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ENVIRONMENT

Wain Estates (Land) Limited
Wilderness Park
Land North of Wilderness Lane, Great Barr
Air Quality Assessment

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EXECUTIVE SUMMARY

BWB Consulting Limited was appointed by Wain Estates (Land) Limited to undertake an air quality assessment for a proposed residential development known as Wilderness Park, at land north of Wilderness Lane, Great Barr, Birmingham.

The Site is located within the administrative area of Sandwell Metropolitan Borough Council and is located within the Sandwell Metropolitan Borough Council Air Quality Management Area, which was designated for the potential exceedance of the annual mean nitrogen dioxide objective for England.

A qualitative construction phase dust assessment was undertaken in accordance with Institute of Air Quality Management guidance and measures were recommended to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions was considered to be 'not significant' in accordance with Institute of Air Quality Management guidance.

The proposed development trip generation was screened using the Institute of Air Quality Management and Environmental Protection UK two stage screening process, to determine whether a detailed road traffic emissions impact assessment was required. Consideration was also given to the Black Country Air Quality Supplementary Planning Document. The proposed development trip generation exceeds the relevant screening criteria and therefore detailed air dispersion modelling of development-generated road traffic was undertaken. Measures were recommended in accordance with the Black Country Air Quality Supplementary Planning Document.

A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the air dispersion model ADMS-Roads and concentrations of nitrogen dioxide and particulate matter (PM_{10} and $PM_{2.5}$) were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance, Institute of Air Quality Management & Environmental Protection UK guidance. The development was not predicted to result in any new exceedances of the current relevant air quality objectives for England and the overall significance of the development on local air quality was predicted to be 'not significant' in accordance with guidance.

Concentrations of nitrogen dioxide and particulate matter were also predicted across the proposed development Site and the suitability of the Site for the proposed residential use considered with regard to the current relevant air quality objectives for England. Pollutant concentrations were predicted to be below the objectives and the Site was therefore considered suitable for the proposed residential use.

Consideration was also given to the Black Country Supplementary Planning Document and the development was categorised, and mitigation recommended, in accordance with the guidance. The development measures included within the development proposals were considered to meet the required measures outlined in the Black Country Supplementary Planning Document.

CONTENTS

FIGURES

TABLES

APPENDICES

1. INTRODUCTION

1.1 BWB Consulting Limited (BWB) was instructed by Wain Estates (Land) Limited (the Client) to undertake an air quality assessment for a proposed residential development known as Wilderness Park at land north of Wilderness Lane, Great Barr, Birmingham ('the Site').

1.2 The assessment considers construction phase dust impacts and operational phase road traffic emissions. A qualitative construction phase dust assessment was undertaken in accordance with relevant guidance. A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified receptor locations. In addition, pollutant concentrations were predicted across the proposed development Site.

1.3 This report is necessarily technical in nature so to assist the reader a glossary of air quality terminology can be found in **Appendix A**.

Site Setting

1.4 The Site is located to the north of Wilderness Lane, Great Barr and is within the administrative area of Sandwell Metropolitan Borough Council (SMBC). The Site currently comprises managed/low value farmland and is part of a Site of Importance for Nature Conservation (SINC).

1.5 **Figure 1.1** details the location of the proposed development.

1.6 To the north of the Site lies playing fields and the A34 Birmingham Road, to the east of the Site lies residential dwellings, with Peak House Road and the A34 Birmingham Road located beyond. To the south east of the Site lies Wilderness Lane, with residential dwellings and the M6 motorway located beyond, and to the south lies the Great Barr Q3 Academy.

1.7 Principal air pollution sources in the vicinity of the Site are likely to comprise road traffic emissions from the A34 Birmingham Road and M6 motorway. The Site is located within the existing SMBC Air Quality Management Area (AQMA), which covers the whole of the SMBC administrative area.

Proposed Development

1.8 The proposed development comprises the development of up to 150 new dwellings, a countryside park and associated works. The illustrative masterplan for the proposed development is detailed in **Appendix B**.

Figure 1.1: Site Location

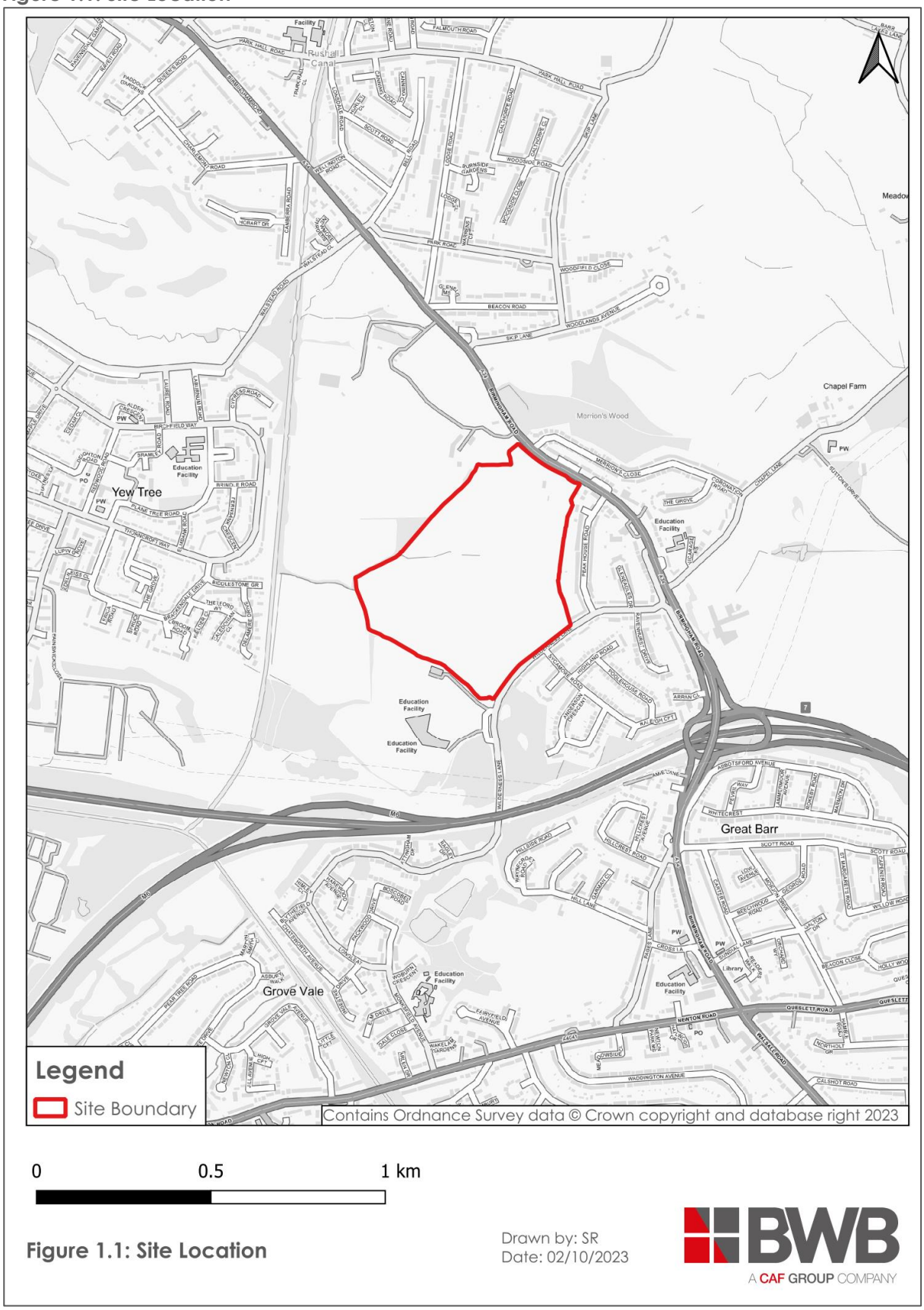

Figure 1.1: Site Location

2. LEGISLATION, PLANNING POLICY & GUIDANCE

National Legislation and Planning Policy

2.1 The following national legislation and planning policy is relevant to air quality and was considered in the undertaking of the assessment. A summary of the relevant national legislation and planning policy is provided in **Appendix C**:

- European Parliament, EU 2008 ambient Air Quality Directive (2008)[1];
- HMSO, Air Quality (England) Regulations (2000)[2];
- HMSO, Environment Act (1995)[3];
- HMSO, Environment Act (2021)[4];
- HMSO, Air Quality (England) Regulations (2002)[5];
- HMSO, Air Quality Standards Regulations (2010)[6];
- Department for Environment, Air Quality Strategy (1997)[7];
- Department for the Environment, Food and Rural Affairs, Air Quality Strategy (2007)[8];
- Department for the Environment, Food and Rural Affairs, Air Quality Strategy (2023)[9];
- Department for the Environment, Food and Rural Affairs, The Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020)[10];
- HMSO, The Environmental Targets (Fine Particulate Matter) (England) Regulations (2023)[11];
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF) (2023)[12]; and
- Ministry for Housing, Communities and Local Government, Planning Practice Guidance (PPG) for air quality (2019)[13].

Regional Planning Policy

2.2 SMBC are in the process of preparing a new local plan for the borough. The four Black Country authorities worked together to produce the existing Black Country Core Strategy[14], covering the period 2006 to 2026. The following regional planning policy was considered in the undertaking of the assessment and a summary is provided in **Appendix C**:

[1] European Parliament (2008) Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe
[2] HMSO (2000) Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations 2000 (as amended), London: HMSO
[3] HMSO (1995) The Environment Act 1995, London: TSO
[4] HMSO (2021) The Environment Act 2021, London: TSO
[5] HMSO (2002) Statutory Instruments 2002 No. 3043, The Air Quality (England) (Amendment) Regulations 2002, London: HMSO
[6] HMSO (2010) Statutory Instruments 2010 No. 1001 Air Quality Standards Regulations 2010. London: HMSO
[7] Department of the Environment (DoE) (1997) The UK National Air Quality Strategy, London: HMSO
[8] Department of the Environment, Food and Rural Affairs (Defra) (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, London: HMSO
[9] Department of the Environment, Food and Rural Affairs (Defra) (2023) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, London: HMSO
[10] Department of the Environment, Food and Rural Affairs (Defra) (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations, London: HMSO
[11] HMSO (2023) Statutory Instruments 2023 No. 96 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023
[12] Ministry of Housing, Communities & Local Government (2023) National Planning Policy Framework, HMSO London
[13] Ministry for Housing, Communities and Local Government (2019) Planning Practice Guidance Air Quality

- Black Country Core Strategy (2011)[14].

Air Quality Assessment Guidance

2.3 The following guidance was utilised in the air quality assessment:

- Defra, Local Air Quality Management Technical Guidance (LAQM.TG (22)) (2022)[15];
- Institute of Air Quality Management, Guidance on the assessment of dust from demolition and construction (2023)[16];
- Institute of Air Quality Management and Environmental Protection UK, Land-Use Planning and Development Control: Planning for Air Quality (2017)[17]; and
- Black Country Supplementary Planning Document (2016)[18].

[14] Dudley Metropolitan Borough Council, Sandwell Metropolitan Borough Council, Walsall Council, Wolverhampton City Council (2011) Black Country Core Strategy
[15] Defra (2022) Local Air Quality Management Technical Guidance LAQM.TG (22)
[16] Institute of Air Quality Management (2023) Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London
[17] Institute of Air Quality Management and Environmental Protection UK (2017) Land-Use Planning and Development Control: Planning for Air Quality
[18] Sandwell Metropolitan District Council (2016) Black Country Supplementary Planning Document

3. METHODOLOGY

Consultation with Sandwell Metropolitan District Council

3.1 Consultation was undertaken with the Pollution Control team at SMBC in which the proposed methodology was initially provided via email on 7th August 2023. A response was received from the Public Health Specialist for SMBC on 7th August 2023, which outlined their agreement of the proposed methodology.

- Construction Phase - A construction phase dust assessment was undertaken and relevant measures to mitigate construction phase dust emissions were recommended. The assessment was undertaken in accordance with guidance provided by the Institute of Air Quality Management (IAQM)[16].
- Operational Phase – A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated traffic on local air quality and predict pollutant concentrations at the proposed development Site. The air dispersion model ADMS-Roads was used to model concentrations of oxides of nitrogen (NOx) and particulate matter (PM_{10} and $PM_{2.5}$) at identified existing receptor locations for both without and with development scenarios. The change in pollutant concentrations as a result of development-generated traffic was then calculated. The assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance (LAQM.TG22)[15] and Institute of Air Quality Management and Environmental Protection UK (EPUK)[17]. Pollutant concentrations were predicted across the Site to consider the suitability of the Site for residential use.
- Consideration was also given to the Black Country Supplementary Planning Document[18] (BCSPD) including the development classification for the proposed development.

3.2 Further consultation was undertaken via email on 21st August to confirm the use of the Defra's NO_2 Adjustment for NOx Sector Removal Tool[19] in the assessment. A response was received on 24th August 2023, from the Public Health Specialist for SMBC who confirmed that the revised methodology was acceptable.

3.3 Full details of the methodology used in the assessment, as agreed with SMBC, are provided below.

Construction Phase Dust Assessment

3.4 An assessment of the potential impacts arising from the construction of the proposed development was undertaken in accordance with IAQM Guidance[16]. The full assessment methodology is not reproduced within this report but a summary of the assessment steps are provided below:

- Step 1 – screen the requirement for a more detailed assessment. No assessment is required if there are no receptors within a certain distance of the works.
- Step 2 – assess the risk of dust impacts separately for each of the four activities considered (demolition, earthworks, construction and trackout).

