} AQUAL.

PM₁₀ 24-hour Mean – Existing Receptors

9.4.33 Based upon the maximum predicted annual mean PM₁₀ concentration of 16.0µg/m³ (receptor location R1) this equates to zero days where 24-hour mean PM₁₀ concentrations are greater than 50µg/m³. 35-days where 24-hour mean

concentrations are in excess of 50µg/m³ are permitted and, therefore, the number of maximum exceedances is in compliance with the 24-hour mean AQAL.

Significance of Road Traffic

9.4.34 The EPUK-IAQM guidance (EPUK & IAQM, 2017) considers a number of factors for the determination of significance of predicted air quality impacts. Such factors include:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the development has adopted best practice to eliminate and minimise emissions.

9.4.35 The unmitigated impact associated with the scheme has been predicted in accordance with the stated assessment methodology. The following factors have been taken into account:

- there are no predicted exceedances of the annual mean NO₂ or PM₁₀ (or PM_{2.5}) AQALs as a result of predicted development trips;
- a negligible level of effect on annual mean NO₂ concentrations has been predicted at all considered sensitive receptor locations;
- a negligible level of effect on annual mean PM₁₀ concentrations has been predicted at all considered sensitive receptor locations, even with change in concentrations as a result of the development assessed against the more exacting PM_{2.5} AQAL;
- exceedances of the 1-hour mean NO₂ and 24-hour mean PM₁₀ AQALs are considered unlikely, based upon the marginal change in concentrations and absolute concentrations predicted through the dispersion modelling study; and
- the dispersion modelling has been verified using a NO₂ concentration dataset from a period of site-specific baseline monitoring. This baseline monitoring indicated no existing exceedances of the NO₂ annual mean AQAL in the development locale.

9.4.36 A sensitivity assessment of the model input variables (emission factors and background concentrations) has been considered and is presented in Appendix 9.2. However, the overall conclusion over the significance of the effect has been based upon the main body of the assessment and the impact assessment based upon a 2030 development opening year.

9.4.37 Therefore, on the basis of the above, the overall effect on air quality as a result of the additional development trips on sensitive receptors is considered to be 'not significant'.

Risk Assessment of Dust and Odour (Post-remediation activities)

9.4.38 An assessment of the potential for any residual dust or odour effects from the contaminated materials has been undertaken. This assessment considers potential impacts subsequent to the remediation activities having been carried out and completed. Reference should be made to Chapter 8 and Appendix 9.2 for further information.

9.4.39 The IAQM method is a risk-based approach based on the source-pathway-receptor conceptual model, i.e. the hypothetical relationship between the source (S) of the pollutant, the pathway (P) by which exposure might occur, and the receptor (R) that could be adversely affected.

9.4.40 The source of the previously treated materials will be entombed by a layer of non-contaminated soils. A capping layer will be placed across the previously treated materials to prevent mobilisation during any subsequent construction works. Therefore, the source dust and odour potential is classed as zero. The IAQM odour guidance (IAQM, 2018) states:

“Before an adverse effect (such as disamenity, annoyance, nuisance or complaints) can occur, there must be odour exposure. For odour exposure to occur all three links in the source-pathway-receptor chain must be present.”

9.4.41 Following the IAQM odour guidance (IAQM, 2018) as there is no potential for the emission source to be released into the atmosphere, there would be no potential for the adverse effects to occur: the pathway and receptor elements of the source-pathway-receptor conceptual model are therefore considered immaterial.

9.4.42 Therefore, overall as there is considered a negligible risk, the level of effect of residual dust and odour post-remediation activities is considered to be ‘not significant’.

9.5 Mitigation and Enhancement

Mitigation Hierarchy

9.5.1 An IAQM position statement (IAQM, 2015) recommends basic hierarchy principles for determining appropriate mitigation measures for a development scheme. These are as follows:

- Preventing and Avoiding - the initial step should be to, if possible, prevent or avoid exposure to the pollutant by isolating or removing potential sources. The design process should take air quality into account.
- Reduction and Minimisation - all options for avoiding exposure and preventing exposure should be implemented. Preference should be given to measures which are close to the potential source, then those which act on the pathway and finally measures close to the point of exposure.
- Off-setting -compensating for impacts associated with the new development by contributing to air quality improvements elsewhere.

9.5.2 This hierarchy for mitigation measures has been considered in the determination of mitigation measures required.

9.5.3 In addition to the IAQM Position Statement, the Air Quality and Emissions Good Practice Planning Document (BMBC, 2020) has been used to determine the relevant

mitigation measures required for the proposed scheme, based on the 'major' development classification.

Primary mitigation

9.5.4 Primary mitigation has been identified as being required as part of the construction phase in order to address the potential risks identified in Section 9.4, which would otherwise be significant.

Construction Phase - Dust

9.5.5 Following the construction dust assessment, the site is found to be at worse high risk in relation to dust soiling effects on people and property and low risk in relation to human health impacts, Table 9.15.

9.5.6 Potential dust effects during the construction phase are considered to be temporary in nature. The impacts are determined to be temporary as they will only potentially occur throughout the construction phase and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

9.5.7 Commensurate with the above designation of dust risk, mitigation measures, as identified by IAQM guidance are required to ensure that any potential impacts arising from the construction phase of the proposed scheme are reduced and, where possible, completely removed. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Table 9.20, construction dust impacts are considered to be not significant.

Table 9.20: Construction dust mitigation measures

Site Application	Mitigation Measures
Highly Recommended	
Dust management	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document.
	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.

Site Application	Mitigation Measures
	Make the complaints log available to the LA when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
	Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.
	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.

