



AIR QUALITY ASSESSMENT

AT

2 SWINBOURNE GROVE, WITHINGTON

AQ109929

11TH FEBRUARY 2021

Prepared For

Kava (NW) Limited
7 St Petersgate
Stockport
Cheshire
SK1 1EB

Prepared By

Katie Lewis-Jones
Ensafe Consultants
Osprey House,
Pacific Quay, Broadway,
Manchester,
M50 2UE

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QUALITY ASSURANCE

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Date	11/02/2021		
Prepared By	Katie Lewis-Jones		
Job Title	Graduate Air Quality Assessment		
Signature			
Checked By	Lewis Ellison		
Job Title	Air Quality Consultant		
Signature			
Authorised By	Conal Kearney		
Job Title	Head of Noise and Air		
Signature			
Project Number	AQ109929		

EXECUTIVE SUMMARY

Ensaf Consultants were commissioned by Kava (NW) Limited to undertake an Air Quality Assessment in support of a proposed residential development at 2 Swinbourne Grove, Withington.

The proposed development comprises the construction of 6 residential flats alongside associated infrastructure.

The application site is located within an area identified by Greater Manchester Combined Authority as experiencing elevated pollutant concentrations. Subsequently, the Proposed Development has potential to introduce future users to poor air quality, as well as cause impacts during the construction and operational phases. An Air Quality Assessment is therefore required to determine the baseline conditions at the site, assess site suitability for the proposed end-use and consider effects as a result of the development.

Dispersion modelling was undertaken in order to predict annual mean pollutant concentrations across the application site as a result of existing road vehicle exhaust emissions associated with the B5093, to assess the potential for future users to be exposed to poor air quality. Results were subsequently verified using local monitoring results provided by Greater Manchester Combined Authority.

The dispersion modelling results indicated that annual mean pollutant concentrations across the application site were below the relevant air quality objectives at proposed sensitive locations. The site is therefore considered suitable for proposed end-use without the implementation of protective mitigation techniques.

The level of anticipated traffic generation from the site concluded that impacts on existing pollutant levels as a result of operational phase pollutant emissions were predicted to be not significant in accordance with relevant screening criteria. The use of robust assumptions, where necessary, was considered to provide sufficient results confidence for an assessment of this nature.

Based on the assessment results the site is considered suitable for the proposed end use, subject to the inclusion of relevant mitigation measures to safeguard future occupiers of the development, and complies with the Manchester City Council Local Plan and National Planning Policy Framework.

1.0 INTRODUCTION

1.1 Background

Ensafe Consultants has been commissioned by Kava (NW) Limited, hereafter referred to as “the Client” to undertake an Air Quality Assessment in support of a proposed development, comprising of the construction of 6 residential flats, herein after referred to as the “Proposed Development”.

1.2 Site Location and Context

The application site is located at 2 Swinbourne Grove at approximate National Grid Reference (NGR) 385000, 393130, and partially within the Greater Manchester Combined Authority (GMCA) Air Quality Management Area (AQMA) which is considered a notable source of road traffic emissions including nitrogen dioxide (NO₂) and particulate matter (PM).

Subsequently, the Proposed Development has the potential to introduce future residential occupants into an area of elevated NO₂ and PM concentrations, as well as to cause impacts at sensitive receptor locations during the construction and operational phases.

An Air Quality Assessment has therefore been requested to quantify annual mean NO₂ and PM₁₀ concentrations across the site to consider suitability for the proposed end-use, and to assess potential impacts as a result of the development. This is detailed in the following report.

Reference should be made to Figure 1 within Appendix I for a location plan.

1.3 Limitations

This report has been produced in accordance with Ensaf Group's standard terms of engagement. Ensaf Group has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Ensaf Group; a charge may be levied against such approval.

2.0 LEGISLATION, GUIDANCE AND POLICY

The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- European Union (EU) Directive 2008/50/EC;
- The National Planning Policy Framework (NPPF), updated on 19th February 2019);
- The National Planning Practice Guidance (NPPG), relevant chapters produced on 1st November 2019;
- Section 82 of the Environment Act (1995) (Part IV);
- The Air Quality Standards (Amendment) Regulations (2016)¹;
- Local Air Quality Management Technical Guidance 2016 LAQM.(TG16), DEFRA, 2018²;
- Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management (IAQM), v1.1, June 2016³; and
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and IAQM, January 2017⁴.

2.1 Background

The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1: Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration (µg/m ³)	Averaging Periods
NO ₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM ₁₀	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
PM _{2.5}	25	Annual Mean

Table 2 summarises the advice provided in DEFRA guidance LAQM (TG16)² on where the AQOs for pollutants considered within this report apply.

1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007
 2 Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, February 2018.
 3 Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, 2016.
 4 Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017.

Table 2: Examples of Where the Air Quality Objectives Apply

Averaging Periods	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

The results of the dispersion modelling assessment will also be compared against the relevant AQOs detailed in Table 1 to determine significance.

2.2 Local Planning Policy

2.2.1 Manchester City Council Local Plan⁵

The Manchester Local Plan guides development within Manchester. A review of the Core Strategy indicated the following policies in relation to air quality that are relevant to this assessment. Manchester's Core Strategy was adopted in 2012 and sets out the long term strategic policies for Manchester's future development.

- Policy EN16
- Policy DM1

Reference has been made to these policies during the undertaking of this Air Quality Assessment by assessing the impact of road vehicle exhaust emissions on future site users as necessary.

2.3 Greater Manchester Air Quality Action Plan

The Greater Manchester Air Quality Action Plan (AQAP) has involved a review of the strategies, policies and plans which tackle or are in some way related to air quality, to develop a clear, robust and meaningful set of actions which will deliver real changes in terms of air quality, whilst supporting the sustainable economic growth of the region.

⁵ https://secure.manchester.gov.uk/info/200074/planning/6572/local_plan

The primary objectives of the AQAP are to improve air quality across Greater Manchester and to embed low-emission behaviours into the culture of our organisations and lifestyles by 2025, whilst supporting the UK Government in meeting all EU thresholds for key air pollutants. The Plan identifies 'Key Priority Areas' which are generally locations near to major roads and heavily trafficked areas in Manchester city centre, and other major urban centres across the other nine districts.

The AQAP comprises a single document including actions that will be ratified by Transport for Greater Manchester (TfGM) and district authorities to tackle air quality in Key Priority Areas, whilst supporting the sustainable economic growth of the region. This plan will allow councils to carry out their statutory duties under Part IV of the Environment Act 1995, as its implementation will help mandatory EU limit values to be met. Consideration to the action plan has been made throughout the preparation assessment.

Reference has been made to the AQAP during the undertaking of this Air Quality Assessment by assessing pollutant concentrations across the development site.

3.0 METHODOLOGY

There is the potential for the Proposed Development to expose future site users to elevated pollution concentrations and to cause impacts at sensitive locations during the construction and operational phases. These have been assessed in accordance with the following methodology.