[19] Defra NO_2 Adjustment for NOx Sector Removal Tool v8.0 https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/

- Step 2A – determine the potential dust emission magnitude for each of the four activities;
- Step 2B – determine the sensitivity of the area;
- Step 2C – determine the risk of dust impacts by combining the findings of steps 2A and 2B.

- Step 3 – determine the site-specific mitigation for each of the four activities; and
- Step 4 – examine the residual effects and determine significance.

Operational Phase Road Traffic Emissions – Detailed Assessment

Black Country Supplementary Planning Document

3.5 SMBC adopted the BCSPD[18] and therefore the development classification process detailed in the BCSPD[18] was undertaken and mitigation measures recommended accordingly.

3.6 The BCSPD[18] provides a four step assessment process as follows:

- Step 1 – development proposal / pre-application discussions;
- Step 2 – classification of the development proposal;
- Step 3 – assessment; and
- Step 4 – determining suitable mitigation measures.

3.7 This four step process was undertaken.

IAQM and EPUK Guidance

3.8 Guidance published by the IAQM and EPUK in 2017[17] provides a two-stage approach to determine the level of assessment required in the consideration of the impact of development-generated road traffic emissions on local air quality.

Stage 1:

3.9 The Stage 1 criteria requires that the assessment progress to Stage 2 if any of the following apply:

- The development comprises:
  - 10 or more residential units or a site area of more than 0.5ha; or
  - More than 1,000m^2 of floor space for all other uses or a site area greater than 1ha;
- Coupled with any of the following:
  - The development has more than 10 parking spaces; or
  - The development will have a centralised energy facility or other centralised combustion process.

Note: Consideration should be given to the potential impacts of neighbouring sources on the site, even if an assessment of impacts of the development on the surrounding area is screened out.

Stage 2:

3.10 The IAQM and EPUK guidance[17] provides the following indicative criteria to determine whether a detailed road traffic emissions assessment is required for a proposed development.

3.11 The Stage 2 criteria relevant to the Proposed Development are:

- A change in Light Duty Vehicles (LDV) flow of more than 100 vehicles as a 24 hour Annual Average Daily Traffic (AADT) flow within an AQMA; and
- A change in Heavy Duty Vehicles (HDV) flow of more than 25 vehicles as a 24 hour AADT flow within an AQMA.

Air Dispersion Modelling

3.12 The air dispersion model ADMS-Roads, version 5.0.1.3 was utilised in the assessment to predict concentrations of NOx, PM_{10} and $PM_{2.5}$ at existing and proposed receptor locations.

3.13 The assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance[15] and the IAQM and EPUK guidance[17].

Assessment Scenarios and Traffic Data

3.14 The following scenarios were considered in the air dispersion modelling:

- Scenario 1: 2019 Verification Year;
- Scenario 2: 2023 Base Year;
- Scenario 3: 2025 Opening Year without development; and
- Scenario 4: 2025 Opening Year with development.

3.15 Traffic data were obtained from PJA, the Transport Consultants for the project. 24-hour AADT and HDV proportions were provided for the following roads for use in the assessment:

- M6 motorway;
- A34 Birmingham Road;
- A34 Walsall Road;
- A4041 Newton Road;
- Wilderness Lane;
- Peak House Road;
- Longleat Road; and
- Monksfield Avenue.

3.16 Consideration was given to the speeds at which vehicles are likely to travel within the study area. Free flowing traffic conditions were modelled at speed limits. Queuing sections were modelled in accordance with Defra guidance[15].

3.17 Traffic data used in the air dispersion modelling are provided in **Appendix D**.

ADMS-Roads Model Inputs

3.18 The following model inputs were utilised in the assessment:

- Emission factors – emission factors were utilised from the Defra Emission Factor Toolkit[20] (EFT), version 11, for the years of assessment (2019, 2023 and 2025).
- Conversion of oxides of nitrogen – concentrations of NOx were predicted using the ADMS-Roads dispersion model. These concentrations were converted to nitrogen dioxide (NO_2) using the Defra NOx to NO_2 calculator[21], version 8.1.
- Meteorological data – hourly sequential meteorological data for the verification year of assessment (2019) were obtained for the Birmingham Airport recording station. The meteorological recording station was used as it is the closest recording station that is considered to best represent the Site in terms of its location within the wider Birmingham Metropolitan Area. The wind rose for 2019 is provided in **Appendix E**.
- Surface roughness and Monin-Obukhov length (MO) – Site – a surface roughness of 0.75m and an MO length of 30m were utilised in the air dispersion model to represent conditions at the Site and within the Study area. These parameters were considered to best represent the location of the Site within the outlying suburban area of Great Barr, which is also located within the wider Birmingham Metropolitan Area.
- Surface roughness and Monin-Obukhov length (MO) – Meteorological Station – a surface roughness of 0.0881m and an MO length of 26.7534m were utilised in the air dispersion model to represent conditions at the meteorological station. These were the meteorological parameters contained within the meteorological file for the Birmingham Airport recording station.
- Background pollutant concentrations – background concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the study area were obtained from pollutant concentration maps[22] provided by Defra as a 1km x 1km grid of the UK, for the years of assessment (2019, 2023 and 2025).
- Model verification – model verification was undertaken using 2019 monitoring data available for the study area. 2022 monitoring data was available at the time of the assessment. However, this monitoring data was not validated by Defra at the time of writing and was therefore not used in the verification process. This was agreed with SMBC.
- Full details of the verification procedure are provided in **Appendix F**.
- Calculation of short term PM_{10} concentrations – the following calculation, as detailed in Defra guidance[9], was utilised to calculate the number of exceedances of the 24-hour mean PM_{10} air quality objective:

[20] Defra (2019) Emission Factor Toolkit [https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html]
[21] Defra (2019) NOx to NO_2 Calculator [https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc]
[22] Defra (2019) background pollutant concentration maps [https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2019]

Number of 24-Hour Mean Exceedance = -18.5 + 0.00145 * Annual Mean^3 + (206 / Annual Mean)

- The IAQM released a position statement[23] in July 2018 regarding dealing with the uncertainty in vehicle NOx emissions within air quality assessments. This recommends that sensitivity analyses be undertaken and professional judgement be applied to consider the scenario where NOx emissions do not reduce as rapidly as shown by the EFT. The IAQM position statement was withdrawn in July 2021 following extensive research which identified that Emission Factor Toolkits v8.1 and onwards were considered to more accurately represent real world NOx emissions. No sensitivity analysis was therefore required to be undertaken as part of the air quality assessment.

Receptor Locations

Existing Sensitive Receptors

3.19 Existing receptor locations were identified within close proximity of the road links detailed in paragraph 3.15 and considered in the operational phase road traffic emissions assessment. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at the identified existing receptor locations for the assessment scenarios detailed in paragraph 3.14. Where possible the closest receptors to those road links were considered, as these receptors are likely to experience the greatest change in pollutant concentrations as a result of the proposed development. Receptor heights were modelled at 1.5m for ground floor receptors, 0.8m for nurseries and primary schools, 1.0m for high schools, and 3.0m for receptors at heights of first floor level.

3.20 The existing receptor locations are detailed in **Table 3.1** and **Figure 3.1**.

Table 3.1: Existing Sensitive Receptor Locations

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R1	404135	295290	Residential Dwelling on Wilderness Lane	1.5
R2	403799	294992	Secondary School on Wilderness Lane	1.0
R3	403826	294666	Residential Dwelling on Longleat Road	1.5
R4	403606	294355	Residential Dwelling on Longleat Road	1.5
R5	403697	294207	Primary School on Monksfield Avenue	0.8
R6	403761	294072	Residential Dwelling on Monksfield Avenue	1.5
R7	403765	294020	Residential Dwelling on the A4041 Newton Road	1.5
R8	404034	294098	Residential Dwelling on the A4041 Newton Road	1.5

[23] Institute of Air Quality Management (2018) Position Statement: Dealing with Uncertainty in Vehicle NOx Emissions within Air Quality Assessments, Version 1.1

Receptor	Grid Reference		Details	Height Modelled
	X	Y		(m)
R9	404856	293997	Residential Dwelling on the A34 Walsall Road	1.5
R10	405187	293480	Residential Dwelling on the A34 Walsall Road	1.5
R11	405642	292996	Residential Dwelling on the A34 Walsall Road	1.5
R12	404650	294249	Residential Dwelling on Queslett Road	3
R13	404519	294349	Residential Dwelling on the A34 Birmingham Road	1.5
R14	404476	294357	Primary School on the A34 Birmingham Road	0.8
R15	404468	294466	Residential Dwelling on the A34 Birmingham Road	1.5
R16	404474	294629	Residential Dwelling on the A34 Birmingham Road	1.5
R17	404462	294913	Residential Dwelling on the A34 Birmingham Road	1.5
R18	404668	294951	Residential Dwelling on Abbotsford Avenue	1.5
R19	404520	295085	Residential Dwelling on the A34 Birmingham Road	1.5
R20	404456	295272	Residential Dwelling on the A34 Birmingham Road	1.5
R21	404415	295356	Residential Dwelling on the A34 Birmingham Road	1.5
R22	404386	295396	Residential Dwelling on Wilderness Lane	1.5
R23	404418	295540	Primary School on the A34 Birmingham Road	0.8
R24	404345	295532	Residential Dwelling on the A34 Birmingham Road	1.5
R25	404237	295667	Residential Dwelling on Peak House Road	1.5
R26	404074	295826	Residential Dwelling on the A34 Birmingham Road	1.5
R27	403847	296153	Residential Dwelling on the A34 Birmingham Road	1.5
R28	404194	295368	Residential Dwelling on Peak House Road	1.5

Figure 3.1: Existing Receptor Locations

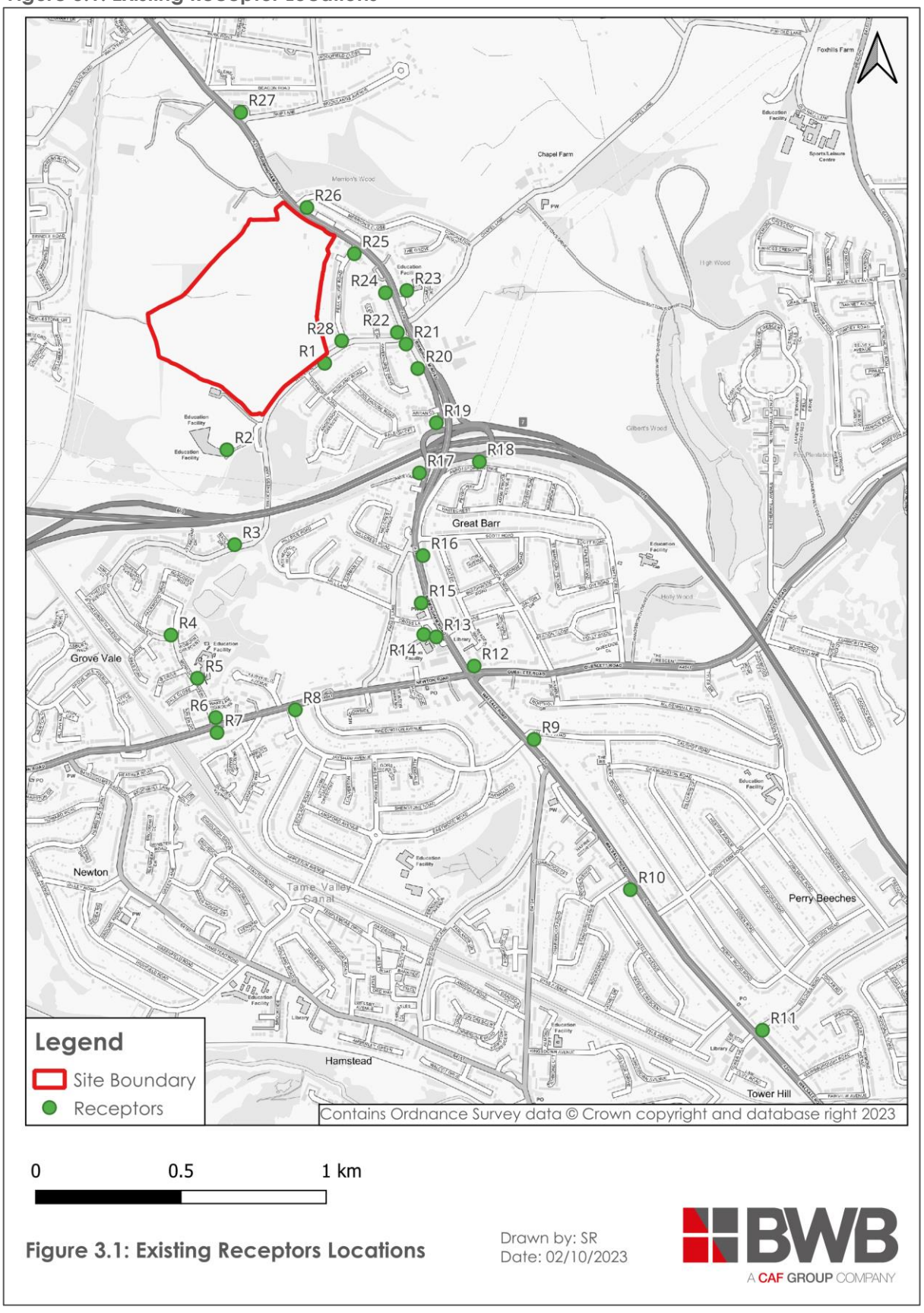

Figure 3.1: Existing Receptors Locations

Drawn by: SR
Date: 02/10/2023

Proposed Receptor Locations

3.21 The proposed development proposes sensitive uses and therefore, pollutant concentrations were predicted across the Site to consider the suitability for the proposed residential use with regard to the current air quality objectives for England. Pollutant concentrations were predicted across the Site for Scenario 4 Opening Year with development. A Cartesian grid was modelled at a height of 1.5m to represent average breathing height at ground floor. The grid was modelled to cover the following grid references: minimum X: 403399, Y: 294971 to maximum X: 404527, Y: 295961.

