wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

LIDL GB LTD

WAVERTREE, LIVERPOOL

AIR QUALITY ASSESSMENT

MARCH 2021

wardell armstrong

Wardell Armstrong
41-50 Futura Park, Aspinall Way, Middlebrook, Bolton, BL6 6SU
Telephone: +44 (0)1204 227 227 www.wardell-armstrong.com

DATE ISSUED:	**30th March 2021**
JOB NUMBER:	**GM11714**
REPORT NUMBER:	**001**
VERSION:	**V0.1**
STATUS:	**FINAL**

LIDL GB LTD

WAVERTREE, LIVERPOOL

AIR QUALITY ASSESSMENT

MARCH 2021

PREPARED BY:

Dr. M Barnes — Senior Environmental Scientist (Air Quality)

.....

APPROVED BY:

M Dawson — Technical Director and Service Lead

This report has been prepared by Wardell Armstrong LLP with all reasonable skill, care and diligence, within the terms of the Contract with the Client. The report is confidential to the Client and Wardell Armstrong LLP accepts no responsibility of whatever nature to third parties to whom this report may be made known.

No part of this document may be reproduced without the prior written approval of Wardell Armstrong LLP.

Wardell Armstrong is the trading name of Wardell Armstrong LLP, Registered in England No. OC307138.

Registered office: Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom

UK Offices: Stoke-on-Trent, Birmingham, Cardiff, Carlisle, Edinburgh, Glasgow, Greater Manchester, Central Manchester London, Newcastle upon Tyne, Sheffield, Truro. International Offices: Almaty, Moscow

CONTENTS

EXECUTIVE SUMMARY 1
1 INTRODUCTION 2
1.1 Background 2
2 LEGISLATION AND POLICY CONTEXT 3
2.1 Relevant Air Quality Legislation and Guidance 3
2.2 Assessment Criteria 3
3 ASSESSMENT METHODOLOGY 5
3.1 Consultation and Scope of Assessment 5
3.2 Construction Phase Assessment 5
3.3 Operational Phase Assessment 6
3.4 Limitations and Uncertainties 8
4 BASELINE SITUATION 11
4.1 Liverpool City Council Local Air Quality Management 11
4.2 Background Air Pollutant Concentrations 11
4.3 Modelled Baseline Concentrations at Existing Sensitive Receptors 12
5 IMPACT ASSESSMENT 13
5.1 Construction Phase Assessment 13
5.2 Operational Phase Assessment – Sensitivity Analysis 17
6 CONCLUSIONS 24
6.1 Construction Phase 24
6.2 Operational Phase 24
6.3 Summary 24

APPENDICES

Appendix A: Air Quality Legislation and Guidance
Appendix B: Methodology for Construction Phase Assessment
Appendix C: Methodology for Operational Phase Assessment
Appendix D: Professional Experience of Assessors

DRAWINGS	TITLE	SCALE
GM11714-001	Existing Sensitive Receptor Locations	1:2,500

EXECUTIVE SUMMARY

An air quality assessment has been undertaken to accompany a full planning application for a proposed supermarket off Church Road North, Wavertree, Liverpool

The assessment considers dust and fine particulate matter emissions during the construction phase and road traffic emissions during the operational phase of the development.

During the construction phase, the risk of dust soiling effects is classed as medium for demolition, earthworks and construction and negligible for trackout; the risk of human health effects is classed as low for demolition, earthworks and construction and negligible for trackout. Mitigation measures, based on best practice guidance, are proposed to further reduce any potential impacts.

For the operational phase assessment, annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations have been modelled at twelve existing receptor locations using the most recent Emission Factor Toolkit available from DEFRA (v 10.1). In accordance with national guidance, a sensitivity analysis has been undertaken for NO_2 concentrations in which base year background pollutant concentrations and vehicle emission factors have been applied to the opening/future years. This is considered to provide a conservative upper-bound to the assessment. Predicted annual mean pollutant concentrations have been compared to the relevant air quality objectives and target level.