3.1 Construction Phase Assessment

Given the change of use application, on site construction activities associated with the scheme will only consist of internal amendments. As a result, it is not anticipated that air quality impacts would arise as a result of construction phase emissions.

With minimal fugitive dust releases expected, a construction phase dust risk assessment has not been considered further in the preparation of the assessment

3.2 Operational Phase Assessment

3.2.1 Future Exposure

The Proposed Development is located within the vicinity of B5093. As such, the proposals have potential to introduce new receptors into an area of existing poor air quality.

Detailed dispersion modelling was therefore undertaken to quantify annual mean NO₂ and PM concentrations across the site and determine suitability for the proposed use. The following modelling scenarios were utilised during the assessment:

- 2019 as baseline year for verification against latest ratified data;
- Opening year do-something (DS) (predicted traffic flows in 2022 should the proposals be completed)

It should be noted that air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2019 were utilised within the dispersion model. The use of 2022 traffic data and 2019 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations.

Full details of data used for the modelling assessment are presented in Appendix II of this report.

3.2.2 Road Traffic Exhaust Emission Impacts

The Proposed Development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5} associated with vehicles travelling to and from the site. A screening assessment was therefore undertaken using the criteria contained within the EPUK and IAQM guidance⁴ documents to determine the potential for trips generated by the Proposed Development to affect local air quality.

The EPUK and IAQM guidance⁴ document states the following criteria to help establish when an air quality assessment is likely to be considered necessary:

- Proposals that will cause a change in Light Duty Vehicle (LDV) flows of more than 100 AADT within or adjacent to an AQMA or more than 500 elsewhere;
- Proposals that will cause a change in Heavy Duty Vehicle (HDV) flows of more than 25 AADT within or adjacent to an AQMA or more than 100 elsewhere;

Should the above criteria not be met, the EPUK and IAQM guidance⁴ document considers air quality impacts associated with the scheme to be not significant and no further assessment is required. Conversely, should the criterion be exceeded it may be deemed necessary that further assessment is required.

4.0 BASELINE

Existing air quality conditions in the vicinity of the application site were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

As required by the Environment Act (1995), GMCA of which MCC is a part of, has undertaken Review and Assessment of air quality within their area of administration. This process has indicated that annual mean concentrations of NO₂ are above the AQO within their administration. As such, one AQMA has been declared, which is described as:

- AQMA Greater Manchester - An Area covering the 10 districts of Greater Manchester, including arterial routes, district centres, and airport

The application site is located within the AQMA. As such there is potential for the Proposed Development to cause air quality impacts during the construction and operational phases.

MCC and GMCA has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by MCC using continuous and passive methods throughout their areas of administration. A review of MCC's most recent Air Quality Monitoring Data⁶ indicated that there are currently 3 automatic analysers operated by MCC, the closest of which is Manchester Oxford Road (Urban traffic) located approximately 4km north of the site, located at the approximate NGR: 384233, 397287. Due to the distance between the development site and automatic analyser, similar pollutant concentrations would not be expected and as such, this monitoring station has not been considered further within this assessment.

MCC also monitor NO₂ concentrations across the borough using passive diffusion tubes. A review of the most recent air quality monitoring data indicated 6 diffusion tubes located within the vicinity of the application site, presented in Table 3.

Table 3: Diffusion Tube Monitoring Results

ID	Type	NGR (m)		Dist' to Site (m)	Annual Mean Concentration (µg/m ³)		
		X	Y		2017	2018	2019
MA37NO	Roadside	382829	391493	2,720	43.1	39.3	38.7
MA74NO	Roadside	385399	390093	3,064	37.5	35.7	33.6
MA75NO	Kerbside	387363	394617	2,791	48.3	47.6	47.0
MA80NO	Roadside	387358	393990	2,509	34.6	32.2	33.2
MA81NO	Urban Background	386589	394083	1,852	25.4	21.8	23.1
ST27NO	Urban Background	387091	391384	2,725	18.7	16.8	17.50

As indicated in Table 3, there were exceedances of annual mean AQO for NO₂ at two diffusion tube locations in recent years. This may be due to their roadside and kerbside locations within an AQMA. Reference should be made to Figure 2 within Appendix I for a graphical representation of the passive monitoring locations.

⁶ 2019 Air Quality Annual Status Report, June 2020

4.3 Background Pollutant Concentrations

The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

In reality, it is not usually practical to obtain a true representation of background levels in urban areas due to corruption by local sources; background levels used in assessments may contain a mixture of both sources.

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The Proposed Development site is located across grid squares:

- NGR: 384500, 393500
- NGR: 385500,393500

Data for these locations was downloaded from the DEFRA website⁷. For the purpose of this assessment, average background concentrations of the two squares are summarised in Table 4 for the verification year (2019) and the predicted development opening year (2022).

Table 4: Predicted Background Pollutant Concentrations

Pollutant	Predicated Background Concentration ($\mu\text{g}/\text{m}^3$)	
	2019	2022
NO _x	23.96	20.86
NO ₂	17.10	15.14
PM ₁₀	12.38	11.88
PM _{2.5}	8.40	8.07

As indicated in Table 4, background pollutant concentrations of NO₂ and PM are well below the relevant AQOs detailed in Table 1. It should be noted that 2019 background concentrations have been used for future modelled scenarios to maintain conservative approach with 2022 data only presented for completeness.

4.4 Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for construction dust impacts in the following Sections.

4.4.1 Operational Phase Sensitive Receptors

A desk top study was undertaken to identify the closest receptor locations to the application site. This indicated residential locations within close proximity to all development boundaries. There are no educational or medical facility in immediate vicinity of the application site or the affected road networks, with the nearest education facility (Withington Girl's School) and medical facility (Christie Hospital) located approximately 380m and 590m north and south of the site.

5.0 ASSESSMENT

5.1 Operational Phase Assessment

The assessment was undertaken in accordance with the methodology detailed in Section 3.2. Reference should be made to Appendix II for full assessment input details.

5.1.1 Future Exposure

Annual mean NO₂, PM₁₀ and PM_{2.5} concentrations were predicted across the Proposed Development for the 2022 DS scenario at a height of 1.5m to represent exposure across the ground floor level, as shown in Figures 6, 7 and 8 within Appendix I.

Background NO₂ and PM₁₀ levels are likely to be lower at elevated heights due to increased distance from emission sources, such as roads. Therefore, predicted concentrations at heights above ground floor level are considered acceptable in regards to future exposure and have not been assessed further.

Nitrogen Dioxide

Predicted annual mean NO₂ concentrations across the Proposed Development site during the DS scenario are summarised in Table 5.

Table 5: Modelling Results - Annual Mean NO₂ Across Sensitive Uses

Floor Level	Predicted 2022 Annual Mean NO ₂ Concentration (µg/m ³)
Ground (1.5m)	24.97 – 25.88

The predicted concentrations shown in Table 5 indicate that there were no exceedances of the AQO at sensitive locations across ground floor areas of the proposed development. As such, it is considered that annual mean NO₂ levels at the Proposed Development site should not be viewed as a constraint to development.