Limitations and Assumptions

3.22 There are uncertainties associated with both measured and predicted pollutant concentrations. The model (ADMS-Roads) used in this assessment relies on input data, which are also subject to uncertainty. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not take into account.

3.23 The assessment is based on traffic data provided by PJA, the transport consultants for the project. As such any assumptions made by the transport consultants will also influence the air quality assessment.

3.24 In future year scenarios, uncertainty relates to the projection of vehicle emissions and, in particular the rate at which emissions per vehicle will improve over time. This assessment utilised the most recent version of the Defra EFT[20] to provide the most up to date estimate of current and future emission projections.

3.25 To reduce the uncertainty associated with predicted concentrations, model verification was carried out following guidance set out in Defra guidance[15]. As the models were verified using local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

Assessment Criteria

3.26 Monitored concentrations undertaken by SMBC were compared to the relevant air quality objectives[7]. The current relevant air quality standards and objectives for England are detailed in **Table 3.2**.

Table 3.2: Air Quality Standards and Objectives (England)

Pollutant	Averaging Period	Air Quality Objective ($\mu g.m^{-3}$)	Date to Achieve by
NO_2	Annual Mean	40	31 December 2005
	1-hour mean not to be exceeded more than 18 times per year	200	31 December 2005
PM_{10}	Annual Mean	40	31 December 2004

Pollutant	Averaging Period	Air Quality Objective ($\mu g.m^{-3}$)	Date to Achieve by
	24-hour mean not to be exceeded more than 35 times per year	50	31 December 2004
$PM_{2.5}$	Annual mean	20	1 January 2020
	Annual mean interim target as detailed within the Environmental Improvement Plan[24]	*12*	*31 January 2028*
	Annual mean	*10*	*31 December 2040*

Italics denotes future air quality objectives published by the UK Government that will come into force in the future

3.27 Guidance is provided by the IAQM and EPUK[17] to determine the significance of the impact of development-generated road traffic emissions on local air quality. The impact descriptors at receptor locations are detailed in **Table 3.3.** These impact descriptors consider the predicted magnitude of change in pollutant concentrations and the concentration in relation to the relevant air quality objectives.

Table 3.3: Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)			
	1%	2 – 5%	6 – 10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Note: Figures rounded up to the nearest whole number, therefore any value less than 1% after rounding (effectively less than 0.5%) will be described as negligible.

[24] Defra (2023) Environmental Improvement Plan 2023, First revision of the 25 Year Environment Plan

4. BASELINE CONDITIONS

Local Air Quality Management

4.1 The Site is located within the SMBC AQMA. The AQMA was designated by SMBC for the potential exceedance of the current annual mean NO_2 air quality objective and covers the whole borough.

Local Air Quality Monitoring

Nitrogen Dioxide

4.2 SMBC undertakes NO_2 monitoring within its administrative boundary using a network of automatic monitors and passive diffusion tubes. The closest monitoring location to the Site is the KE diffusion tube, located approximately 160m south of the Site.

4.3 Bias adjusted NO_2 monitoring results, for the locations in the vicinity of the Site, are detailed in **Table 4.1.** Exceedances of the annual mean NO_2 objective are highlighted in bold and potential exceedances of the one-hour mean NO_2 objective are bold and underlined.

4.4 2020, 2021 and 2022 monitoring data was available for this review and was included, however air quality monitoring undertaken in 2020 and 2021 is not considered representative of normal conditions due to the influence of COVID-19 lockdown restrictions on road traffic levels. In accordance with the IAQM Position Statement[25], 2019 monitoring data should be treated as the last year of 'normal' monitoring data until such time that the impact of lockdown restrictions on pollutant concentrations is more fully understood. However, 2022 data is available and is considered to be the most recent relevant year in terms of monitoring.

Table 4.1: SMBC NO_2 Monitoring Data in 2015 – 2022

Location and Reference	X, Y	Site Monitoring Type	Distance from and direction to Site boundary	Monitored Annual Average Concentration (µg.m^{-3})							
				2015	2016	2017	2018	2019	2020	2021	2022
KE, Ragley Drive, Great Barr	403925, 294970	Roadside	160m south	27.8	26.2	24	21.7	22.5	17.7	18.7	18.0
Wilderness Lane, Great Barr	403956, 294855	Roadside	260m south	21.2	26.0	29.0	31.0	30.0	23.0	23.0	24.0
SA, Spring Field Site, Great Barr	403951, 294852	Roadside	260m south	30.8	31.3	28.5	25.7	26.2	20.6	21.9	20.4

[25] Institute of Air Quality Management (2021) Position Statement: Use of 2020 and 2021 Monitoring Datasets

Location and Reference	X, Y	Site Monitoring Type	Distance from and direction to Site boundary	Monitored Annual Average Concentration (µg.m^{-3})							
				2015	2016	2017	2018	2019	2020	2021	2022
KD, Attingham Drive	403793, 294661	Urban Background	420m south	28.7	30.3	25.0	24.0	24.4	19.5	18.0	19.2
XE, Lochranza Croft	404439, 294846	Roadside	580m south east	27.3	30.9	30.6	29.1	26.3	20.8	28.3	25.9
ZA, Abbotsford Avenue	404505, 294813	Roadside	690m south east	29.3	26.8	29.2	25.7	26.7	22.4	25.8	24.9
ZC, Whitecrest	404493, 294532	Roadside	840m south east	26.8	30.7	27.9	28.4	27.0	23.6	22.5	21.5
ZK, Birmingham Road	404621, 294291	Roadside	1km south east	28.7	30.3	25.0	31.2	29.6	23.1	22.5	23.5
ZP, Newton Road	404555, 294219	Roadside	1.1km south east	33.8	34.2	34.9	33.3	32.0	23.3	26.3	23.8
ZQ, Newton Road	404547, 294188	Roadside	1.1km south east	**44.3**	**50.3**	**49.1**	**44.2**	**41.2**	34.3	34.3	49.1
ZR, Newton Road	404410, 2941170	Roadside	1.1km south east	**44.3**	**43.5**	39.8	42.0	36.5	35.2	33.4	39.8
ZO, Newton Road	404290, 294179	Roadside	1.1km south east	31.9	33.2	30.0	30.2	24.3	26.7	24.2	30.0

4.5 Monitored annual NO_2 concentrations were below the current relevant NO_2 objectives for England of 40µg.m^{-3} at the majority of monitoring locations detailed in **Table 4.1** between 2015 and 2022. However, monitoring location ZQ exceeded 40µg.m^{-3} from 2015 – 2019 and monitoring location ZR exceeded in 2015, 2016 and 2018. Both monitoring locations are located along the A4041 Newton Road, which is a busy A-road that runs through the centre of Great Barr. As such, higher volumes of traffic and more frequent queuing are experienced along this road, therefore higher concentrations are expected at these monitoring locations. Monitored NO_2 concentrations at all monitoring locations fluctuated between 2015 and 2022; however an overall downward trend is noticeable. There was a significant decrease in concentrations in 2020, this was considered to be a result of lockdown restrictions influencing traffic levels during the COVID-19 pandemic in 2020. Furthermore, in 2022, the most recent year of monitoring, the majority of monitoring locations show a decrease in NO_2 concentrations from 2019 monitored concentrations.

4.6 Urban background monitoring location KD was considered for obtaining background NO_2 concentrations. However, upon review, concentrations at this monitoring location were higher than those of roadside monitoring locations in the vicinity of the Site. It is considered that these higher concentrations are likely influenced by the M6 motorway, located to the north of this monitoring location, which is considered a significant emissions source. Background pollutant concentrations for NO_2 were therefore obtained from the latest Defra background concentration maps[20], which was agreed with SMBC during the consultation process.

4.7 As detailed in **Appendix F**, the Wilderness Lane, Great Barr automatic monitoring location and ZC diffusion tube were utilised within the model verification. Other monitoring locations in the vicinity of the Site including diffusion tubes KE, ZK, ZP, ZQ, ZR and ZO were discounted from the model verification as they were considered to be more representative of kerbside monitoring locations in terms of their distance and location in relation to adjacent roads. The LAQM.TG (22)[15] guidance recommends the use of roadside monitoring locations for verification purposes.

4.8 The SA diffusion tube was not considered for verification as it is co-located with the Wilderness Lane, Great Barr automatic monitoring location, and the latter was considered more appropriate to use for verification due to the preferred monitoring accuracy of a continuous analyser over a passive diffusion tube. The Wilderness Road automatic monitoring location monitored higher concentrations than SA, it was therefore considered that only using Wilderness Road in the verification process would result in a more robust adjustment factor. Monitoring locations ZA and XE were also discounted from model verification due their location on roads that traffic data was not available for.

4.9 The monitoring locations used in the verification process were agreed with SMBC during the consultation process.

Particulate Matter (PM_{10})

4.10 SMBC undertakes PM_{10} monitoring within its administrative boundary using a network of automatic monitoring stations. The closest monitoring location to the Site is the Wilderness Lane, Great Barr automatic monitoring location.

Table 4.2: SMBC PM_{10} Monitoring Data in 2015 – 2022

Location and Reference	X, Y	Site Monitoring Type	Distance from and direction to Site boundary	Monitored Annual Average Concentration (µg.m^{-3})							
				2015	2016	2017	2018	2019	2020	2021	2022
Wilderness Lane, Great Barr	403956, 294855	Roadside	260m south	15.4	-	-	11.0	14.0	17.0	13.0	12.0

- data not available

4.11 Monitored annual PM_{10} concentrations at all monitoring locations detailed in **Table 4.2** were below the relevant PM_{10} objectives for England of 40µg.m^{-3} between 2015 and 2022. Monitored PM_{10} concentrations at all monitoring locations fluctuated between 2015 and 2022 with no discernible trend.

4.12 The Wilderness Lane, Great Barr automatic monitor was considered for use in the model verification process. However, upon further review, background PM_{10} concentrations available from Defra mapping[22] within the grid squares of the study area were higher than the monitored concentrations at the Wilderness Lane, Great Barr Automatic Monitoring Location. It was therefore not considered suitable for use in the verification process.

Particulate Matter ($PM_{2.5}$)

4.13 SMBC undertakes $PM_{2.5}$ monitoring within its administrative boundary using a network of automatic monitoring stations. The closest monitoring location to the Site is the Wilderness Lane, Great Barr automatic monitoring location. Monitoring commenced at this location in 2021.

Table 4.3: SMBC $PM_{2.5}$ Monitoring Data in 2021 – 2022

Location and Reference	X, Y	Site Monitoring Type	Distance from and direction to Site boundary	Monitored Annual Average Concentration (µg.m^{-3})	
				2021	2022
Wilderness Lane, Great Barr	403956, 294855	Roadside	260m south	6.8	7.0

- data not available

4.14 Monitored $PM_{2.5}$ concentrations at all monitoring locations detailed in **Table 4.3** were below the annual mean $PM_{2.5}$ objective in 2022, the most recent representative year of monitoring. Furthermore, monitoring concentrations were also below the 2028 interim target of 12µg.m^{-3} and 2040 future $PM_{2.5}$ objective of 10µg.m^{-3} for England in 2022.

4.15 The Wilderness Lane, Great Barr Automatic Monitoring Location was considered for the inclusion of $PM_{2.5}$ within the model verification process, however only 2021 and 2022 monitoring data was available at this monitoring location. 2022 is the most recent year of monitoring data released by SMBC, however this 2022 monitoring data was not agreed by Defra at the time of assessment and was therefore not considered further in the assessment. This approach was agreed with SMBC during the consultation process.

Background Pollutant Concentrations

4.16 Background monitoring undertaken by SMBC in the study area was reviewed. The background monitoring location KD monitored higher concentrations in 2019 than some roadside locations within the study area. This was likely due to the influence of the M6 motorway on monitored concentrations at KD and it was not considered that KD was a suitable background monitoring tube for use in the assessment, as agreed with SMBC. Background pollutant concentrations were therefore obtained from the latest Defra

background concentration maps[22], which are provided for the UK as a 1km x 1km grid network. The latest maps are based on 2018 monitoring and meteorological data. Background concentrations of NO_2, PM_{10} and $PM_{2.5}$ were obtained for the grid squares covering the study area for the years of assessment (2019, 2023 and 2025).