The operational phase sensitivity analysis concludes that the development will result in concentrations of NO_2, PM_{10} and $PM_{2.5}$ remaining below the air quality objectives/target values, both without and with the development for the proposed 2022 opening year and the 2027 future year. The impact of the development during the operational phase is predicted to be negligible at all twelve existing sensitive receptors that have been considered. Air quality effects are therefore considered to be 'not significant'.

The assessment demonstrates that the proposed development will not lead to an unacceptable risk from air pollution or to any breach in national objectives and is, therefore, compliant with relevant national policy. Therefore, there are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

1 INTRODUCTION

1.1 Background

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Lidl GB to undertake an air quality assessment to accompany a full planning application for a proposed supermarket off Church Road North, Wavertree, Liverpool.

1.1.2 The proposed development site currently consists of a Co-op supermarket, which will be demolished. Existing residential properties are adjacent to the site to the east and south. To the west, the site is bordered by Church Road North with a mix of commercial, retail and residential properties, while to the north the site is bordered by Childwall Road.

1.1.3 This report details the results of the air quality assessment undertaken to accompany a full planning application for the proposed development. The report discusses the potential dust and fine particulate matter impacts associated with the construction phase and an assessment of the potential air quality impacts of the additional road traffic generated by the proposed development. Air pollutant concentrations are considered at existing sensitive receptor locations in the vicinity of the proposed development.

2 LEGISLATION AND POLICY CONTEXT

2.1 Relevant Air Quality Legislation and Guidance

2.1.1 The air quality assessment has been undertaken in accordance with the following legislation and guidance (further details are included in **Appendix A**):

- EU Ambient Air Quality Directive 2008/50/EC (i.e. the CAFE Directive);
- The Environment Act 1995;
- Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007;
- The Air Quality Standards Regulations 2010;
- Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(16), February 2018;
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework, February 2019; and
- Department for Communities and Local Government, Planning Practice Guidance: Air Quality, November 2019.

2.2 Assessment Criteria

2.2.1 The relevant air quality objectives and limit values for this assessment are included within Table 1.

Table 1: Air Quality Objectives and Limit Values Relevant to the Assessment*

Pollutant	Objective/Limit Value	Averaging Period	Obligation
Nitrogen Dioxide (NO_2)	200µg/m^3, not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	England, Wales and Northern Ireland
	40µg/m^3	Annual mean	England, Wales and Northern Ireland
	18µg/m^3	Annual mean	Scotland only
Particulate Matter ($PM_{2.5}$)	Limit Value of 25µg/m^3	Annual mean	England, Wales and Northern Ireland
	10µg/m^3	Annual mean	Scotland only

**In accordance with the Air Quality Standards Regulations 2010*

2.2.2 Further details of where these objectives and limit values apply are detailed in **Appendix A**.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 The assessment methodology was discussed with Mr Keith Dooley, Air Quality Support Officer at Liverpool City Council (LCC), via email correspondence, on 9th March 2021.

3.1.2 A summary of the consultation undertaken is provided in Table 2.

Table 2: Summary of Consultation

Assessment Stage	Proposed Method	Response
Construction phase assessment to consider dust and fine particulate matter (PM_{10})	Qualitative assessment in accordance with Institute of Air Quality Management (IAQM) guidance	No objection to method
Operational phase assessment to consider nitrogen dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$)	Detailed assessment using the ADMS-Roads atmospheric dispersion model, in accordance with Environmental Protection UK (EPUK)/IAQM guidance, and with all predicted concentrations compared to air quality objectives/limit values	No objection to method
	2019 meteorological data from Liverpool recording station	No objection to method
	Background concentrations from 2018-based DEFRA default maps	No objection to method
	Assessment undertaken using EFT v10.0 emission factors.	No objection to method
	Model verification using roadside diffusion tubes S8 and S20	No objection to method

3.1.3 Mr Keith Dooley replied that he agreed in principle with the proposed methodology.

3.1.4 In order to verify the model, traffic data from the Department for Transport (DfT) count points, located on the A562 and Queens Drive, close to diffusion tubes S8 and S20, has been used within the assessment.