Furthermore, predictions of 1-hour NO₂ concentrations were not produced as part of the dispersion modelling assessment. However, as stated in LAQM (TG16)² if annual mean NO₂ concentrations are below 60µg/m³ then it is unlikely that the 1-hour AQO will be exceeded. As such based on the results in Table 5, it is not predicted that on-site concentrations will exceed the 1-hour mean AQO for NO₂.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated NO₂ concentrations.

Particulate Matter (PM₁₀ & PM_{2.5})

Predicted annual mean PM concentrations across the Proposed Development site during the DS scenario are summarised in Table 6.

Table 6: Modelling Results - Annual Mean PM Across Sensitive Uses

Floor Level	Predicted 2022 Annual Mean Concentration (µg/m ³)	
	PM ₁₀	PM _{2.5}
Ground (1.5m)	12.63 – 12.79	8.57 – 8.67

The predicted concentrations shown in Table 6 indicate that there were no exceedances of the annual mean AQOs for PM₁₀ or PM_{2.5} throughout the modelling area. As such, it is considered that annual mean PM levels at the Proposed Development site should not be viewed as a constraint to development.

Based on the results of the dispersion modelling assessment, the site is considered to be suitable for residential use without the implementation of mitigation techniques to protect future site users from elevated PM concentrations.

5.1.2 Road Vehicle Exhaust Impacts

Any additional vehicle movements associated with the Proposed Development will generate exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5} on the local and regional road networks.

There is no parking associated with the Proposed Development. It is therefore not anticipated that the operational phase of the site would result in a change of AADT flows of more than 500, produce 100 HDV movements per day or significantly affect average speeds on the local road network.

Subsequently, potential air quality impacts associated with operational phase road vehicle exhaust emissions are predicted to be **not significant** in accordance the EPUK and IAQM⁴ screening criteria shown in Section 3.2.2.

6.0 CONCLUSION

Ensafe Consultants were commissioned by the Client to undertake an Air Quality Assessment in support of a proposed residential development at 2 Swinbourne Grove, Withington..

Dispersion modelling was undertaken to quantify annual mean NO₂ and PM₁₀ concentrations across the application and subsequently verified using MCC local monitoring data.

The dispersion modelling results indicated that annual mean NO₂ and PM₁₀ concentrations across the application site were below the relevant air quality objectives at proposed sensitive locations. The site is therefore considered suitable for proposed end-use without the implementation of protective mitigation techniques.

Potential impacts during the operational phase of the Proposed Development may occur due to road traffic exhaust emissions associated with vehicles travelling to and from the site. An assessment was therefore undertaken using the EPUK and IAQM screening criteria to determine the potential for vehicle trips generated by the Proposed Development to affect local air quality. There is no parking associated with the Proposed Development. Based on this information associated impacts are likely to be **not significant** throughout the operational phase.

Based on the assessment results the site is considered suitable for the proposed end use and complies with the MCC Local Plan and NPPF.

7.0 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DS	Do Something
DMP	Dust Management Plan
EPUK	Environmental Protection UK
EU	European Union
GMCA	Greater Manchester Combined Authority
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LA	Local Authority
LDV	Light Duty Vehicle
MCC	Manchester City Council
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PM _{2.5}	Particulate matter with an aerodynamic diameter of less than 2.5µm
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
TEMPRO	Trip End Model Presentation Program
z ₀	Roughness Length

END OF REPORT

APPENDIX I - FIGURES



Legend

-  Site Boundary
-  Air Quality Management Area

Title

Figure 1
Site Location

Project

Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number

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Client

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Osprey House, Broadway, Manchester M50 2UE
Tel – 0161 868 1300
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Legend

-  Site Boundary
-  Diffusion Tube Monitoring Locations

Title

Figure 2
Diffusion Tube Monitoring Locations

Project

Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number

AQ109929

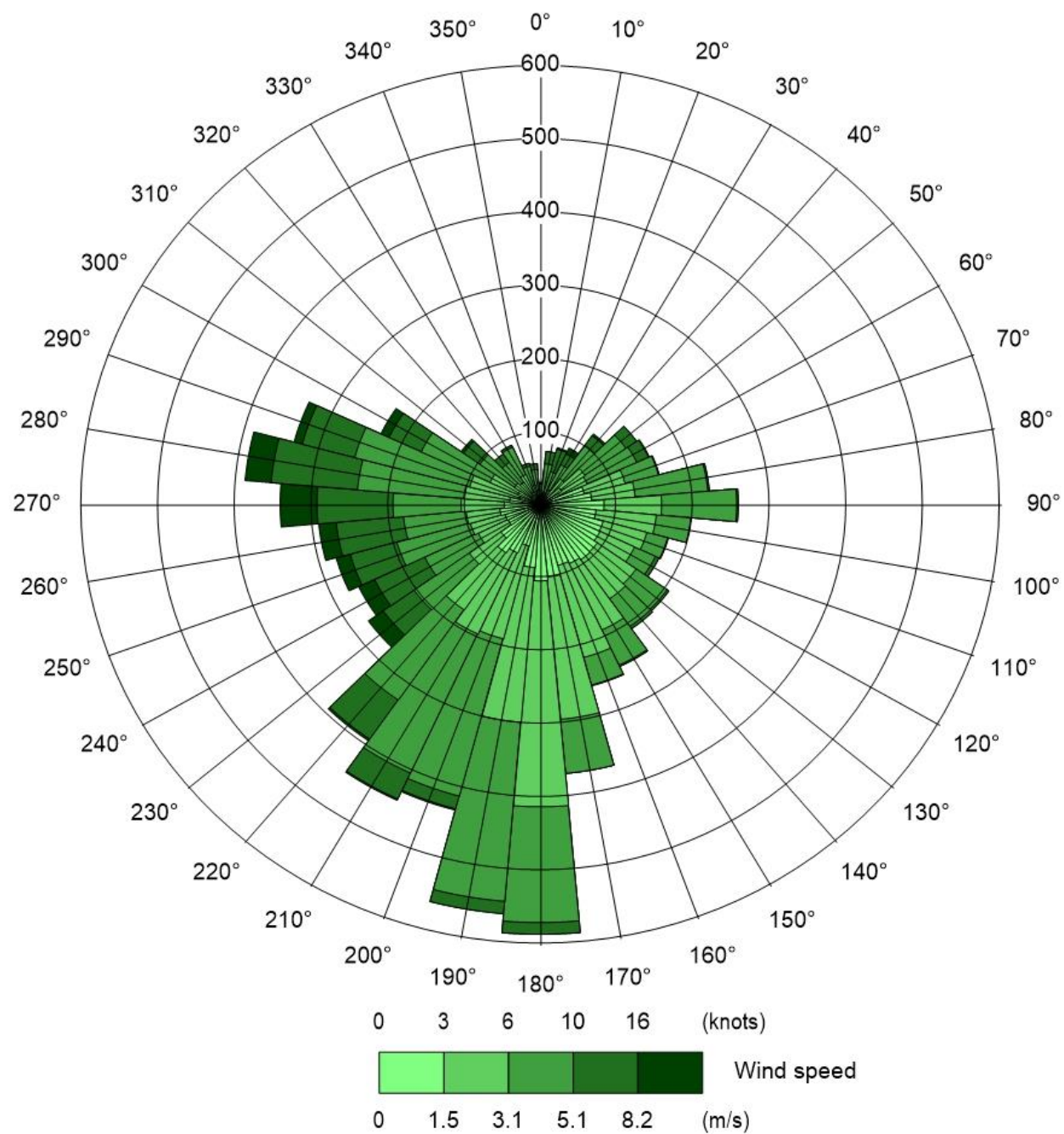
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Title
Figure 3
Wind Rose 2019
Manchester Meteorological Station