4.17 During the verification process, it became clear that the grid squares containing the verification locations experienced contributions from the nearby M6 motorway and A34 Birmingham Road. Therefore, Defra's NO_2 Adjustment For NO_x Sector Removal Tool v8.0[19] was used to remove emissions from the Defra background concentrations associated with road sources which were included in the model, including the M6 and A34 Birmingham Road. This process was implemented for background NO_2 concentrations in the study area, however was not possible for background PM_{10} concentrations, as is outlined in paragraph 4.11. The background concentrations used in the assessment are detailed in **Table 4.4.**

Table 4.4: Background Pollutant Concentrations used in the Assessment

Pollutant	Grid Square	Monitoring Locations / Receptors	Concentration (µg.m^{-3})		
			2019	2023	2025
Monitoring Locations Used in Verification					
NO_2	403500, 294500	Wilderness Lane, Great Barr	30.5	24.6	22.2
PM_{10}			16.7	15.9	15.6
$PM_{2.5}$			11.0	10.4	10.2
NO_2	404500, 294500	Whitecrest (ZC)	25.6	20.9	19.0
PM_{10}			16.7	16.0	15.7
$PM_{2.5}$			11.1	10.5	10.3
Receptors					
NO_2	404500, 295500	R1, R19 - R26, R28	22.3	18.3	16.7
PM_{10}			15.9	15.2	14.9
$PM_{2.5}$			10.5	10.0	9.7
NO_2	403500, 294500	R2 - R7	30.5	24.6	22.2
PM_{10}			16.7	15.9	15.6
$PM_{2.5}$			11.0	10.4	10.2

Pollutant	Grid Square	Monitoring Locations / Receptors	Concentration (µg.m^{-3})		
			2019	2023	2025
NO_2	404500, 293500	R9	20.3	17.0	15.7
PM_{10}			15.7	15.0	14.7
$PM_{2.5}$			10.7	10.1	9.9
NO_2	405500, 293500	R10	21.1	17.5	16.1
PM_{10}			16.7	16.0	15.7
$PM_{2.5}$			11.2	10.7	10.5
NO_2	405500, 292500	R11	19.5	16.6	15.4
PM_{10}			15.3	14.5	14.2
$PM_{2.5}$			10.5	9.9	9.7
NO_2	404500, 294500	R8, R12 - R18	25.6	20.9	19.0
PM_{10}			16.7	16.0	15.7
$PM_{2.5}$			11.1	10.5	10.3
NO_2	403500, 296500	R27	17.7	14.9	13.9
PM_{10}			14.7	14.0	13.7
$PM_{2.5}$			9.9	9.3	9.1

4.18 Background NO_2, PM_{10} and $PM_{2.5}$ concentrations were below the current relevant air quality objectives for England in all grid squares utilised in the assessment. Furthermore, background $PM_{2.5}$ concentrations were below the 2028 interim target of 12µg.m^{-3}, but not all grid squares were below the 2040 future air quality objective of 10µg.m^{-3}.

5. CONSTRUCTION PHASE DUST ASSESSMENT

5.1 The construction phase of the proposed development will involve a number of activities which have the potential to impact on local air quality. These include emissions of dust generated through excavation, construction, earthworks and trackout activities, exhaust pollutant emissions from construction traffic on the local highways network, and exhaust emissions from non-road mobile machinery (NRMM) within the construction site itself.

5.2 The location of sensitive receptors in relation to construction activities will affect the potential for such construction activities to cause dust soiling, nuisance and local air quality impacts. Meteorological conditions and the use of control measures will also contribute to the effects experienced.

Step 1: Screen the Need for a Detailed Assessment

5.3 Step 1 of the IAQM guidance[16] involves a screening assessment to consider whether a more detailed construction phase dust assessment is required.

5.4 In accordance with the guidance, a detailed assessment is required if:

- Human receptors are located within 250m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the site entrances; or
- Ecological receptors are located within 50m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 250m from the site entrances.

5.5 From a review of the Multi Agency Geographic Information for the Countryside (MAGIC) website[26], no ecological designations were identified within the above screening distance from the developable area. However, the SINC within the Site has been noted and therefore the impact on ecological designations was considered. Human receptors are located within the above screening distances, with the closest of these receptors located off Wilderness Lane. A construction phase assessment was therefore undertaken.

5.6 The illustrative masterplan shows that only section of the Site will be developed on, and the remainder of the Site will be retained as an accessible countryside park, where no development will take place, as shown in **Figure 5.1**. This was considered during the construction phase dust assessment.

Step 2: Assess the Risk of Dust Impacts

Step 2A: Define the Potential Dust Emission Magnitude

5.7 The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance[16] as detailed in **Table 5.1**. Demolition is not

[26] Defra, Multi Agency Geographic Information for the Countryside (MAGIC) [http://magic.defra.gov.uk/]

proposed as part of the development and therefore was not considered further in the assessment.

Table 5.1: Dust Emission Magnitude Criteria and Definition

Activity	IAQM Dust Emission Magnitude	IAQM Dust Emission Magnitude Criteria
Earthworks	Large	Total site area >110,000 m^2 , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.
	Medium	Total site area 18,000 m^2 – 110,000 m^2 , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height.
	Small	Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height.
Construction	Large	Total building volume >75,000 m^3, on site concrete batching, sandblasting;
	Medium	Total building volume 12,000 m^3 – 75,000 m^3 , potentially dusty construction material (e.g. concrete), on site concrete batching.
	Small	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g., metal cladding or timber).
Trackout	Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.
	Medium	20 -50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m.
	Small	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, road length <50 m.

5.8 The following dust emissions magnitudes were defined for the proposed development:

- Earthworks – The total developable area is between 18,000m^2 – 110,000m^2, therefore the dust emission magnitude associated for earthworks was defined as '**Medium'**.
- Construction – The proposed development comprises the construction of up to 150 residential dwellings. Therefore, based on the quantum of development, the dust emission magnitude for construction was defined as '**Large**'.
- Trackout – There is anticipated to be between 20 - 50 HDV outward movement in any one day during the construction phase and therefore the dust emission magnitude for trackout was defined as '**Medium'**. A trackout distance of 200m was therefore used from the Site access on Wilderness Lane.

5.9 A summary of the defined dust emissions magnitudes for the development are provided in **Table 5.2**.

Table 5.2: Summary of Project Defined Dust Emissions Magnitudes

Activity	Dust Emissions Magnitude
Earthworks	Medium
Construction	Large
Trackout	Medium

Step 2B: Define the Sensitivity of the Area

5.10 The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling, human health and ecological impacts. The sensitivity of the study area takes into account the specific receptors in the vicinity of the Site, the proximity and number of those receptors, the local background concentration of PM_{10} and site-specific factors. **Figure 5.1** was utilised to determine the number of receptors located within the distance bands provided in the IAQM guidance[16] for determining receptor sensitivity.

5.11 According to the IAQM guidance[16], the main potential impacts on ecological receptors resulting from dust emissions are direct physical effects in the form of *"reduced photosynthesis, respiration and transpiration through smothering"*. Other impacts, such as chemical changes to soil *"are likely to occur only as a result of long-term demolition and construction works"*. Unless species particularly sensitive to these effects are present, ecological receptors are likely to be less sensitive than human receptors.

Figure 5.1: Construction Phase Assessment Dust Distance Buffers

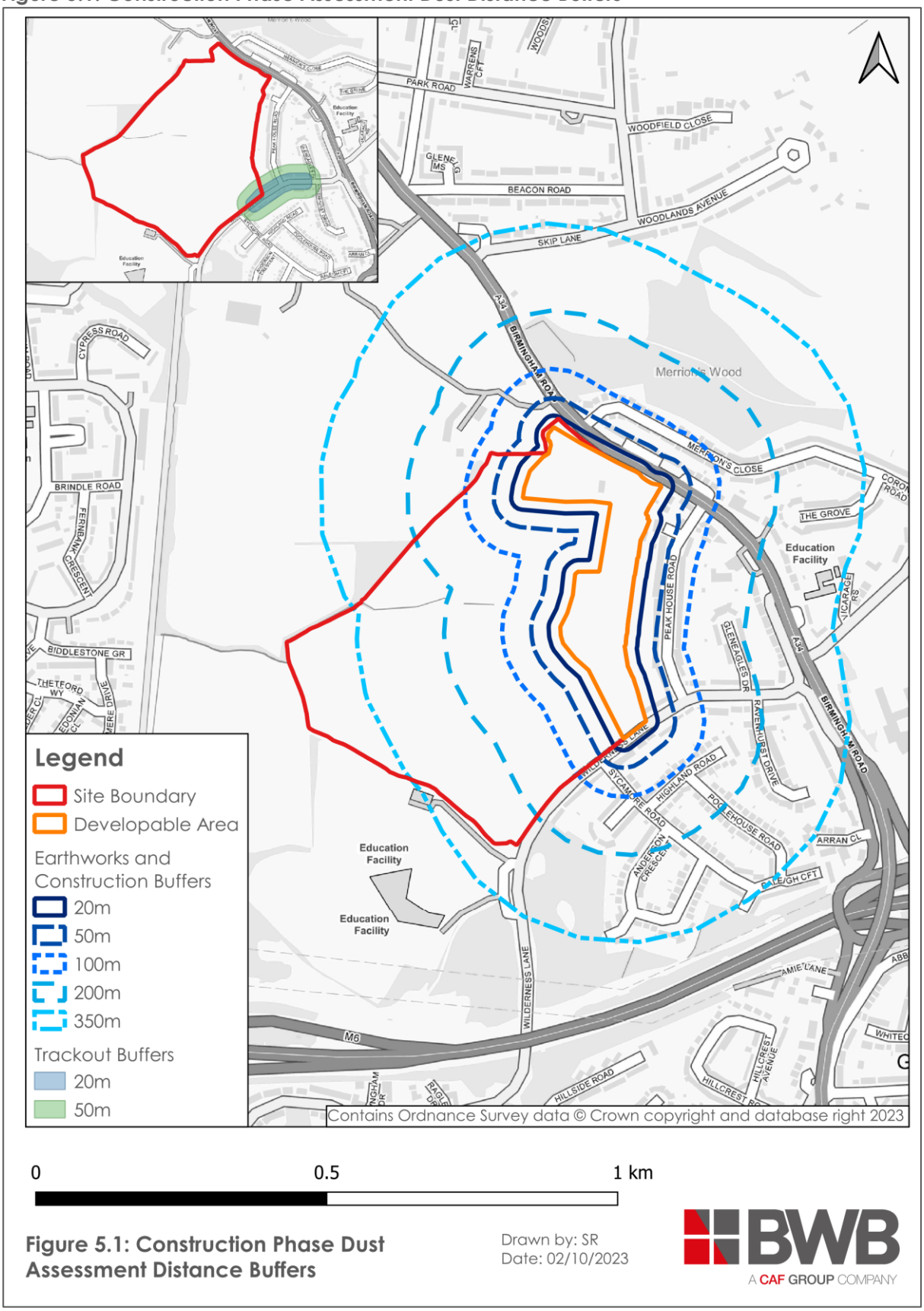

Figure 5.1: Construction Phase Dust Assessment Distance Buffers

Drawn by: SR
Date: 02/10/2023

5.13 The sensitivity of the area is defined below, in accordance with IAQM criteria[16] and summarised in **Table 5.3**.

- Dust Soiling – There are between 10 - 100 existing highly sensitive residential receptors located within 50m of the proposed developable area of the Site. Therefore, the sensitivity of the area to dust soiling from earthworks and construction activities was defined as '**Medium**'. In addition, there are 10 – 100 existing highly sensitive residential receptors located within 20m of the assumed roads used by construction traffic. Therefore, the sensitivity of the area to dust soiling from trackout activities was defined as '**High**'.
- Human Health – There are between 10 - 100 existing highly sensitive residential receptors located within 50m of the proposed developable area of the Site. In addition, there are 10 – 100 existing highly sensitive residential receptors located within 20m of the assumed roads used by construction traffic. As detailed in **Table 4.4**, PM_{10} concentrations are less than 24µg.m^{-3} and therefore the sensitivity of the area to human health effects is defined as '**Low**'.
- Ecological Effects – the SINC is located within the Site, comprising the hedgerow network and grassland areas. The project ecologist, FPCR, advised that due to the local nature of the ecological designation, the SINC is considered to be a low sensitivity receptor. The sensitivity of the area to ecological impacts is therefore defined as '**Low**'.

Table 5.3: Determination of the Sensitivity of the Area

Potential Impact	Sensitivity		
	Earthworks	Construction	Trackout
Dust Soiling	Medim	Medium	High
Human Health	Low	Low	Medium
Ecological	Low	Low	Low

Step 2C: Define the Risk of Impacts

5.14 The dust emission magnitude determined in Step 2A is then combined with the sensitivity of the area determined in Step 2B to define the risk of dust impacts with no mitigation applied. The results of this assessment are detailed in **Table 5.4.**

Table 5.4: Summary Dust Risk Table to Define Site Specific Risk

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Dust Soiling Effects on People and Property			
Earthworks	Medium	Medium	Medium Risk
Construction	Large	Medim	Medium Risk
Trackout	Medium	High	Medium Risk

Activity	Step 2A: Dust Emission Magnitude	Step 2B: Sensitivity of the Area	Step 2C: Risk of Dust Impacts
Human Health Impacts			
Earthworks	Medium	Low	Low Risk
Construction	Large	Low	Low Risk
Trackout	Medium	Low	Low Risk
Ecological Impacts			
Earthworks	Medium	Low	Low Risk
Construction	Large	Low	Low Risk
Trackout	Medium	Low	Low Risk

Step 3: Site-Specific Mitigation

5.15 The risk of dust impacts, defined in Step 2C of the assessment, is used to determine the mitigation measures required to minimise the emission of dust during construction phase activities. The IAQM guidance[16] provides details of highly recommended and desirable mitigation measures which are commensurate with the risk of dust impacts defined in Step 2C for construction, earthworks and trackout activities. Where the mitigation measures are general in nature, the highest risk category was applied in accordance with the guidance[16]. The highest risk category identified was 'Medium Risk' and the recommended mitigation taken from the IAQM guidance[16] is detailed in **Table 5.5** and **Table 5.6**.