3.2 Construction Phase Assessment

3.2.1 To assess the impacts associated with dust and fine particulate matter releases during the construction phase of the development, an assessment has been undertaken in accordance with guidance from the Institute of Air Quality Management (IAQM)[1].

[1] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, February 2014

Further details of the construction assessment methodology are provided in **Appendix B**.

3.2.2 The closest sensitive human receptors to where construction phase activities will take place are residential and commercial in nature and are detailed in Table 3.

Table 3: Existing Sensitive Receptors Considered in the Construction Phase Assessment

Receptor	Direction from the Site	Approximate Distance from the Site Boundary (m)
Existing Commercial Properties along Lake Road	North	Approximately 40m
Existing Residential Dwellings along Lance Lane	East	Adjacent
Existing Residential Dwellings along Wavertree Green and Church Road North	South	Adjacent
Existing Commercial, Retail and Residential Properties along Church Road North	West	Approximately 22m at closest point

3.2.3 There are no ecological receptors, or potentially dust sensitive statutory designated habitat sites, within 50m of the site and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Ecological effects do not therefore need to be considered within this assessment.

3.2.4 The criteria used to assess the construction impact of the proposed development, and the associated significance of effects at existing sensitive receptors, are included in **Appendix B**.

3.3 Operational Phase Assessment

3.3.1 The air dispersion model ADMS-Roads (CERC, Version 5) has been used to assess the impacts associated with road traffic emissions during the operational phase assessment. The impacts have been assessed in accordance with guidance from Environmental Protection UK (EPUK) and the IAQM[2]. Further details of the modelling and assessment methodology are provided in **Appendix C**.

[2] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

3.3.2 NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted at existing sensitive receptors, as these are the pollutants considered most likely to exceed the objectives and limit values.

3.3.3 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for five assessment scenarios as follows:

- **Scenario 1:** 2019 Verification and Base Year, the most recent year for which traffic flow information, local monitored pollution data and meteorological data is available;
- **Scenario 2:** 2022 Opening Year, without the proposed development in place;
- **Scenario 3:** 2022 Opening Year, with the proposed development in place;
- **Scenario 4:** 2027 Future Year, without the development in place; and,
- **Scenario 5:** 2027 Future Year, with the development in place.

Existing Sensitive Receptors

3.3.4 A number of representative existing sensitive receptors (identified as ESR 1 to ESR 12) have been selected for consideration in the air quality assessment. These have been chosen based on their sensitivity and their proximity to roads which will be affected by development generated traffic.

3.3.5 Details of the receptors considered are provided in Table 4, and their locations are shown on drawing GM11714-001.

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment

Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1*	High Street	339215	389452	Residential
ESR 2*		339175	389457	Residential
ESR 3*		339127	389462	Residential
ESR 4*		338894	389511	Residential
ESR 5*		338965	389469	Residential
ESR 6*	Church Road North	339212	389358	Residential
ESR 7*		339218	389328	Residential
ESR 8*		339260	389320	Residential

Table 4: Existing Sensitive Receptors Considered in Operational Phase Assessment				
Receptor	**Address**	**Grid Reference**		**Receptor Type**
		Easting	**Northing**	
ESR 9*	Childwall Road	339309	389404	Residential
ESR 10*		339383	389446	Residential
ESR 11*		339487	389380	Residential
ESR 12*		339639	389373	Residential
**Situated within an Air Quality Management Area*				

3.3.6 The criteria used to assess the operational impact of the proposed development, and the associated significance of effects at existing sensitive receptors, are included in **Appendix C**.

Proposed Sensitive Receptors

3.3.7 Proposed sensitive receptors have not been considered within this air quality assessment as the development is not for residential purposes.

3.4 Limitations and Uncertainties

3.4.1 At present, there is a degree of uncertainty associated with the prediction of future NO_2 concentrations, and consequently the assessment of impacts relating to development generated road traffic emissions.