Project
Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number
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Legend

-  Site Boundary
-  Modelled Road Link
-  Cartesian Grid
-  Diffusion Tube Monitoring

Title

Figure 4
ADMS-Roads Input - Verification Scenario

Project

Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number

AQ109929

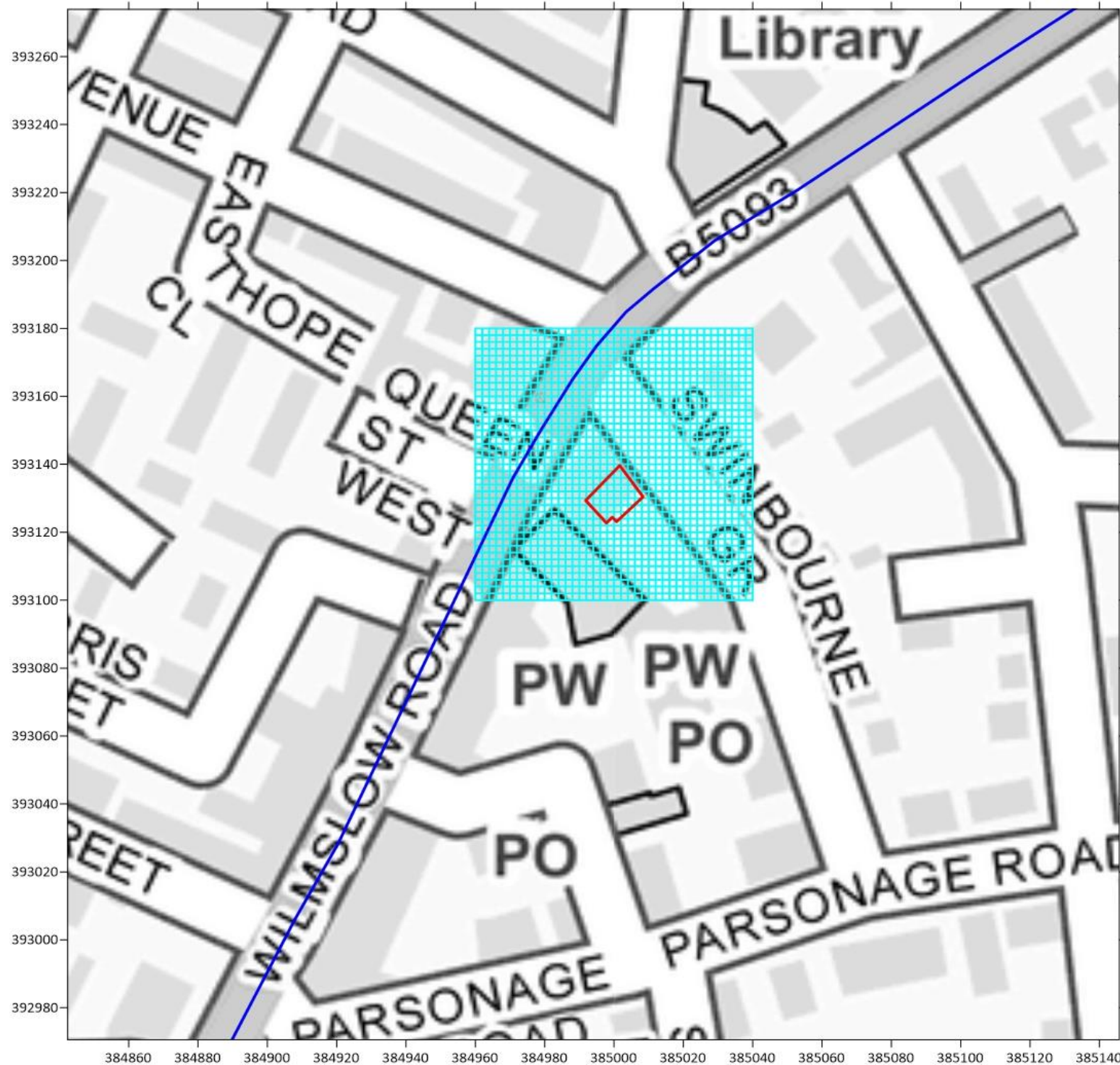
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Legend