Table 5.5: Mitigation Measures for a Medium Risk Site

Category	Mitigation Measures for a Medium Risk Site	
	Highly Recommended	**Desirable**
Communication	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	None
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental 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	

Category	Mitigation Measures for a Medium Risk Site	
	Highly Recommended	**Desirable**
	emissions, approved by the Local Authority.	
Site Management	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.	None
	Make the complaints log available to the local authority when asked.	
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.	
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspections results, and make an inspection log available to the local authority when asked.	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 window sills within 100m of the site boundary, with cleaning to be provided as necessary.
	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.	
Preparing and maintaining the site	Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	None
	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 extended period.	
	Avoid site runoff of water or mud.	
	Keep site fencing, barriers and scaffolding clean using wet methods.	
	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.	
Operating vehicle/ machinery and sustainable travel	Ensure all vehicles switch off engines when stationary – no idling vehicles.	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may

Category	Mitigation Measures for a Medium Risk Site	
	Highly Recommended	**Desirable**
		be increased with suitable control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	
Operations	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.	None
	Ensure an adequate water supply on 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 and dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	
Waste Management	Avoid bonfires and burning of waste materials.	None

Table 5.6: Mitigation Measures Specific to Earthworks, Construction and Trackout

Category	Mitigation Measures	
	Highly Recommended	**Desirable**
Earthworks (Medium Risk Site)	None	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
		Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
		Only remove the cover in small areas during work and not all at once.
Construction		Avoid scabbling (roughening of concrete surfaces) if possible.

Category	Mitigation Measures	
	Highly Recommended	Desirable
(Medium Risk Site)	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.	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
		For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout (Medium Risk Site)	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any materials tracked out of the site. This may require the sweeper being continuously in use.	None
	Avoid dry sweeping of large areas.	
	Ensure vehicles entering and leaving the 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 log book.	
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers 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.	
	Access gates to be located at least 10m from receptors where possible.	

Step 4: Determine Significant Effects

5.16 In accordance with IAQM guidance[16], with the implementation of the mitigation measures detailed in Step 3, the residual impacts from the construction phase are considered to be 'not significant'.

6. OPERATIONAL PHASE ROAD TRAFFIC EMISSIONS ASSESSMENT

Baseline Assessment

6.1 Pollutant concentrations were predicted at the identified existing sensitive receptor locations using the air dispersion model ADMS-Roads. Predicted pollutant concentrations for Scenario 2: 2023 Base Year and Scenario 3: 2025 Opening Year without development are detailed in **Table 6.1.**

Table 6.1: Predicted Annual Mean Pollutant Concentrations for Scenario 2: 2023 Base Year and Scenario 3: 2025 Opening Year Without Development at Existing Receptor Locations

Receptor	Scenario 2: 2023 Base Year (µg.m^{-3})			Scenario 3: 2025 Opening Year Without Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R1	21.0	16.0	10.4	18.8	15.7	10.2
R2	28.2	17.0	11.0	25.0	16.8	10.8
R3	29.7	17.5	11.3	26.2	17.2	11.0
R4	30.7	17.7	11.4	27.1	17.4	11.1
R5	26.7	16.5	10.7	23.8	16.2	10.5
R6	28.6	17.1	11.0	25.4	16.8	10.8
R7	27.5	16.8	10.9	24.5	16.5	10.6
R8	24.5	17.0	11.1	21.9	16.8	10.9
R9	20.8	16.1	10.8	18.8	15.8	10.6
R10	19.3	16.5	11.0	17.6	16.2	10.8
R11	19.5	15.3	10.4	17.8	15.0	10.1
R12	28.3	18.1	11.7	24.9	17.8	11.5
R13	24.6	17.1	11.2	22.0	16.8	10.9
R14	23.4	16.7	11.0	21.0	16.4	10.7
R15	24.7	17.1	11.2	22.1	16.8	11.0

Receptor	Scenario 2: 2023 Base Year (µg.m^{-3})			Scenario 3: 2025 Opening Year Without Development (µg.m^{-3})		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R16	27.8	18.1	11.7	24.6	17.8	11.5
R17	32.1	19.5	12.5	27.9	19.2	12.2
R18	29.0	18.4	11.9	25.5	18.1	11.7
R19	29.5	18.6	11.9	25.6	18.4	11.6
R20	22.8	16.6	10.7	20.3	16.3	10.5
R21	22.5	16.4	10.6	20.0	16.2	10.4
R22	22.2	16.4	10.6	19.8	16.1	10.4
R23	22.6	16.5	10.7	20.1	16.2	10.4
R24	22.2	16.4	10.6	19.8	16.1	10.4
R25	21.7	16.2	10.5	19.4	15.9	10.3
R26	23.6	16.8	10.8	20.9	16.5	10.6
R27	19.7	15.4	10.1	17.7	15.1	9.9
R28	21.2	16.1	10.4	19.0	15.8	10.2

6.2 Annual mean NO_2 concentrations in Scenario 2 and Scenario 3 were below the current annual mean NO_2 objective for England of 40µg.m^{-3} at all modelled receptor locations.

6.3 The predicted concentrations of PM_{10} and $PM_{2.5}$ were below the relevant current annual mean air quality objectives for England at all receptors in both Scenario 2 and 3. $PM_{2.5}$ concentrations are predicted to exceed the 2028 interim target of 12µg.m^{-3} at R17 for Scenario 2 and Scenario 3. $PM_{2.5}$ concentrations are expected to exceed the 2040 future air quality objective of 10µg.m^{-3} at all receptor locations for both Scenario 2 and 3 with the exception of R27, which was below the future objective for Scenario 3.

6.4 With regard to short term air quality objectives for NO_2 and PM_{10}, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in 3.18 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Impact Assessment

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6.5 SMBC has adopted the BCSPD[18]. The guidance provides a four stage process to determine the type of the proposed development and therefore what level of air quality assessment and mitigation measures may be required.

Step 1 – Development Proposal / Pre-application Discussions

6.6 Consultation was undertaken with the Pollution Control team at SMBC as detailed in paragraph 3.1, in which the proposed assessment methodology and the development type classification was provided. At the time of writing, a response was received outlying the agreement of the proposed assessment methodology.

Step 2 – Classification of the Development Proposal

6.7 A Transport Assessment will be submitted with the planning application. Where a proposed development meets the criteria for the requirement of a Transport Assessment, the proposed development is considered to be a 'Medium' scheme, in accordance with the BCSPD[18]. The proposed development did not meet the criteria for a 'major' scheme as it does not increase traffic flows by more 5% on any road with more than 10,000 AADT.

Step 3: Assessment

6.8 In accordance with the BCSPD[18] 'medium' schemes require a detailed assessment to determine the potential impacts of the development on local air quality, and a exposure assessment to determine the suitability of the Site for the proposed residential use.

Detailed Operational Phase Road Traffic Emissions Assessment

6.9 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified existing receptor locations for Scenario 4: 2025 Opening Year with development, to consider the impact of development-generated vehicles on local air quality.

6.10 Predicted pollutant concentrations are detailed in **Table 6.2**, **Table 6.3** and **Table 6.4** for NO_2, PM_{10} and $PM_{2.5}$ respectively together with Scenario 3: 2025 Opening Year without development concentrations for comparison purposes. The predicted change in pollutant concentrations resulting from development-generated traffic, and the associated impact are also provided.

Table 6.2: Predicted Annual Mean NO_2 Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted NO_2 Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2025 Without Development ($\mu g.m^{-3}$)	Scenario 4: 2025 With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	18.8	18.9	+0.1	0	Negligible
R2	25.0	25.1	0.0	0	Negligible
R3	26.2	26.2	0.0	0	Negligible
R4	27.1	27.1	+0.1	0	Negligible
R5	23.8	23.9	+0.1	0	Negligible
R6	25.4	25.4	0.0	0	Negligible
R7	24.5	24.6	0.0	0	Negligible
R8	21.9	21.9	0.0	0	Negligible
R9	18.8	18.8	0.0	0	Negligible
R10	17.6	17.6	0.0	0	Negligible
R11	17.8	17.8	0.0	0	Negligible
R12	24.9	25.0	0.0	0	Negligible
R13	22.0	22.0	0.0	0	Negligible
R14	21.0	21.0	0.0	0	Negligible
R15	22.1	22.1	0.0	0	Negligible
R16	24.6	24.7	0.0	0	Negligible
R17	27.9	28.0	0.0	0	Negligible
R18	25.5	25.5	0.0	0	Negligible
R19	25.6	25.7	0.0	0	Negligible

Receptor	Predicted NO_2 Concentration (µg.m^{-3})				
	Scenario 3: 2025 Without Development (µg.m^{-3})	Scenario 4: 2025 With Development (µg.m^{-3})	Concentration Change* (µg.m^{-3})	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R20	20.3	20.3	0.0	0	Negligible
R21	20.0	20.1	0.0	0	Negligible
R22	19.8	19.9	+0.1	0	Negligible
R23	20.1	20.1	0.0	0	Negligible
R24	19.8	19.8	+0.1	0	Negligible
R25	19.4	19.5	0.0	0	Negligible
R26	20.9	20.9	0.0	0	Negligible
R27	17.7	17.7	0.0	0	Negligible
R28	19.0	19.1	+0.1	0	Negligible

** Discrepancies in changes due to rounding effects*

Table 6.3: Predicted Annual Mean PM_{10} Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted PM_{10} Concentration (µg.m^{-3})				
	Scenario 3: 2025 Without Development (µg.m^{-3})	Scenario 4: 2025 With Development (µg.m^{-3})	Concentration Change* (µg.m^{-3})	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	15.7	15.8	0.0	0	Negligible
R2	16.8	16.8	0.0	0	Negligible
R3	17.2	17.2	0.0	0	Negligible
R4	17.4	17.4	0.0	0	Negligible
R5	16.2	16.2	0.0	0	Negligible

Receptor	Predicted PM_{10} Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2025 Without Development ($\mu g.m^{-3}$)	Scenario 4: 2025 With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R6	16.8	16.8	0.0	0	Negligible
R7	16.5	16.5	0.0	0	Negligible
R8	16.8	16.8	0.0	0	Negligible
R9	15.8	15.8	0.0	0	Negligible
R10	16.2	16.2	0.0	0	Negligible
R11	15.0	15.0	0.0	0	Negligible
R12	17.8	17.8	0.0	0	Negligible
R13	16.8	16.8	0.0	0	Negligible
R14	16.4	16.4	0.0	0	Negligible
R15	16.8	16.8	0.0	0	Negligible
R16	17.8	17.8	0.0	0	Negligible
R17	19.2	19.2	0.0	0	Negligible
R18	18.1	18.1	0.0	0	Negligible
R19	18.4	18.4	0.0	0	Negligible
R20	16.3	16.3	0.0	0	Negligible
R21	16.2	16.2	0.0	0	Negligible
R22	16.1	16.1	0.0	0	Negligible
R23	16.2	16.2	0.0	0	Negligible
R24	16.1	16.1	0.0	0	Negligible
R25	15.9	16.0	0.0	0	Negligible

Receptor	Predicted PM_{10} Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2025 Without Development ($\mu g.m^{-3}$)	Scenario 4: 2025 With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R26	16.5	16.5	0.0	0	Negligible
R27	15.1	15.1	0.0	0	Negligible
R28	15.8	15.8	0.0	0	Negligible

** Discrepancies in changes due to rounding effects*

Table 6.4: Predicted Annual Mean $PM_{2.5}$ Concentrations and Development Impact at Existing Receptor Locations

Receptor	Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2025 Without Development ($\mu g.m^{-3}$)	Scenario 4: 2025 With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R1	10.2	10.2	0.0	0	Negligible
R2	10.8	10.8	0.0	0	Negligible
R3	11.0	11.0	0.0	0	Negligible
R4	11.1	11.1	0.0	0	Negligible
R5	10.5	10.5	0.0	0	Negligible
R6	10.8	10.8	0.0	0	Negligible
R7	10.6	10.6	0.0	0	Negligible
R8	10.9	10.9	0.0	0	Negligible
R9	10.6	10.6	0.0	0	Negligible
R10	10.8	10.8	0.0	0	Negligible
R11	10.1	10.1	0.0	0	Negligible

Receptor	Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$)				
	Scenario 3: 2025 Without Development ($\mu g.m^{-3}$)	Scenario 4: 2025 With Development ($\mu g.m^{-3}$)	Concentration Change* ($\mu g.m^{-3}$)	Change in Concentration Relative to Air Quality Assessment Level (%)	Impact
R12	11.5	11.5	0.0	0	Negligible
R13	10.9	10.9	0.0	0	Negligible
R14	10.7	10.7	0.0	0	Negligible
R15	11.0	11.0	0.0	0	Negligible
R16	11.5	11.5	0.0	0	Negligible
R17	12.2	12.2	0.0	0	Negligible
R18	11.7	11.7	0.0	0	Negligible
R19	11.6	11.6	0.0	0	Negligible
R20	10.5	10.5	0.0	0	Negligible
R21	10.4	10.4	0.0	0	Negligible
R22	10.4	10.4	0.0	0	Negligible
R23	10.4	10.4	0.0	0	Negligible
R24	10.4	10.4	0.0	0	Negligible
R25	10.3	10.3	0.0	0	Negligible
R26	10.6	10.6	0.0	0	Negligible
R27	9.9	9.9	0.0	0	Negligible
R28	10.2	10.2	0.0	0	Negligible

** Discrepancies in changes due to rounding effects*

6.11 The predicted annual mean NO_2 concentrations for Scenario 3 2025 Opening Year without development and Scenario 4: 2025 Opening Year with development are below the current annual mean NO_2 air quality objective at all existing receptor locations considered.

6.12 The proposed development does not lead to any new exceedances of the annual mean NO_2 objective and predicted changes in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations were less than 0.5% at all receptor locations. The predicted NO_2 concentrations were less than 75% of the annual mean NO_2 objective. Therefore, in accordance with IAQM and EPUK guidance[17], the impact of the proposed development on annual mean NO_2 concentrations was considered to be 'negligible'.

6.13 $PM_{2.5}$ concentrations are predicted to exceed the 2028 interim target of 12µg.m^{-3} at R17 for Scenarios 3 and 4 (without and with the development in place). $PM_{2.5}$ concentrations are expected to exceed the 2040 future air quality objective of 10µg.m^{-3} at all receptor locations for both Scenarios 3 and 4, with the exception of R27. Therefore, the proposed development does not lead to any new exceedances of the 2028 interim target or 2040 future air quality objective for $PM_{2.5}$.