3.4.2 Air quality assessments make use of official sources of information (i.e. vehicle emission factors and background concentrations) which are increasingly considered to be overly optimistic. Monitoring data collected by the UK Government and local authorities shows that annual mean NO_2 concentrations have remained higher than previously expected (especially in roadside locations). This is widely thought to be due to the lower than expected decline in NO_x emissions from diesel vehicles (even as new Euro standards have been introduced), coupled with an overall increase in the number of diesel vehicles on the road.

3.4.3 The vehicle emission factors used in this assessment are from Defra's Emission Factor Toolkit (EFT v10.1)[3], which is the most up-to-date version available. Although this is considered to be more realistic than earlier versions, some uncertainty remains.

3.4.4 A position statement was produced by the IAQM in 2018 which deals specifically with the use of EFT v8.0 and the consideration of uncertainties in predicting future air quality[4]. The statement concludes that the approaches for dealing with this uncertainty should be decided on a case-by-case basis, but may include use of a sensitivity test in which it is assumed that NO_x emissions will not reduce as quickly over time as within the EFT. The statement also highlights the need for careful consideration of the results of any sensitivity test, particularly with regard to assessing impacts and the significance of effects. A precautionary approach is recommended.

3.4.5 At the time of the assessment, no IAQM update has been provided for EFT v10.1. However, a recent study provides evidence that the previous version, EFT v9.0, may be relied upon to predict the 'most likely' future emissions reductions where model verification has been undertaken using monitored data from 2016 or later[5]. A further study in September 2020 concluded that the differences between the current EFT v.10.1 and the previous EFT v.9.0.1 are sufficiently small that previous work to validate the EFT remains valid for the most recent edition[6]. The IAQM has yet to comment on these studies.

3.4.6 In accordance with Defra guidance a sensitivity analysis has been undertaken for the NO_2 modelling in which the 2019 background pollution concentrations and vehicle emission factors have been applied to the 2022 opening and 2027 future year scenarios, to provide a conservative upper-bound to the assessment. Further details of the methodology are provided in **Appendix C**.

3.4.7 Several steps have been taken to ensure the model is as accurate and representative as possible. These comprise:

- Consultation has been undertaken with LCC to confirm their agreement with the methodology used within the assessment;

[3] Defra Local Air Quality Management webpages (https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html)
[4] Institute of Air Quality Management, Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments v1.1, July 2018
[5] https://www.aqconsultants.co.uk/news/march-2020/defra%E2%80%99s-emission-factor-toolkit-now-matching-measu
[6] Air Quality Consultants, Comparison of EFT v10 with EFT v9, September 2020

- Detailed traffic data has been obtained from the appointed transport consultant following extensive consultation to ensure its appropriateness and robustness;
- The latest Defra LAQM tools have been incorporated into the assessment following their release in August 2020;
- Meteorological data, obtained from a representative meteorological recording station, has been incorporated into the assessment; and
- The nearby Council operated diffusion tube monitoring locations (REF: S8 and S20) have been considered within the assessment to allow model verification to take place. Model verification factor(s) have been applied to NO_x concentrations, which are then input into the Defra NO_x to NO_2 calculator tool to predict total NO_2 concentrations at each receptor considered in the assessment.

4 BASELINE SITUATION

4.1 Liverpool City Council Local Air Quality Management

4.1.1 The proposed development site is located within the administrative area of Liverpool City Council (LCC), which is responsible for the management of local air quality.

4.1.2 There is currently one borough wide AQMA declared, as a result of exceedances of the annual mean NO_2 objective. The development is therefore situated within the AQMA.

4.1.3 There are two roadside NO_2 diffusion tubes located on the A562 and the corner of Queen's Drive and Menlove Avenue which have been used for model verification purposes. Monitoring data for 2019, provided by LCC, showed monitored annual mean NO_2 concentrations of 33.9 µg/m^3 and 39.2 µg/m^3, respectively.

4.2 Background Air Pollutant Concentrations

4.2.1 The air quality assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed.

4.2.2 As there are currently no representative NO_2, PM_{10} or $PM_{2.5}$ background monitoring locations in the vicinity of the proposed development site, background concentrations have been obtained from the 2018-based Defra default concentration maps, for the appropriate grid squares[7].