-  Site Boundary
-  Modelled Road Link
-  Cartesian Grid

Title

Figure 5
ADMS-Roads Input DS 2022 Scenario

Project

Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number

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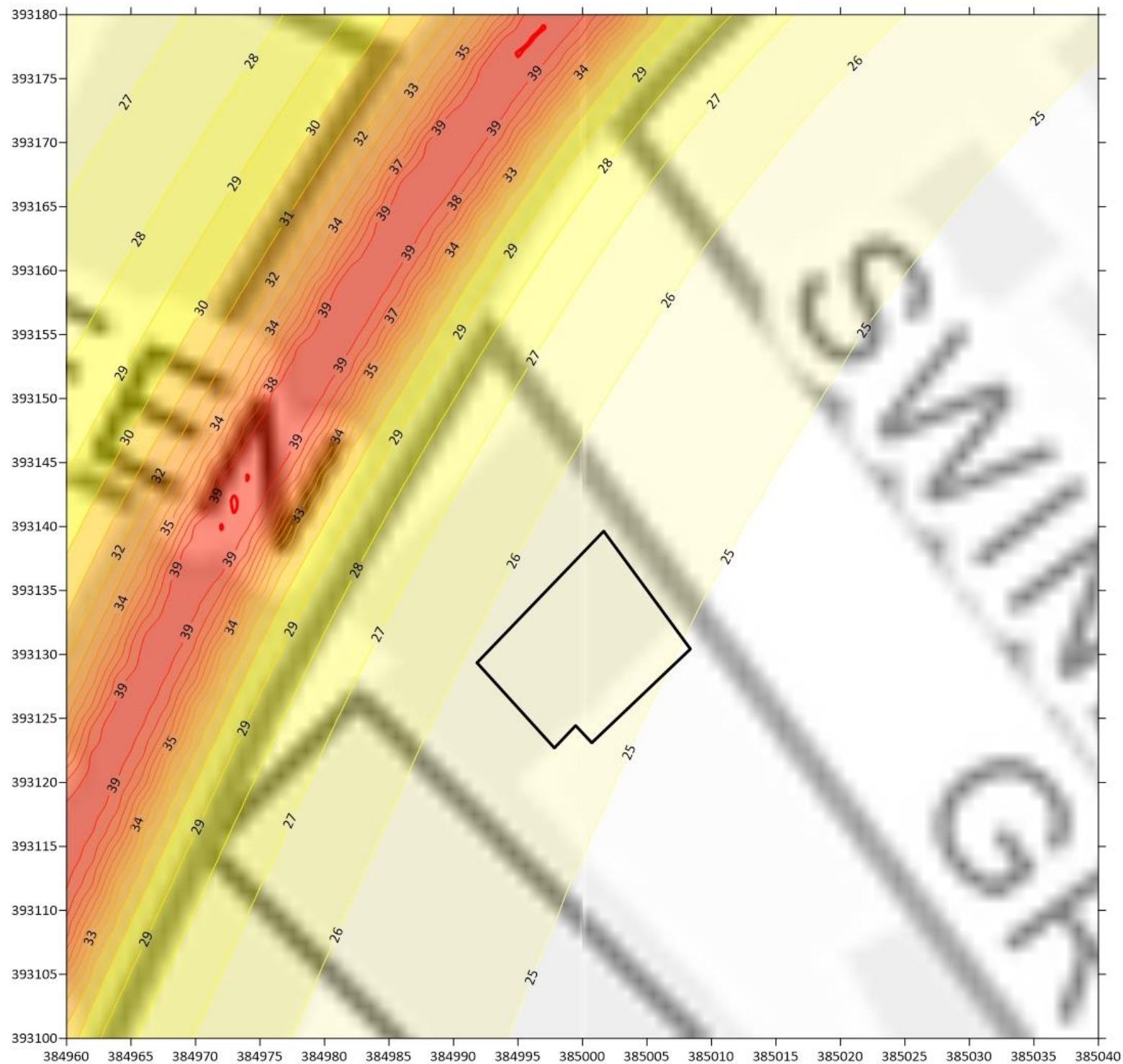
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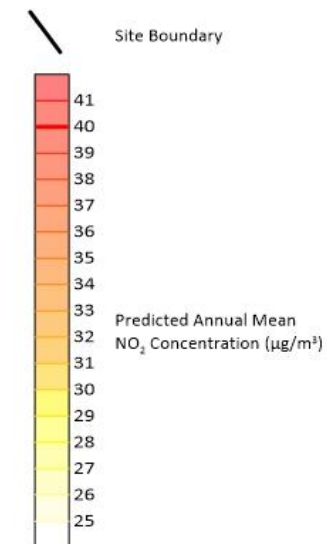
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Legend



Title

Figure 6
Predicted Annual Mean NO₂
Concentrations (µg/m³) 2022

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Project Number

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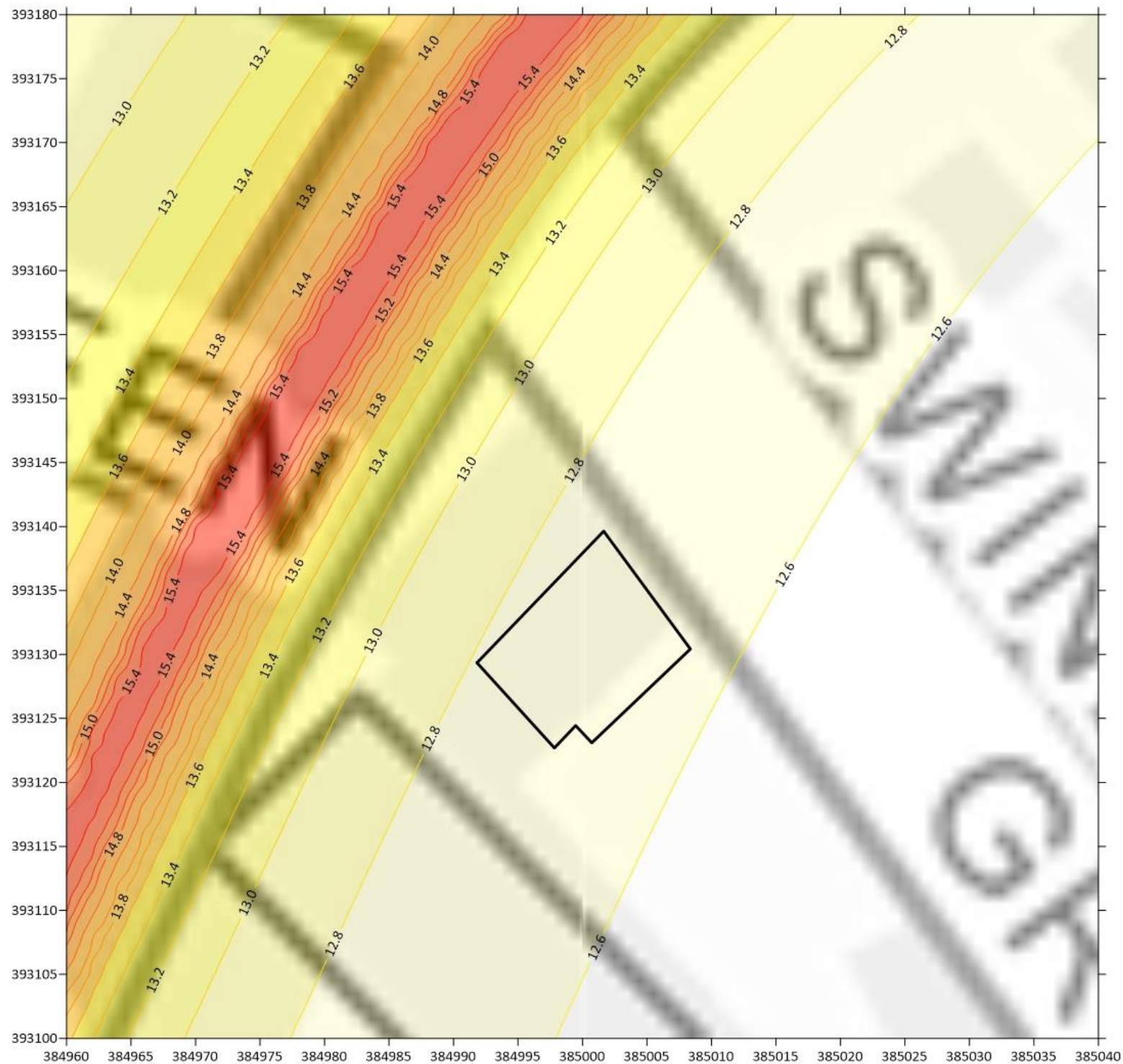
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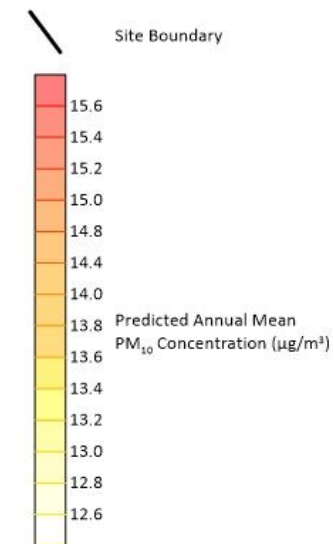
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Legend