6.14 With regard to short term air quality objectives for NO_2 and PM_{10}, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with therefore in accordance with Defra guidance[17] it may be assumed that exceedance of the 1-hour mean objective is unlikely. The calculation detailed in paragraph 3.18 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Impact Significance Summary

6.15 Relevant guidance, legislation and professional judgement was utilised to determine the significance of the findings of the air quality assessment. The air quality assessment was supervised by a full member of the IAQM. A summary of the impact significance and justification of this are provided below.

6.16 The overall significance of the proposed development on air quality is considered to be 'not significant':

- Consideration was given to local planning policy[14] and the development proposals are considered to be in accordance with this policy with regard to air quality.
- The air quality assessment undertaken utilised robust model inputs including slowing traffic sections at junctions, appropriate meteorological data and surface roughness.
- The impact of development-generated road traffic on local air quality is defined as negligible in accordance with IAQM and EPUK guidance[16].

Site Suitability Assessment

Road Traffic Emissions

6.17 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted across the Site to determine the suitability for the proposed residential use with regard to the current relevant air quality objectives for England.

6.18 A Cartesian grid was modelled covering the area between the following grid references: minimum X: 403399 Y: 294971 to maximum X: 404527 Y: 295961. The Cartesian

grid was modelled over the Site and the surrounding area to capture the A34 Birmingham Road as the primary emission source in the vicinity of the Site. The grid was run at a height of 1.5m to represent the average breathing height at ground floor level across the Site for Scenario 4: 2025 Opening Year with development. Annual mean pollutant concentration contours for NO_2, PM_{10} and $PM_{2.5}$ are illustrated in **Figures 6.1 – 6.3**.

Figure 6.1: Predicted Annual Mean NO_2 Concentrations across the Site for Scenario 4: 2025 Opening Year with development

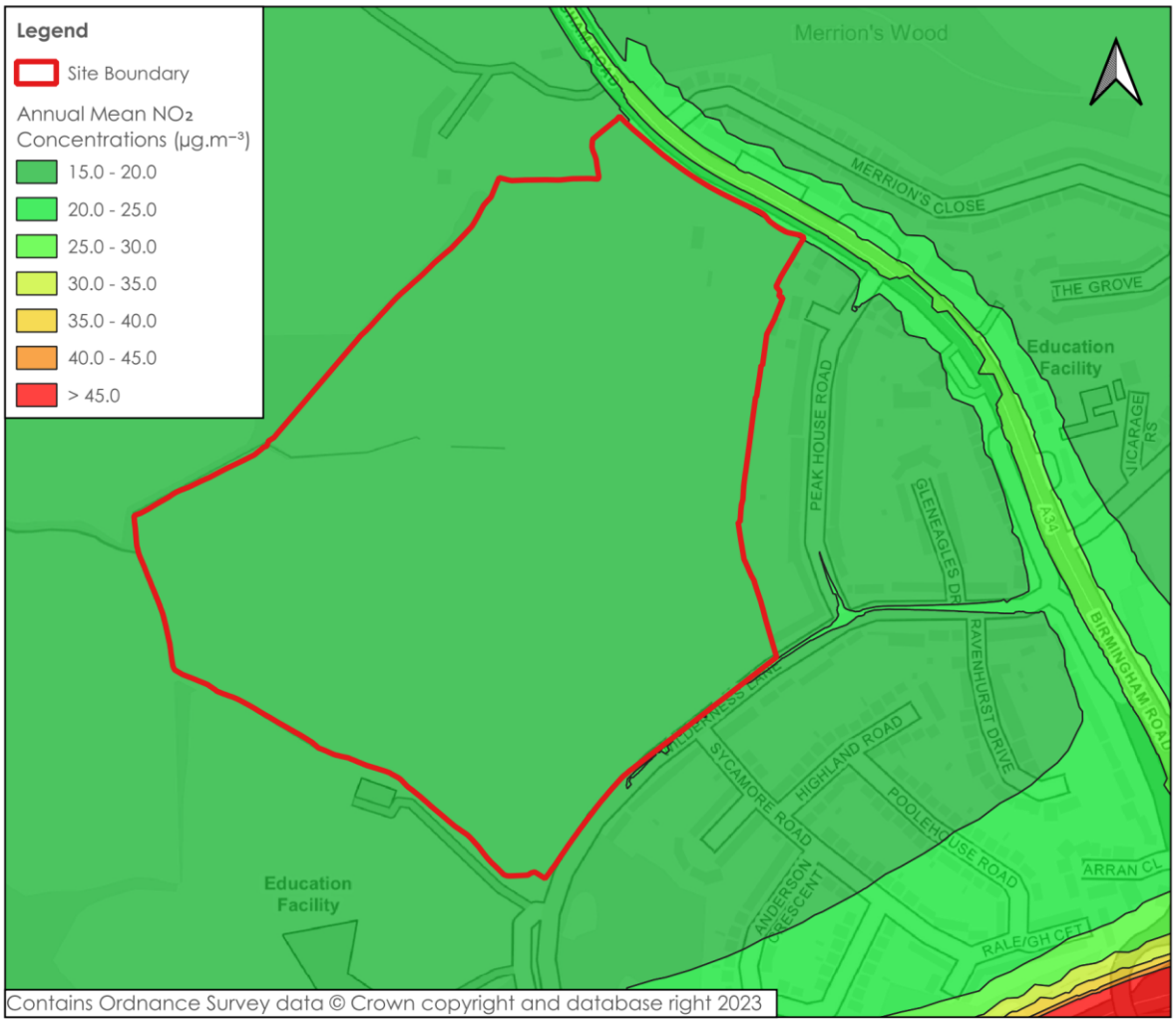

Figure 6.1: Annual Mean NO_2 Concentrations (µg.m⁻³) across the Site

Drawn by: SR
Date: 12/10/2023

BWB
A CAF GROUP COMPANY

Figure 6.2: Predicted Annual Mean PM_{10} Concentrations across the Site for Scenario 4: 2025 Opening Year with development

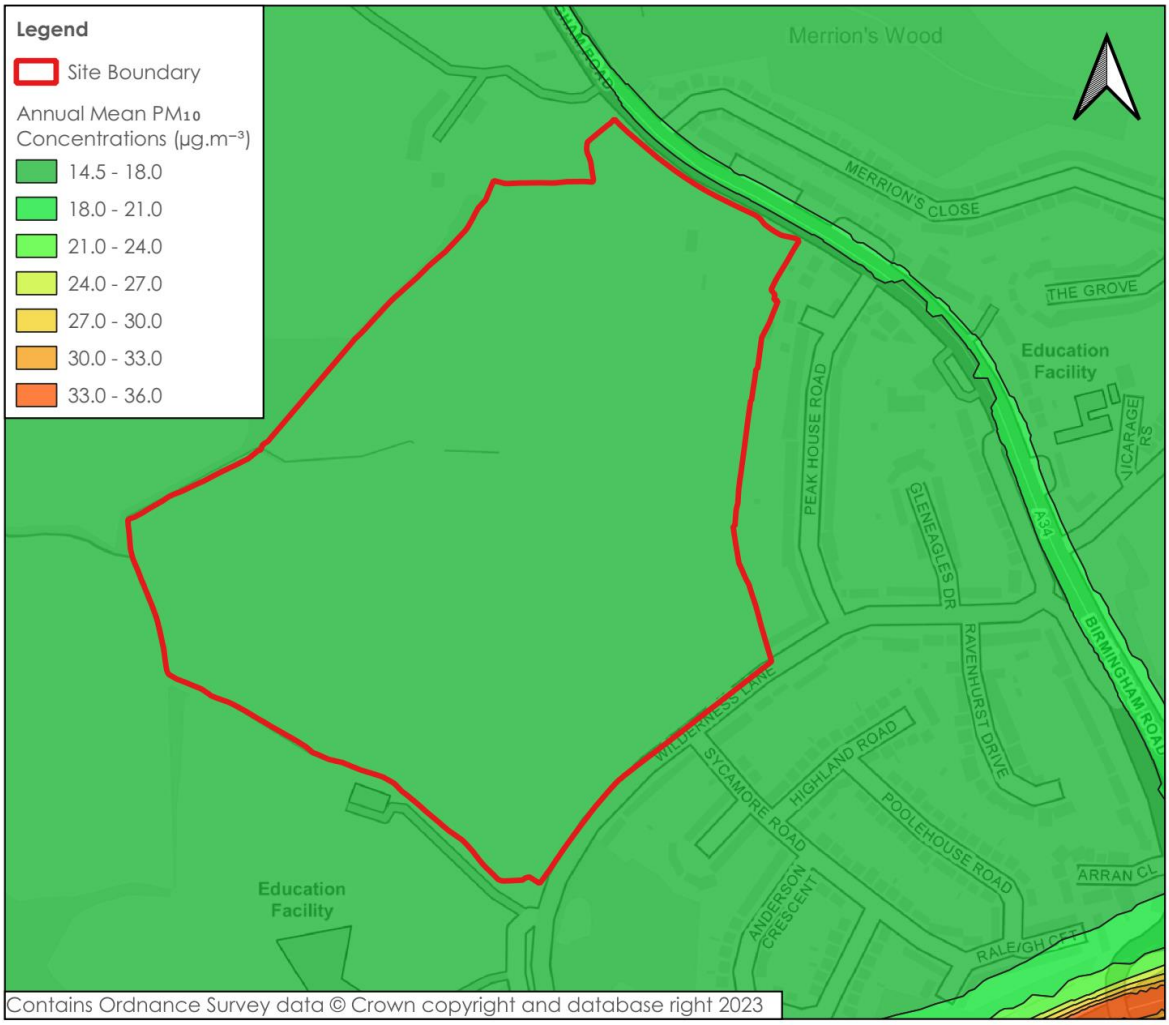

Figure 6.2: Annual Mean PM_{10} Concentrations (µg.m⁻³) across the Site

Drawn by: SR
Date: 12/10/2023

Figure 6.3: Predicted Annual Mean $PM_{2.5}$ Concentrations across the Site for Scenario 4: 2025 Opening Year with development

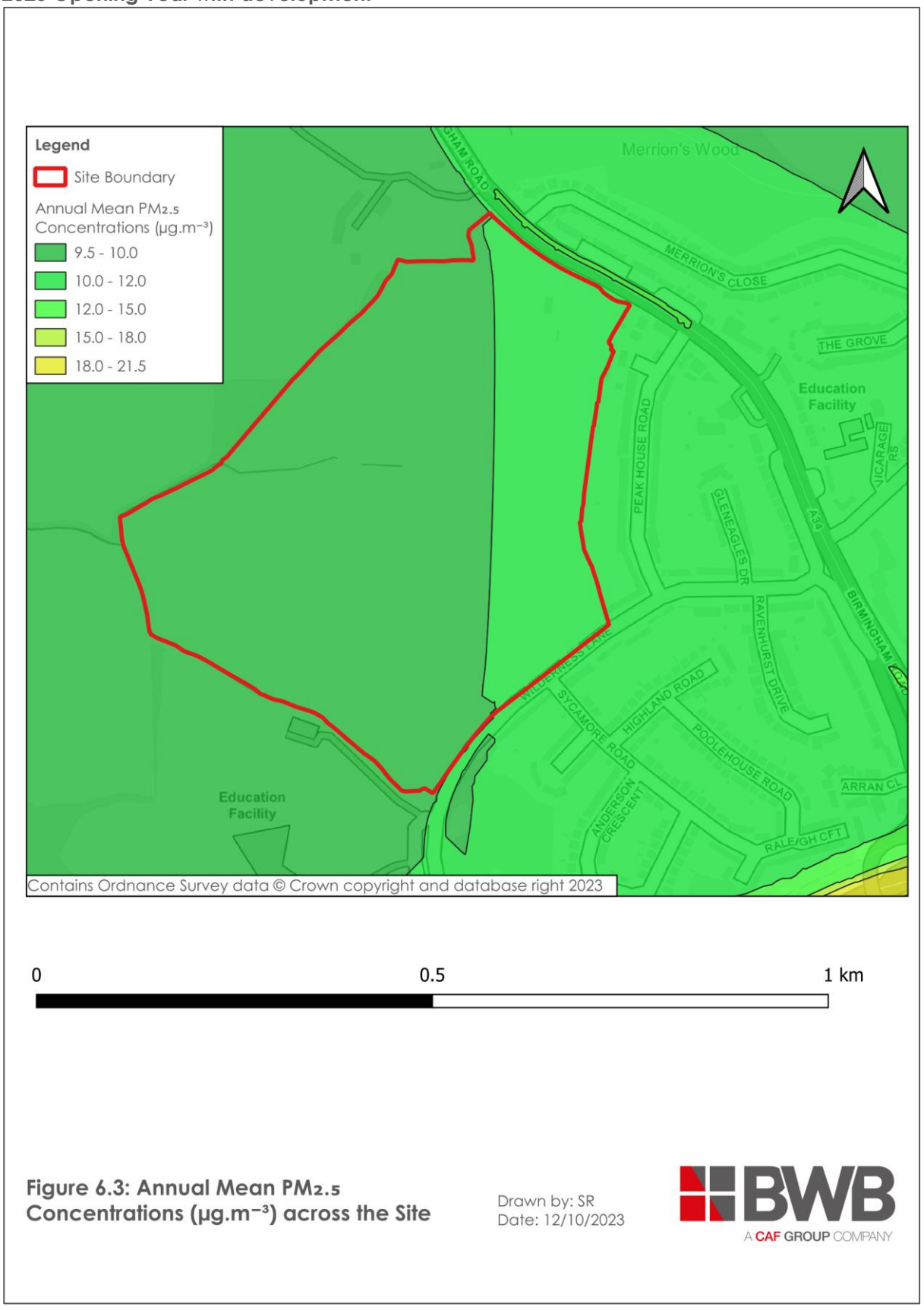

Figure 6.3: Annual Mean $PM_{2.5}$ Concentrations (µg.m⁻³) across the Site

Drawn by: SR
Date: 12/10/2023

6.19 The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for Scenario 4: 2025 Opening Year with development indicate that pollutant concentrations at the proposed residential development will be below the respective current air quality objectives for England. Furthermore, $PM_{2.5}$ concentrations at the Site are predicted to be below the 2028 interim target of 12µg.m^{-3}. The predicted $PM_{2.5}$ concentrations are in exceedance of the 2040 future air quality objective of 10µg.m^{-3}; however, it should be noted that the modelling was undertaken for a 2025 Opening Year and that it is anticipated that $PM_{2.5}$ concentrations will decrease by 2040, due to decreasing background concentrations and vehicle emissions.