4.2.3 The background pollutant concentrations used in this assessment are detailed in Table 5.

Table 5: Background Pollutant Concentrations Used in the Air Quality Assessment*

Pollutant	Annual Mean Concentrations (µg/m^3)			
	NOx	NO_2	PM_{10}	$PM_{2.5}$
2019 Base Year				
ESR 1 – ESR 3 & ESR 6 – ESR 12 (339500, 389500)	21.67	15.27	12.99	9.07
ESR 4 & ESR 5 (338500, 389500)	21.02	16.61	12.78	8.99
**Obtained from the Defra 2018-based background maps*				

[7] Accessed through the Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html)

4.3 Modelled Baseline Concentrations at Existing Sensitive Receptors

4.3.1 The baseline assessment (i.e. scenarios 1, 2 and 4) has been carried out for the existing sensitive receptors considered, in accordance with Defra guidance (i.e. using EFT v10.1). The adjusted NO_2 and unadjusted PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 6.

Table 6: Predicted Adjusted NO_2 and Unadjusted PM_{10} and $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 1 and 2

Receptor	Calculated Annual Mean Concentrations (µg/m^3)								
	Scenario 1: 2019 Base Year			Scenario 2: 2022 Opening Year, Without Development			Scenario 4: 2027 Future Year, Without Development		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	24.94	13.75	9.52	25.36	13.79	9.54	25.91	13.83	9.56
ESR 2	25.11	13.77	9.53	25.55	13.81	9.55	26.13	13.86	9.58
ESR 3	25.18	13.91	9.60	25.62	13.95	9.62	26.21	14.01	9.66
ESR 4	26.83	13.78	9.56	27.28	13.83	9.59	27.89	13.89	9.63
ESR 5	22.54	13.35	9.31	22.82	13.38	9.33	23.18	13.41	9.35
ESR 6	23.30	13.72	9.49	23.65	13.75	9.51	24.14	13.80	9.54
ESR 7	21.43	13.57	9.40	21.70	13.59	9.41	22.08	13.63	9.44
ESR 8	20.33	13.46	9.34	20.56	13.48	9.35	20.88	13.51	9.37
ESR 9	21.92	13.59	9.41	22.23	13.62	9.43	22.61	13.65	9.45
ESR 10	21.05	13.53	9.38	21.31	13.56	9.39	21.65	13.59	9.41
ESR 11	19.66	13.41	9.31	19.86	13.42	9.32	20.11	13.45	9.33
ESR 12	20.86	13.52	9.37	21.11	13.55	9.39	21.43	13.58	9.41

NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[8] in accordance with LAQM.TG(16)

4.3.2 The results show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant objectives and limit values.

[8] Defra Local Air Quality Management webpages (http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html)

5 IMPACT ASSESSMENT

5.1 Construction Phase Assessment

Step 2 – Impact Assessment

5.1.1 In accordance with the IAQM guidance, the main activities to be considered during the construction phase of the proposed development are demolition, earthworks, construction and trackout.

5.1.2 Demolition will involve the removal of the existing buildings within the site. Earthworks covers the processes of soil-stripping, ground-levelling, excavation and landscaping. Construction activities will focus on the proposed buildings, access roads car parking areas. Trackout is defined as the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

Step 2A

5.1.3 Step 2A of the assessment defines the potential dust emission magnitude from demolition, earthworks, construction and trackout in the absence of site-specific mitigation.

5.1.4 Examples of the criteria for the dust emission classes are detailed in **Appendix B**. The results of this step are detailed in Table 8.

Step 2B

5.1.5 Step 2B of the construction phase dust assessment defines the sensitivity of the area, taking into account the significance criteria detailed in **Appendix B**, for demolition, earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health effects and ecological effects.

5.1.6 For demolition, earthworks and construction, there are currently between 10 and 100 receptors (a mix of residential and commercial) within 50m of where these activities may take place, which is assumed to be the site boundary for the purposes of this assessment.

5.1.7 The routing of construction vehicles is unknown at this stage. Therefore, for the purposes of this assessment, worst case routing scenarios have been assumed for assessment of potential trackout impacts at nearby receptors.