Title

Figure 7
Predicted Annual Mean PM_{10}
Concentrations ($\mu g/m^3$) 2022

Project

Air Quality Assessment
2 Swinbourne Grove, Withington

Project Number

AQ109929

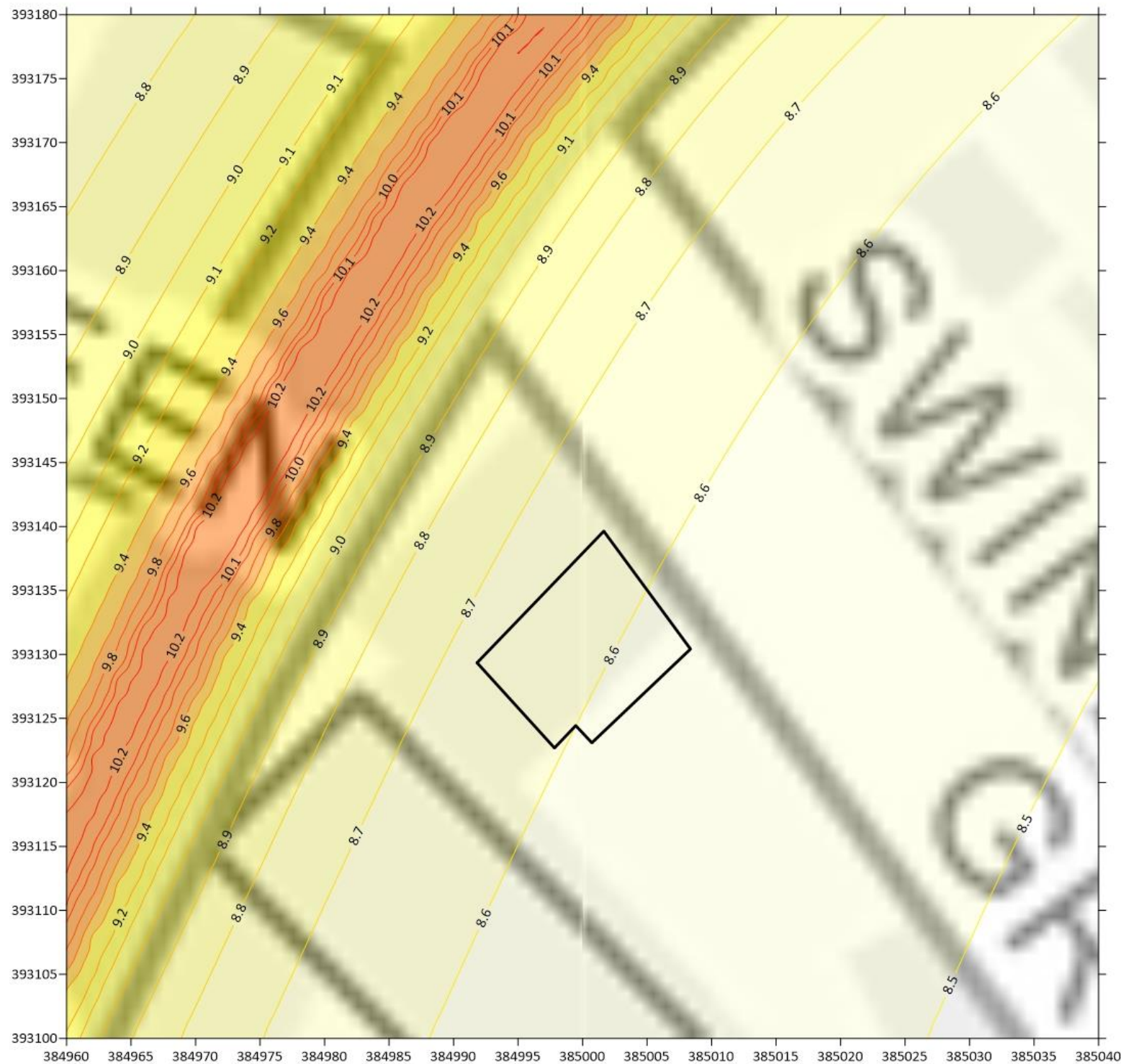
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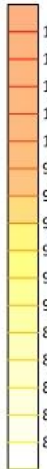
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Legend
 Site Boundary
 Predicted Annual Mean PM_{2.5} Concentration (µg/m³)

Title
Figure 8
Predicted Annual Mean PM_{2.5} Concentrations (µg/m³) 2022

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APPENDIX II – ASSESSMENT INPUTS

8.0 ASSESSMENT INPUTS

The Proposed Development has the potential to introduce future site users to poor air quality. Dispersion modelling using ADMS Roads was therefore undertaken to predict NO₂ and PM₁₀ concentrations across the site to consider site suitability for the proposed end-use.

The assessment was undertaken in accordance with the guidance contained within the DEFRA document LAQM (TG16)² and the EPUK and IAQM guidance⁴.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

The model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and
- Monin-Obukhov length.

Assessment Area

Ambient concentrations were predicted over the Proposed Development site and surrounding highway network. One Cartesian grid was included in the model over the area at approximately NGR: 384960, 393100 and 385040, 393180 at height of 1.5m to represent the proposed ground floor level for the 2022 opening year scenario.

Results were subsequently used to produce contour plots within the Surfer software package. Reference should be made to Figure 4 and 5 within Appendix I for a graphical representation of the verification inputs and operation phase DS extents, respectively.

Traffic Flow Data

Baseline traffic data was obtained from the Department for Transport (DfT).

The DfT Matrix web tool enables the user to view and download traffic flows on every link of the A-road and motorway network in Great Britain for the years 1999 to 2018. The DfT matrix is referenced in DEFRA guidance LAQM (TG16)² as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Growth factors provided by the Trip End Model Presentation Program (TEMPO) software package were utilised to allow for conversion from the obtained 2019 traffic flow to 2022 which was used to represent the opening year scenario. Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

A summary of the traffic data used in the verification scenario is provided in Table AII 1.