6.20 With regard to short term air quality objectives for NO_2 and PM_{10} at the residential development, the predicted annual mean NO_2 concentrations are less than 60µg.m^{-3} and therefore in accordance with Defra guidance[15] it may be assumed that exceedance of the 1-hour mean NO_2 objective are unlikely. The calculation detailed in paragraph 3.18 was used to determine potential exceedance of the 24-hour PM_{10} short term objective; no exceedances were predicted.

Development Measures

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Stage 4: Determining Suitable Mitigation Measures

6.21 Whilst no mitigation measures are required with regard to air quality at the Site, the proposed development was classified as 'medium' and therefore Type 1 and 2 mitigation is required in accordance with the BCSPD[18] to minimise the impact of the proposed development on local air quality.

6.22 Type 1 mitigation required as part of the BCSPD[18] comprises electric vehicle charging points, the installation of low NOx boilers and the agreement of measures to minimise emissions during construction activities, such as is detailed in **Table 5.5**. Type 2 mitigation comprises practical mitigation measures supported by national policy and guidance; the following list is not exhaustive and is not limited to the following measures:

- Travel Planning, including mechanisms for discouraging high emission vehicle use and encouraging modal shift (i.e. public transport, cycling and walking) as well as the uptake of low emission fuels and technologies; and
- Designation of parking spaces for low emission vehicles.

6.23 It is understood that the proposed development will not include the use of fossil fuel-based heating systems, and technologies including Air Source Heat Pumps are being tested to determine the most appropriate method for reducing energy demand and carbon emissions from the proposed development. Furthermore, the proposed development will comprise EV charging, to encourage uptake of low emission vehicles. A Travel Plan is also to be submitted with the development proposals, further reducing emissions associated with travel to and from the proposed development. Therefore, the development proposals meet the required mitigation measures outlined in the BCSPD[18].

7. CONCLUSION

7.1 An air quality assessment was undertaken for the proposed residential development located at land north of Wilderness Lane in Great Barr, Birmingham.

7.2 A qualitative construction phase assessment was undertaken and measures were recommended minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions is considered to be 'not significant' in accordance with IAQM guidance[16].

7.3 A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance[15]. The development was not predicted to result in any new exceedances of the current relevant air quality objectives for England and the overall significance of the development on local air quality was predicted to be 'not significant' in accordance with IAQM and EPUK guidance[17].

7.4 Pollutant concentrations were also predicted across the Site. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ were all predicted to be below the current relevant air quality objectives for England and therefore the Site was considered to be suitable for the proposed residential use with regard to air quality.

7.5 Consideration was also given to the BCSPD[18], and the development was categorised, and mitigation recommended in accordance with the guidance. The development measures included within the development proposals were considered to meet the required measures outlined in the BCSPD[18].

APPENDICES

APPENDIX A: GLOSSARY OF TERMS

Term	Definition
AADT	Annual Average Daily Traffic flow.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between two years, which is useful for pollutants that have higher concentrations during the winter months.
AQAP	Air Quality Action Plan.
AQMA	Air Quality Management Area.
AQS	Air Quality Strategy.
Defra	Department for Environment, Food and Rural Affairs.
EPUK	Environmental Protection UK.
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
HDV	Heavy Duty Vehicles (HGVs + buses and coaches)
HGV	Heavy Goods Vehicles.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
LDV	Light Duty Vehicles (motorbikes, cars, vans and small trucks)
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
micrograms per cubic metre ($\mu g.m^{-3}$)	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g.m^{-3}$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

APPENDIX B: ILLUSTRATIVE MASTERPLAN

APPENDIX C: PLANNING POLICY AND LEGISLATION

National Legislation and Planning Policy

The UK Air Quality Strategy

European Union (EU) legislation forms the basis of air quality policy and legislation in the UK. The EU 2008 ambient Air Quality Directive[1] sets limits for ambient concentrations of air pollutants including nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). The air quality standards and objectives are prescribed through the Air Quality (England) Regulations 2000[2], as amended, for the purpose of the Local Air Quality Management Framework. The Air Quality (England) Regulations were amended in 2002[5] and again in 2010[6], with miscellaneous amendments added in 2020[10] following the UK exit from the EU. Additionally, an updated $PM_{2.5}$ objective was published in 2023[11] with an interim target to be achieved by 2028[24].

The UK Government are required under the Environment Act 1995[3] to produce a national Air Quality Strategy (AQS). The AQS was first published in 1997[7] and was reviewed and updated in 2007[8] and 2023[9]. The AQS provides an overview of the Government's ambient air quality policy and sets out the air quality standards and objectives to be achieved and measures to improve air quality.

The Environment Act 2021[4] was granted Royal Assent in November 2021 and contains amendments to Part IV of the Environment Act 1995[3] with regard to the Local Air Quality Management regime. Under the Environment Act 2021[4], the Secretary of State must lay a statement before Parliament setting out progress made in meeting air quality objectives and standard in England and steps taken towards achieving the standards. The Environment Act 2021[4] also places responsibility on local authorities to co-operate with air quality partners in the preparation of Air Quality Action Plans and identification of measures which should be monitored within the Plan and dates by which they should be implemented.

Part IV of the Environment Act[3] requires local authorities in the UK to review local air quality within their administrative area and, if relevant air quality standards and objectives are likely to be exceeded, designate Air Quality Management Areas (AQMAs). Following the designation of an AQMA, local authorities are required to publish an Air Quality Action Plan (AQAP) detailing measures to be taken to improve local air quality and work towards meeting the relevant air quality standards and objectives.

National Planning Policy Framework

The National Planning Policy Framework (NPPF)[12] was amended in September 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

The NPPF[12] recognises air quality within Section 15: Conserving and enhancing the natural environment, and states that:

> *"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 soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

[…]

Ground conditions and pollution

[…]

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.
[…]
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."

With regard to assessing cumulative effects the NPPF[12] states:

"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.

[...]"

Planning Practice Guidance

The Planning Practice Guidance (PPG) for air quality[13] was updated in November 2019 and provides guiding principles on how the planning process can take account of the impacts of new development on air quality.

The PPG[12] sets out the following with regard to air quality and planning:

- *"What air quality considerations does planning need to address;*
- *What is the role of plan-making with regard to air quality;*

- *Air quality concerns relevant to neighbourhood planning;*
- *What information is available about air quality;*
- *When could air quality considerations be relevant to the development management process;*
- *What specific issues may need to be considered when assessing air quality impacts;*
- *How detailed does an air quality assessment need to be; and*
- *How can an impact on air quality be mitigated*".

The PPG[13] sets out the pollutants for which there are legally binding limits for concentrations and those which the UK also has national emissions reduction commitments.

The PPG[13] states that development plans may need to consider:

- "*what are the observed trends shown by recent air quality monitoring data and what would happen to these trends in light of proposed development and / or allocations;*
- *the impact of point sources of air pollution (pollution that originates from one place);*
- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments, including their implications for vehicle emissions;*
- *ways in which new development could be made appropriate in locations where air quality is or is likely to be a concern, and not give rise to unacceptable risks from pollution. This could, for example, entail identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable; and*
- *opportunities to improve air quality or mitigate impacts, such as through traffic and travel management and green infrastructure provision and enhancement*".

The PPG[13] also states what may be considered relevant to determining a planning application and these include whether a development would:

- "*Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or*

plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;

- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value".*

The PPG[13] provides guidance regarding what should be included within an air quality assessment. Examples of potential air quality mitigation measures are also provided.

Local Planning Policy

Black Country Core Strategy (2011)

SMBC are in the process of preparing a new local plan for the borough. The four Black Country authorities worked together to produce the existing Black Country Core Strategy, covering the period 2006 to 2026. The Core Strategy is a spatial plan and provides a clear spatial dimension to the regeneration of the Black Country local authorities of Dudley, Sandwell, Walsall and Wolverhampton by addressing its economic, transportation, social infrastructure and environmental needs. The following policy is relevant with regard to air quality:

"ENV8 Air Quality – Air Quality

Where development is proposed in areas where air quality does not meet(or is unlikely to meet) air quality objectives or where significant air quality impacts are likely to be generated by the development, an appropriate air quality assessment will be required.

The assessment must take into account any potential cumulative impacts as a result of known proposals in the vicinity of the proposed development site, and should consider pollutant emissions generated by the development.

If an assessment which is acceptable to the local authority indicates that a proposal will result in exposure to pollutant concentrations that exceed national air quality objectives, adequate and satisfactory mitigation measures which are capable of implementation must be secured before planning permission is granted.

[…]"

The above policy was taken into consideration throughout the undertaking of the assessment.

APPENDIX D: TRAFFIC DATA UTILISED IN THE AIR QUALITY ASSESSMENT

Table D1: Traffic Data Utilised in the Air Dispersion Modelling Assessment

Road Link	Speed	Scenario 1: 2019 Verification Year		Scenario 2: 2023 Base Year		Scenario 3: 2024 Opening Year Without Development		Scenario 4: 2025 Opening Year With Development	
	Km.hr^{-1}	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
Wilderness Lane (Between Sycamore Road and site access)	48	2,667	7	2,718	7	2,744	7	2,998	8
Wilderness Lane (South of Sycamore Road)	32	2,667	7	2,718	7	2,744	7	2,998	8
Monksfield Avenue	48, 38, 32	2,667	7	2,718	7	2,744	7	2,970	8
A4041 Newton Road (West of Monksfield Avenue)	48	27,032	757	27,514	771	27,751	777	27,809	778
A4041 Newton Road (Between Monksfield Avenue and Scott Arms)	48, 38	27,032	757	27,514	771	27,751	777	27,919	778
A4041 Queslett Road	48, 38	30,867	3,418	31,418	3,479	31,688	3,509	31,733	3,510
A34 Walsall Road	48, 38	18,205	399	18,530	406	18,689	409	18,940	410
A34 Birmingham Road (South of M6)	48, 38	34,742	1,112	35,362	1,132	35,666	1,142	35,808	1,142

Road Link	Speed	Scenario 1: 2019 Verification Year		Scenario 2: 2023 Base Year		Scenario 3: 2024 Opening Year Without Development		Scenario 4: 2025 Opening Year With Development	
	Km.hr^{-1}	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
M6 (East)	112, 80	135,314	19,333	140,285	20,043	142,749	20,395	142,864	20,396
M6 (West)	112, 80	146,735	26,672	152,125	27,652	154,797	28,137	155,054	28,138
A34 Birmingham Road (North of M6)	48, 38	25,825	976	26,285	993	26,511	1,002	27,099	1,004
Birmingham Road (S) (Southern Slip Road)	48, 38	2,667	7	2,718	7	2,744	7	2,998	8
Birmingham Road (N) (Northern Slip Road)	48, 38	2,667	7	2,718	7	2,744	7	2,970	8
Wilderness Lane (East of Peak House Road)	48	2,667	7	2,718	7	2,744	7	2,998	8
Wilderness Lane (Between Peak House Road and Site Access)	48	2,667	7	2,718	7	2,744	7	3,466	10
Peak House Road	48, 38	2,667	7	2,718	7	2,744	7	2,998	8

Road Link	Speed	Scenario 1: 2019 Verification Year		Scenario 2: 2023 Base Year		Scenario 3: 2024 Opening Year Without Development		Scenario 4: 2025 Opening Year With Development	
	Km.hr^{-1}	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
A34 Birmingham Road (Between Birmingham Road (S) and Chapel Lane)	48, 38	25,825	976	26,285	993	26,511	1,002	26,887	1,004
A34 Birmingham Road (Between Birmingham Road (N) and Chapel Lane)	48, 38	25,970	981	26,433	999	26,661	1,007	27,038	1,010
A34 Birmingham Road (Between Birmingham Road (N) and U-turn bay)	48	25,970	981	26,433	999	26,661	1,007	27,000	1,010
A34 Birmingham Road (Between Peak House Road and u-turn bay)	48, 38	25,970	981	26,433	999	26,661	1,007	26,869	1,008
A34 Birmingham Road (North of Peak House Road)	49	25,970	981	26,433	999	26,661	1,007	26,794	1,008
Longleat	48, 32	1,952	6	1,989	6	2,007	6	2,262	8
M6 (WB On-Slip)	80, 48	17,160	532	17,790	551	18,102	561	18,238	562

Road Link	Speed	Scenario 1: 2019 Verification Year		Scenario 2: 2023 Base Year		Scenario 3: 2024 Opening Year Without Development		Scenario 4: 2025 Opening Year With Development	
	Km.hr^{-1}	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow	24 hour AADT Total Flow	HDV Flow
M6 (EB Off-Slip)	112, 80, 48	13,506	1,134	14,002	1,176	14,248	1,197	14,370	1,197

An illustration of the road links included in the ADMS-Roads model is provided in **Figure D1**.