5.1.8 As a result, for trackout, there are between 10 and 100 receptors (mainly residential) within 20m of where trackout may occur for a distance of up to 500m from the site entrance.

Step 2C

5.1.9 Step 2C of the construction phase dust assessment defines the risk of impacts from each activity, by combining the dust emission magnitude with the sensitivity of the surrounding area.

5.1.10 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in **Appendix B**. The results of this step are detailed in Table 7.

Summary of Step 2

5.1.11 Table 7 details the results of Step 2 of the construction phase assessment for human receptors.

Table 7: Construction Phase Dust Assessment for Human Receptors

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	Medium[a]	Medium[b]	Medium[c]	Small[d]
Step 2B				
Sensitivity of Closest Receptors	High	High	High	High
Sensitivity of Area to Dust Soiling Effects	Medium	Medium	Medium	Medium
Sensitivity of Area to Human Health Effects	Low[e]	Low[e]	Low[e]	Low[e]
Step 2C				
Dust Risk: Dust Soiling	Medium Risk	Medium Risk	Medium Risk	Negligible
Dust Risk: Human Health	Low Risk	Low Risk	Low Risk	Negligible

a. Total building volume estimated to be between 20,000m^3 and 50,000m^3
b. Total site area estimated to be between 2,500m^2 and 10,000m^2
c. Total building volume estimated to be between 25,000m^3 and 100,000m^3, with potentially dusty construction materials

Table 7: Construction Phase Dust Assessment for Human Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
d. Number of construction phase vehicles estimated to be less than 10 movements per day				
e. Background annual mean PM_{10} concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2019				

Step 3 – Mitigation

5.1.12 During the construction phase, the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and particulate matter to be generated.

5.1.13 Step 2C of the assessment has identified that the risk of dust soiling and human health effects is not negligible for all the activities and therefore site-specific mitigation will need to be implemented to ensure dust effects from these activities will be not significant.

Recommendations for Site-Specific Mitigation

5.1.14 Specific mitigation relating to dust control may be in the form of construction best practices or could include a dust management plan. Recommendations for mitigation within the IAQM guidance include:

- Soft strip inside buildings before demolition;
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed;
- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Protection of surfaces and exposed material from winds until disturbed areas are sealed and stable;
- Dampening down of exposed stored materials, which will be stored as far from sensitive receptors as possible;
- 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;

- Avoidance of activities that generate large amounts of dust during windy conditions;
- 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;
- Avoid dry sweeping of large areas;
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper to be in use continuously;
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Minimisation of vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation;
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever the site size and layout permits; and
- Access gates to be located at least 10m from receptors, where possible.

5.1.15 All dust and air quality complaints should be recorded and appropriate measures be taken to identify causes and reduce emissions in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a logbook and made available to LCC on request.

5.1.16 It is recognised that the final design solutions will be developed with the input of the Contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials and to incorporate the particular skills and experience offered by the appointed contractor.

Step 4 – Residual Effects

5.1.17 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from demolition, earthworks, construction and trackout associated with the proposed development.

5.1.18 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance

dust and particulate matter to be generated and any residual impact should be **not significant**.

5.2 Operational Phase Assessment – Sensitivity Analysis

Existing Sensitive Human Receptors

5.2.1 The sensitivity analysis has been carried out for the representative existing sensitive receptors considered (i.e. ESR 1 to ESR 12).

5.2.2 Table 8 details the predicted NO_2 concentrations for the 2022 Opening Year, for both the 'Without Development' and 'With Development' scenarios, in accordance with Defra guidance (i.e. using EFT v10.1). The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 8: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean NO_2 Concentrations (µg/m^3)[a]				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	25.36	25.45	<75%	<0.5%	**Negligible**
ESR 2	25.55	25.66	<75%	<0.5%	**Negligible**
ESR 3	25.62	25.73	<75%	<0.5%	**Negligible**
ESR 4	27.28	27.41	<75%	<0.5%	**Negligible**
ESR 5	22.82	22.89	<75%	<0.5%	**Negligible**
ESR 6	23.65	23.73	<75%	<0.5%	**Negligible**
ESR 7	21.70	21.76	<75%	<0.5%	**Negligible**
ESR 8	20.56	20.61	<75%	<0.5%	**Negligible**
ESR 9	22.23	22.28	<75%	<0.5%	**Negligible**
ESR 10	21.31	21.36	<75%	<0.5%	**Negligible**
ESR 11	19.86	19.89	<75%	<0.5%	**Negligible**
ESR 12	21.11	21.14	<75%	<0.5%	**Negligible**

a. NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator, in accordance with LAQM.TG(16)
b. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.3 Table 9 details the PM_{10} concentrations for the 2022 Opening Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 9: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean PM_{10} Concentrations (µg/m^3)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	13.79	13.79	<75%	<0.5%	**Negligible**
ESR 2	13.81	13.82	<75%	<0.5%	**Negligible**
ESR 3	13.95	13.96	<75%	<0.5%	**Negligible**
ESR 4	13.83	13.84	<75%	<0.5%	**Negligible**
ESR 5	13.38	13.38	<75%	<0.5%	**Negligible**
ESR 6	13.75	13.76	<75%	<0.5%	**Negligible**
ESR 7	13.59	13.60	<75%	<0.5%	**Negligible**
ESR 8	13.48	13.49	<75%	<0.5%	**Negligible**
ESR 9	13.62	13.62	<75%	<0.5%	**Negligible**
ESR 10	13.56	13.56	<75%	<0.5%	**Negligible**
ESR 11	13.42	13.43	<75%	<0.5%	**Negligible**
ESR 12	13.55	13.55	<75%	<0.5%	**Negligible**

a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.4 Table 10 details the $PM_{2.5}$ concentrations for the 2022 Opening Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 10: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 2 and 3 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean $PM_{2.5}$ Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	9.54	9.54	<75%	<0.5%	**Negligible**
ESR 2	9.55	9.55	<75%	<0.5%	**Negligible**
ESR 3	9.62	9.63	<75%	<0.5%	**Negligible**
ESR 4	9.59	9.60	<75%	<0.5%	**Negligible**
ESR 5	9.33	9.33	<75%	<0.5%	**Negligible**
ESR 6	9.51	9.51	<75%	<0.5%	**Negligible**
ESR 7	9.41	9.42	<75%	<0.5%	**Negligible**
ESR 8	9.35	9.35	<75%	<0.5%	**Negligible**
ESR 9	9.43	9.43	<75%	<0.5%	**Negligible**
ESR 10	9.39	9.40	<75%	<0.5%	**Negligible**
ESR 11	9.32	9.32	<75%	<0.5%	**Negligible**
ESR 12	9.39	9.39	<75%	<0.5%	**Negligible**

a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.5 Table 11 details the predicted NO_2 concentrations for the 2027 Future Year, for both the 'Without Development' and 'With Development' scenarios, in accordance with Defra guidance (i.e. using EFT v10.1). The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 11: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5– Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean NO_2 Concentrations (µg/m³)[a]				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 1	25.91	26.05	<75%	0.5%	**Negligible**

Table 11: Predicted Adjusted NO_2 Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5– Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean NO_2 Concentrations (µg/m³)[a]				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[b]
		Concentration	Percentage in Relation to AQAL		
ESR 2	26.13	26.23	<75%	0.5%	**Negligible**
ESR 3	26.21	26.29	<75%	0.5%	**Negligible**
ESR 4	27.89	27.97	<75%	0.5%	**Negligible**
ESR 5	23.18	23.23	<75%	0.5%	**Negligible**
ESR 6	24.14	24.23	<75%	0.5%	**Negligible**
ESR 7	22.08	22.15	<75%	0.5%	**Negligible**
ESR 8	20.88	20.93	<75%	0.5%	**Negligible**
ESR 9	22.61	22.66	<75%	0.5%	**Negligible**
ESR 10	21.65	21.69	<75%	0.5%	**Negligible**
ESR 11	20.11	20.14	<75%	0.5%	**Negligible**
ESR 12	21.43	21.46	<75%	0.5%	**Negligible**

a. NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator, in accordance with LAQM.TG(16)
b. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.6 Table 12 details the PM_{10} concentrations for the 2027 Future Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 12: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean PM_{10} Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	13.83	13.84	<75%	<0.5%	**Negligible**
ESR 2	13.86	13.87	<75%	<0.5%	**Negligible**