Site Application	Mitigation Measures
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
	Avoid bonfires and burning of waste materials.

Site Application	Mitigation Measures
Demolition	Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
	Avoid explosive blasting, using appropriate manual or mechanical alternatives.
	Bag and remove any biological debris or damp down such material before demolition.
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.

Site Application	Mitigation Measures
	Access gates to be located at least 10m from receptors where possible.

Construction Phase - NRMM Emissions

9.5.8 During the construction phase NRMM and plant shall be well maintained; if any emissions of dark smoke occur then the relevant machinery should stop immediately and any problem rectified. In addition, the following controls should apply to NRMM:

- all NRMM should use fuel equivalent to ultralow sulphur diesel;
- all NRMM should comply with either the current or previous EU Directive Staged Emission Standards;
- all NRMM should be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- the on-going conformity of plant retrofitted with DPF, to a defined performance standard; and
- implementation of fuel conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded, ensure equipment is properly maintained to ensure efficient fuel consumption.

9.5.9 Successful implementation of the above mitigation measures would ensure that emissions from the construction phase and NRMM used during construction phase result in a 'not significant' effect on air quality.

Secondary mitigation

Operational Phase Mitigation

9.5.10 An overall 'not significant' effect on air quality is predicted during the operational phase of the development, prior to any consideration of secondary mitigation or enhancement measures. Notwithstanding, the following transport related mitigation measures are proposed as part of the scheme and they will help to further reduce the air quality impact.

9.5.11 The site is a 'major' development proposal in accordance with BMBC Air Quality and Emissions Good Practice Planning Document criteria. The Document outlines appropriate mitigation measures that apply to the proposal classification are Type 1, Type 2 and Type 3. All Type 1 and Type 2 measures will be applied as part of the proposed scheme. Type 3 measures which have been deemed applicable to the site have also been included. The following mitigation measures are therefore proposed for inclusion within the proposed scheme during the operational phase:

Type 1:

- 1 electrical vehicle charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking) (minimum 7 kW (32

AMP)) – a requirement within BMBC’s Sustainable Travel Planning Document 2019 (BMBC, 2019 C).

Type 2:

- Travel Plan, including an agreed mechanism for discouraging high emission vehicle use and encouraging modal shift (i.e. to public transport, cycling and walking), as well as uptake of low emission fuels and technologies – See Chapter 7: Transport;
- improved pedestrian access to public transport – See Chapter 7: Transport;
- site layout designed to encourage walking and cycling;– See Chapter 7: Transport.

Type 3, further measures applicable to site are as per the Travel Plan (See Chapter 7 – Transport for further details).

Tertiary Mitigation

9.5.12 No tertiary mitigation is considered as part of the construction or operational phase assessment.

Residual Effects

Construction phase

9.5.13 On the basis that the mitigation measures outlined in Table 9.14 are implemented as part of the development design for inclusion within either a CEMP or DMP, the residual effects from activities generating construction phase dust are predicted to be ‘not significant’ in accordance with the stated IAQM guidance (IAQM, 2016).

Operational Phase Road Traffic Emissions

9.5.14 A ‘not significant’ effect is predicted at all existing receptors. Notwithstanding this, additional secondary mitigation measures are included that will reduce impacts further. Nonetheless, the overall residual effects as a result of additional traffic movements associated with the proposed scheme remains negligible and therefore ‘not significant’.

9.6 Summary

Baseline Conditions

9.6.1 SLR undertook a site-specific NO₂ diffusion tube monitoring survey to determine baseline NO₂ concentrations at the proposed scheme site and surrounding local area. The results of this diffusion tube monitoring survey have been utilised to determine the existing air quality baseline within the vicinity of the development site and verify the operational phase dispersion modelling assessment.

9.6.2 DEFRA background map concentrations have been utilised to determine the existing baseline 2019 and future baseline 2030 background pollutant concentrations.

Assessment of Effects

- 9.6.3 Following the construction dust assessment, the site is found to be at worse high risk in relation to dust soiling effects on people and property and at worse low risk in relation to human health impacts dust impacts to people in regard to trackout from the site. In accordance with IAQM guidance, providing effective mitigation measures are implemented, such as those outlined in Table 9.14, construction dust impacts are considered to be 'not significant'.
- 9.6.4 The proposed scheme is not anticipated to result in a significant increase in traffic movements above the EPUK-IAQM criterion during the construction phase. The duration of movements will be short-term in nature and are not considered further within the context of this assessment. Therefore, in accordance with the criterion presented within EPUK-IAQM guidance, additional road vehicle trips during the construction phase of the scheme is considered to result in an 'insignificant' effect on air quality.
- 9.6.5 Following successful implementation of the above mitigation measures would ensure that emissions from the construction phase and NRMM used during construction phase result in a 'not significant' effect on air quality.
- 9.6.6 Following the road traffic assessment, there are not predicted to be any exceedances of the annual mean NO₂ AQAL, PM₁₀ AQAL, or the more stringent PM_{2.5} AQAL at any identified sensitive receptor in either the 'do-minimum' and 'do-something' scenario. Exceedances of the 1-hour mean NO₂ AQAL are considered unlikely. The number of maximum 24-hour PM₁₀ exceedances is in compliance with the 24-hour mean AQAL.
- 9.6.7 The overall effect on air quality as a result of the additional development trips on sensitive receptors is considered to be 'not significant'.

Conclusions

- 9.6.8 It is considered that air quality does not represent a material constraint to the development proposals, which conform to the principles of National Planning Policy Framework and associated Planning Practice Guidance, the BMBC Local Plan and BMBC's Air Quality and Emissions Good Practice Planning Document.

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