Figure D1: Road Links Included in the ADMS-Roads Model

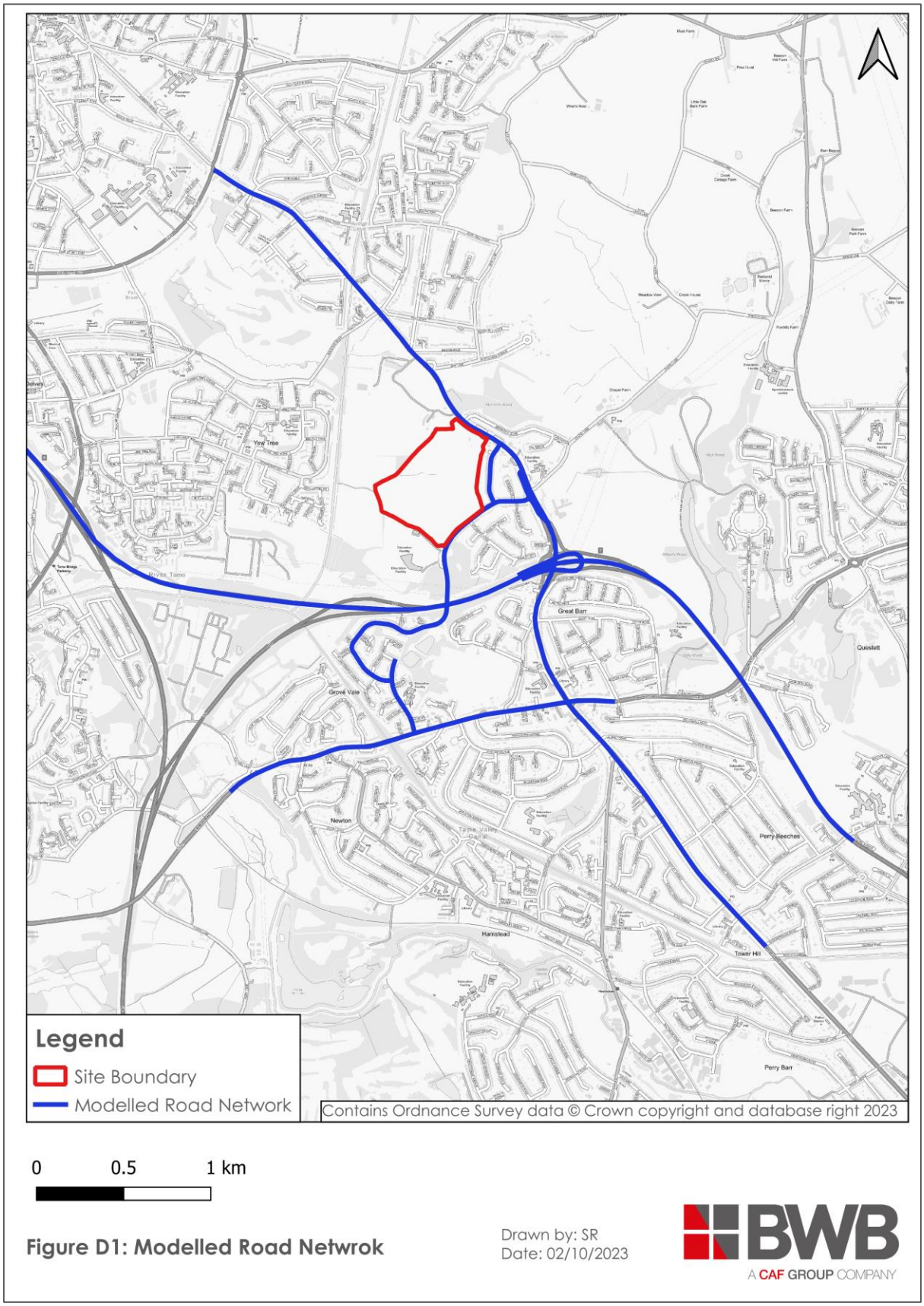

Figure D1: Modelled Road Netwrok

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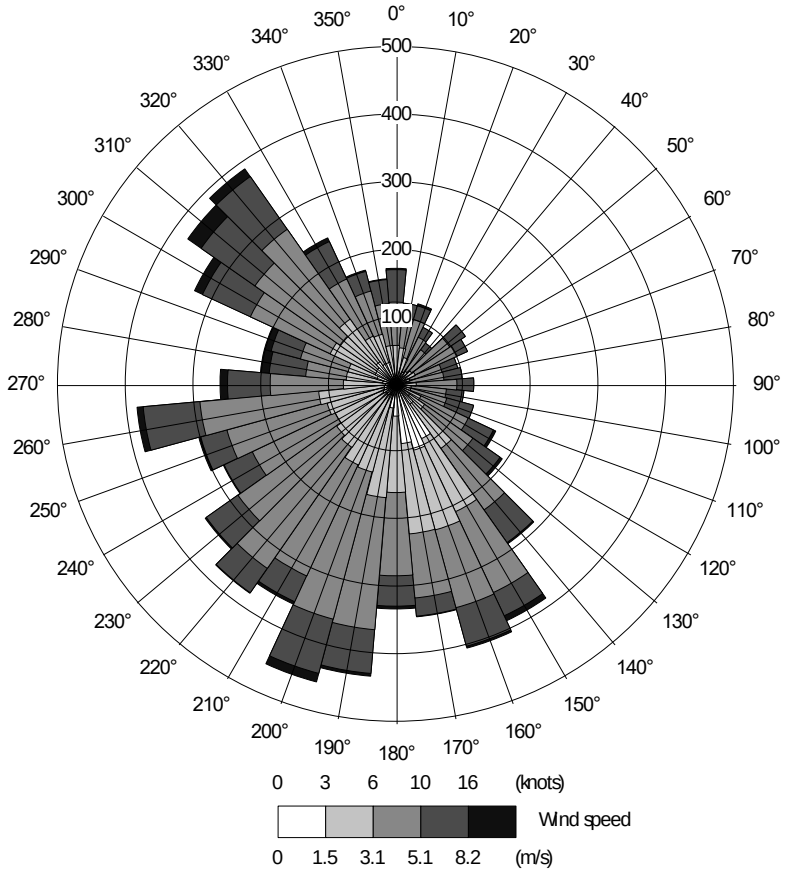
APPENDIX E: WIND ROSE FOR 2019 FOR BIRMINGHAM METEOROLOGICAL RECORDING STATION

Meteorological data for 2019 Verification Year scenario for the Birmingham Airport recording station was obtained for use in the air dispersion modelling assessment. The wind rose for 2019 is detailed below and illustrates a predominant wind direction from the south east to the north west.



APPENDIX F: MODEL VERIFICATION

Whilst ADMS-Roads is widely validated for use in this type of assessment, model verification for the area around the Site will not have been included. To determine model performance at a local level, a comparison of modelled results with monitored results in the study area was done in accordance with the methodology provided by Defra. This process of verification aims to minimise modelling uncertainty by correcting modelled results by an adjustment factor to give greater confidence to the results.

The model was run for Scenario 1: 2019 Verification Year to predict the 2019 annual mean road contributions of NOx at the monitoring locations in the study area. The model NOx outputs at this location were compared to the 2019 monitored concentrations to provide adjustment factors. **Tables F1** presents the verification process for NOx and **Figure F1** details the monitoring locations utilised in the model verification.

Monitoring locations tubes KE, ZK, ZP, ZQ, ZR and ZO were discounted from the model verification as they were deemed to be more representative of kerbside monitoring locations in terms of their distance and location in relation to adjacent roads, such as is detailed in the LAQM.TG (22)[15]. Monitoring locations ZA and XE were also discounted from model verification due their location on roads that traffic data was not available for.

PM_{10} monitoring is undertaken at the, Wilderness Lane, Great Barr automatic monitoring location, however monitored concentrations at this location recorded lower than Defra background concentrations in 2019, the most recent representative year of monitoring. $PM_{2.5}$ is also currently undertaken at the Wilderness Lane, Great Barr automatic monitoring location, however monitoring data is only available for 2022 at this monitoring location, which has not been verified by Defra. Therefore the adjustment factor calculated during the NOx was utilised to adjust predicted concentrations of PM_{10} and $PM_{2.5}$.

Table F1: NOx Verification Process

Model Verification Steps	Wilderness Lane, Great Barr	ZC
2019 monitored total NO_2 ($\mu g.m^{-3}$)	30.0	27.0
2019 background NO_2 concentration ($\mu g.m^{-3}$)	19.5	21.7
Monitored road contribution NOx ($\mu g.m^{-3}$)	20.6	10.4
Modelled road contribution NOx ($\mu g.m^{-3}$)	30.8	21.4
Ratio of monitored road NOx to modelled road NOx	0.7	0.5
Adjustment factor for modelled road contribution NOx	**0.609**	
Adjusted modelled road contribution NOx ($\mu g.m^{-3}$)	30.8	21.4
Modelled total NO_2 concentration ($\mu g.m^{-3}$)	34.8	32.4
Monitored total NO_2 concentration ($\mu g.m^{-3}$)	30.0	27.0
% difference between modelled and monitored total NO_2 concentration	16.1	20.1
RMSE % (should be less than 25% and ideally less than 10%)	12.9%	

** Road-NOx component, determined from NOx to NO_2 calculator*

A road-NOx factor of **0.609** was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero.

To provide a conservative assessment a factor of **1.0** was applied to the modelled road-NOx concentration at each receptor, before conversion to NO_2 concentrations using the NO_x to NO_2 calculator provided by Defra and the adjusted NO_2 background concentration.

Statistical analysis undertaken for the results in **Table F1** demonstrate that the root mean square error (RMSE), used to define the average error or uncertainty of a model, is within the acceptable range.

Figure F1: Monitoring Locations Utilised in the ADMS-Roads Model Verification Process

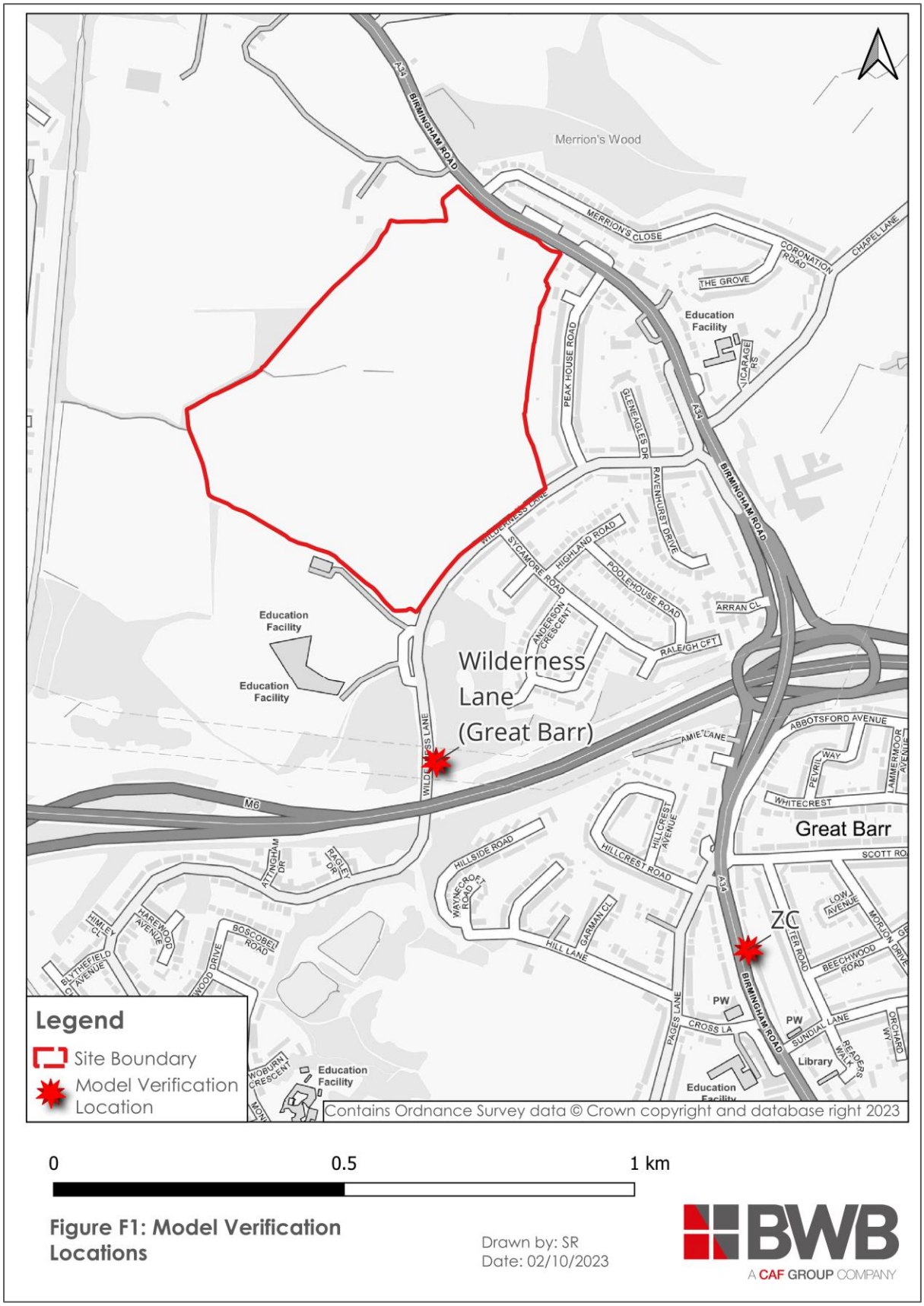


Figure F1: Model Verification Locations

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