Table AII 1: 2019 Verification Traffic Data

Road Link		Road Width (m)	24 Hour AADT Flow	HDV Pop (%)	Mean Vehicle Speed (km/hr)
L1	Princess Road Northbound, South of Mersey Crescent	10.0	38,723	2.0	40
L2	Princess Road Northbound, Slowdown	10.0	38,723	2.0	15
L3	Princess Road Northbound, North of Mersey Crescent	10.0	38,723	2.0	40
L4	Princess Road Southbound, North of Mersey Crescent	10.0	38,723	2.0	40
L5	Princess Road Southbound, Slowdown	10.0	38,723	2.0	15
L6	Princess Road Southbound, South of Mersey Crescent	10.0	38,723	2.0	40
L7	Kingsway Northbound	6.9	18,718	1.8	56
L8	Kingsway Northbound, Slowdown	11.0	18,718	1.8	15
L9	Kingsway Southbound, Slowdown	7.0	18,718	1.8	15
L10	Kingsway Southbound	7.3	18,718	1.8	56
L11	Stockport Road, North of Matthews Lane	13.2	22,764	3.5	40
L12	Stockport Road, Slowdown for Matthews Lane	7.75	22,764	3.5	15
L13	Stockport Road, South of Matthews Lane	7.3	22,764	3.5	40
L14	Stockport Road, South of Cromwell Grove, Slowdown	9.5	22,764	3.5	15
L15	Stockport Road, Delamere Road	6.8	22,764	3.5	40
L16	Matthews Lane, Slowdown	7.0	4,194	4.2	15
L17	Matthews Lane	7.2	4,194	4.2	40

Reference should be made to Figure 4 within Appendix I for a graphical representation of the road link locations used within the verification assessment. The road width, canyon height and mean vehicle speed shown in Table AII.1 remained the same for the 2022 scenarios. A summary of the 2022 traffic data is shown in Table AII 2.

Table AII 2: 2022 Traffic Data

Road Link		Road Width (m)	Development Opening Year		Mean Vehicle Speed (km/hr)
			24 Hr AADT Flow	HDV Prop (%)	
L1	Wilmslow Road, South of Swinbourne Grove	6.5	9,477	9.8	40
L2	Wilmslow Road, Slowdown	15.0	9,477	9.8	8
L3	Wilmslow Road, South of Parsonage Road, Slowdown	8.7	11,018	6.9	8
L4	Wilmslow Road, South of Parsonage Road	8.2	11,018	6.9	40
L5	Palatine Road, Slowdown	8.7	9,268	10.5	8
L6	Palatine Road	10.5	9,268	10.5	40
L7	Wilmslow Road, North of Swinbourne Grove	6.8	9,477	9.8	40
L8	Wilmslow Road, North of Swinbourne Grove, Slowdown	6.8	9,477	9.8	8

Reference should be made to Figure 5 within Appendix I for a graphical representation of the road link locations used within the operation phase assessment.

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.1) released in August 2020, which incorporates updated COPERT 5.3 vehicle emissions factors for NO_x and PM and EURO 6 vehicle fleet sub-categories.

There is current uncertainty over NO₂ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2019 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

NO_x to NO₂ Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO₂ concentrations using the NO_x to NO₂ Calculator (v.8.1) provided by DEFRA, which is the method detailed within LAQM (TG16)².

Meteorological Data

Meteorological data used in this assessment was taken from Manchester meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive).

Manchester meteorological station is located at approximate NGR: 445620, 117300 which is approximately 9.8km South of the Proposed Development. Although there is a large distance between the application site and Manchester the use of this data has prior approval from the Environmental Health Department at MCC and is therefore considered to provide a reasonable representation of conditions at the development site.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 3 within Appendix I for a wind rose of utilised meteorological data.

Roughness Length

The specific roughness length (z_0) values used to represent conditions during the verification process, DS scenario, as well as conditions at the Manchester meteorological station are summarised in Table AII 3.

Table AII 3: Utilised Roughness Lengths

Scenario	Roughness Length (m)	ADMS Description
Verification and DS Scenarios	1	Cities, Woodlands
Manchester Meteorological Station	0.3	Agricultural (max)

These values of z_0 are considered appropriate for the morphology of the assessment area.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere within certain urban or rural contexts. The specific length values used to represent conditions during the verification process, DS scenario, as well as conditions at the Manchester Ringway meteorological station are summarised in Table AII 4

Table All 4: Utilised Monin-Obukhov Lengths

Scenario	Monin-Obukhov Length (m)	ADMS Description
Verification and DS Scenarios and Manchester Meteorological Station	30	Cities and Large Towns

This Monin-Obukhov value is considered appropriate for the morphology of the assessment area.

Background Concentrations

The annual mean NO₂ concentrations detailed in Table 4, was used in the dispersion modelling assessment to represent annual mean pollutant levels at the Proposed Development site and local monitoring sites.

Table All 5 displays the specific background concentrations as predicted by DEFRA, utilised to represent the condition at the monitoring locations used within the verification process.

Table All 5: Predicted Background Pollutant Concentrations for Diffusion Tubes

Monitoring Location	DEFRA Grid Square	Pollutant	2019 Predicted Background Concentration (µg/m ³)
37	382500, 391500	NO _x	23.81
		NO ₂	23.10*
74	385500, 390500	NO _x	27.94
		NO ₂	23.10*
75	381500, 394500	NO _x	26.55
		NO ₂	23.10*

*Peaceville Road (81) – Urban Background monitoring results

Similar to emission factors, background concentrations for 2019 were utilised in preference to predicted background concentrations for the development opening year (2022). This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposals.

Verification

The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of this assessment model verification was undertaken for 2019, using traffic data, meteorological data and monitoring results from this year.

MCC undertakes periodic monitoring of NO₂ concentrations at 3 roadside monitoring location within the assessment extents. Monitoring location situated at Alma Road (80) was not included within the verification process as road traffic data was unavailable for the surrounding areas. The road contribution to total NO_x concentration was calculated from the monitored

NO₂ result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM (TG16)². The monitored annual mean NO₂ concentration and calculated road NO_x concentration are summarised in Table All 6.

Table All 6: Monitoring Results

Site ID	Monitored Road NO _x Concentration (µg/m ³)	Modelled Road NO _x Concentration (µg/m ³)	% Difference ((Monitored Modelled)/Monitored) * 100
37	31.85	30.42	4%
74	20.93	11.75	44%
75	50.79	19.41	62%

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trend line based on the linear progression through zero was calculated, as shown in Graph 1.

This indicated that a verification factor of **1.5279** was required to be applied to all NO_x modelling results, showing the model overestimated pollutant concentrations throughout the assessment extents.

Graph 1 is provided below.

Graph 1 - Verification Adjustment Factor

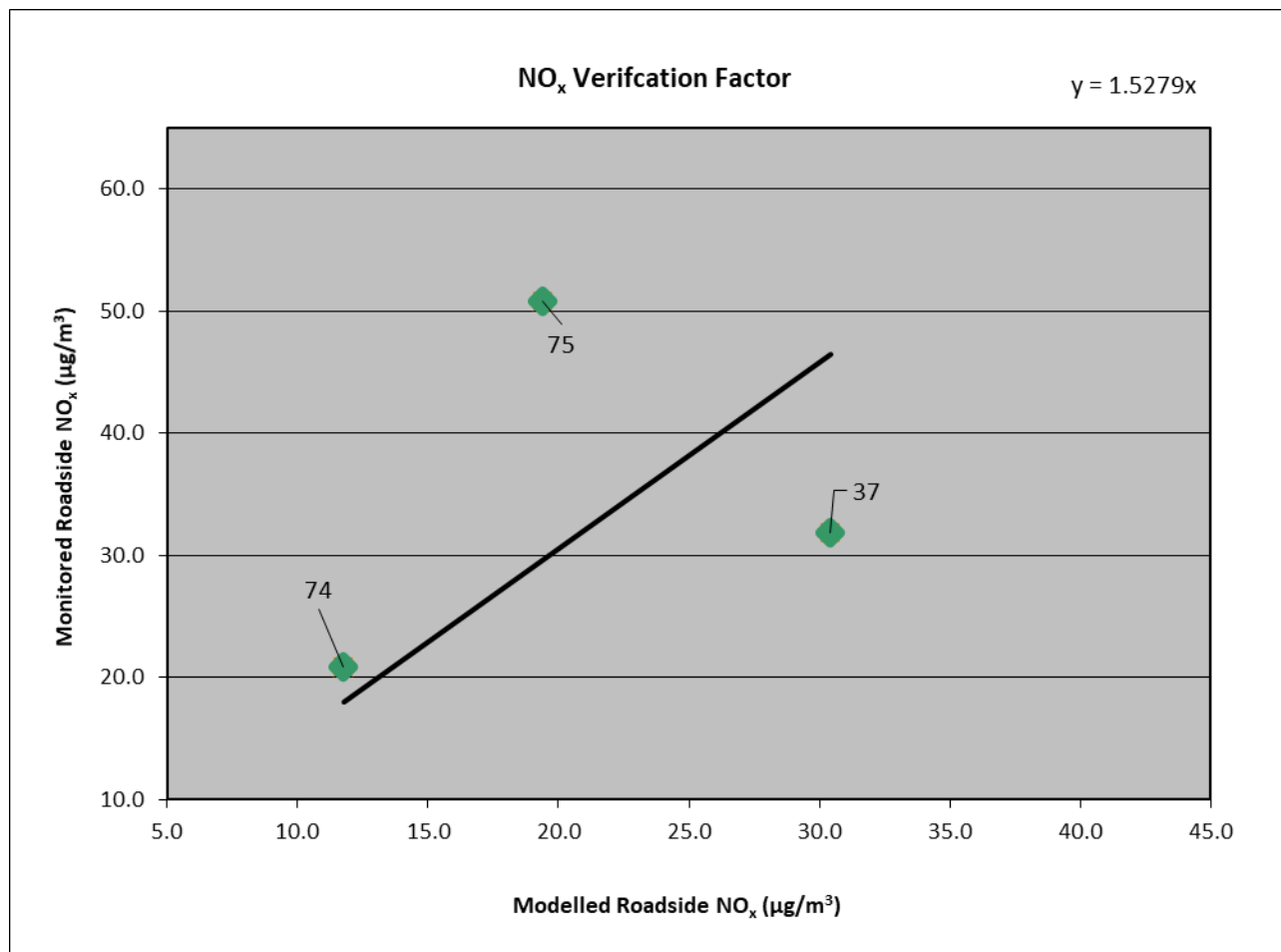


Table All 7 presents the monitored annual mean NO₂ concentrations and the adjusted modelled total NO₂ concentration based on the above verification factor. Exceedances of the annual mean NO₂ AQO are highlighted in **bold**.

Table All 7: Modelled Concentrations

Site ID	Monitored Road NO ₂ Concentration (µg/m ³)	Adjusted Modelled Road NO ₂ Concentration (µg/m ³)	% Difference (((Monitored Modelled)/Monitored)) * 100
37	38.70	45.17	-17%
74	33.60	32.17	4%
75	47.00	37.69	20%

As demonstrated in Table All 7, the percentage difference between modelled and monitored concentrations is deemed acceptable and is less than 25% in all cases. This reduces uncertainties in the model predictions and provide a robust representation of pollutant concentrations in accordance with the guidance suggested in LAQM (TG16)².

As PM monitoring is not undertaken within the assessment extents, the NO_x adjustment factor of **1.5279** was utilised to adjust model predictions of PM in accordance with the guidance provided within LAQM (TG16)².

APPENDIX IV – ASSESSOR’ S CURRICULUM VITAE

LEWIS ELLISON

Air Quality Consultant

MOcean (Hons)

KEY EXPERIENCE

Lewis is an Environmental Consultant with specialist experience in the air quality sector. His key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, retail and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Assessment of Odour Impact from commercial and industrial processes in line with Environment Agency (EA) and IAQM methodologies and guidance
- Quantification of Ecological Impacts associated with Nitrogen and Acid Deposition from industrial processes
- Production of air quality mitigation strategies for developments throughout the UK.
- Management of Environmental Permit Applications primarily for the Medium Combustion Plant Directive (MCDP)

SELECT PROJECTS SUMMARY

Residential Development:

- AGFA Works, Seagate – Air Quality Assessment using ADMS-Roads in support of an 83 residential unit development with the potential to cause air quality impacts at sensitive locations.
- Andrew Avenue, Breahead – Air Quality Assessment using ADMS-Roads in support of a 77 residential unit development in close proximity to the M8.
- Clothorn Road, Didsbury – Air Quality assessment for a residential development consisting of 12 units in close proximity to an AQMA declared by Manchester city council.
- Downend Road, Portchester – Air Quality Assessment in support of a 350 residential unit development in close proximity to the M27.
- Great Leighs, Chelmsford- Baseline scoping report in support of several proposed large scale residential developments totalling 1300 residential units, with the potential to impact on nearby sensitive locations.
- Parkview, Lofthouse Gate – Air Quality Assessment in support of a proposed 160 residential unit development in close proximity to two AQMA declared by Wakefield Metropolitan District Council.
- Shields Road, Walkergate - Air Quality Assessment using ADMS-Roads in support of a 40 residential unit development in close proximity to the Shields Road.

Environmental impact assessment:

- Bower Farm, Bridgewater – Production of an Air Quality Assessment with relevant mitigation measures for inclusion in an EIA report for part of the east Sedgemoor development.

Commercial Development:

- ALDI, Hertford – Air Quality Assessment for the Proposed Aldi Superstore at Hertfordshire using ADMS-Roads.
- Hortonwood West, Telford – Construction Environmental Management Plan (CEMP) for the expansion of the current factory on site.
- Inverness Airport Business Park – Air Quality Scoping Report for a proposed hotel and commercial office space.

Odour assessment:

- Wren Park Care Home, Shefford – Qualitative Odour Assessment of industrial units in the vicinity of a proposed extension to the current care home.
- Marsh Farm, Basildon – Qualitative Odour Assessment of an anaerobic digesting unit in support of a follow up assessment for the unit.

Mixed-Use Development:

- Coldharbour Land, Lambeth – Air Quality Assessment for a proposed mixed use development with the implementation of mitigation measures.
- Old Fire Station, Newham, London- Air Quality Assessment using ADMS-Roads for a proposed mixed use development with the implementation of mitigation measures, in support of a redevelopment of the previous fire station.
- Ordsall Lane, Salford – Air Quality Assessment in support of a mixed use development using ADMS-Roads.

QUALIFICATIONS

- Master of Oceanography
- Member of the Institute of Environmental Science (IES)
- Odour Acuity Certified Master of Science
- Member of the Institute of Air Quality Management