Table 12: Predicted Unadjusted PM_{10} Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean PM_{10} Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 3	14.01	14.02	<75%	<0.5%	**Negligible**
ESR 4	13.89	13.90	<75%	<0.5%	**Negligible**
ESR 5	13.41	13.42	<75%	<0.5%	**Negligible**
ESR 6	13.80	13.81	<75%	<0.5%	**Negligible**
ESR 7	13.63	13.64	<75%	<0.5%	**Negligible**
ESR 8	13.51	13.52	<75%	<0.5%	**Negligible**
ESR 9	13.65	13.66	<75%	<0.5%	**Negligible**
ESR 10	13.59	13.59	<75%	<0.5%	**Negligible**
ESR 11	13.45	13.45	<75%	<0.5%	**Negligible**
ESR 12	13.58	13.58	<75%	<0.5%	**Negligible**

a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.7 Table 13 details the $PM_{2.5}$ concentrations for the 2027 Future Year, for both the 'Without Development' and 'With Development' scenarios. The impact has been assessed in accordance with the descriptors included in **Appendix C**.

Table 13: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean $PM_{2.5}$ Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 1	9.56	9.57	<75%	<0.5%	**Negligible**
ESR 2	9.58	9.58	<75%	<0.5%	**Negligible**
ESR 3	9.66	9.66	<75%	<0.5%	**Negligible**
ESR 4	9.63	9.63	<75%	<0.5%	**Negligible**

Table 13: Predicted Unadjusted $PM_{2.5}$ Concentrations at Existing Sensitive Receptors for Scenarios 4 and 5 – Using the Emission Factor Toolkit v10.1

Receptor	Calculated Annual Mean $PM_{2.5}$ Concentrations (µg/m³)				
	Without Development	With Development		Concentration Change as Percentage of AQAL	Impact[a]
		Concentration	Percentage in Relation to AQAL		
ESR 5	9.35	9.35	<75%	<0.5%	**Negligible**
ESR 6	9.54	9.54	<75%	<0.5%	**Negligible**
ESR 7	9.44	9.44	<75%	<0.5%	**Negligible**
ESR 8	9.37	9.37	<75%	<0.5%	**Negligible**
ESR 9	9.45	9.45	<75%	<0.5%	**Negligible**
ESR 10	9.41	9.42	<75%	<0.5%	**Negligible**
ESR 11	9.33	9.33	<75%	<0.5%	**Negligible**
ESR 12	9.41	9.41	<75%	<0.5%	**Negligible**

a. Assessed using the Impact Descriptors from the EPUK/IAQM guidance, included in Appendix C. Changes of less than 0.5% should be described as negligible

5.2.8 The results of the assessment show that all predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations, in all scenarios considered, are below the relevant objectives and limit values.

Assessment of Significance for Human Receptors

5.2.9 The significance of the overall effects of the proposed development has been assessed in accordance with the EPUK/IAQM guidance. This assessment is based on professional judgement and details of the assessor's experience is included in **Appendix D**.

5.2.10 The assessment of significance has taken into account a number of factors, including:

- Baseline pollutant concentrations in 2019, 2022 and 2027 are below the relevant annual mean objectives and limit values at all existing receptors considered;
- The assessment predicts a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all existing sensitive receptors considered, with the development in place;

- The sensitivity analysis predicts a negligible impact for all pollutants for both the 2022 opening year scenario and the 2027 future year scenario, with the development in place;
- The sensitivity analysis is a highly conservative assessment in which future background pollution concentrations and vehicle emission factors remain the same as the 2019 base year scenario. In reality, there is an expectation that background concentrations and vehicle emissions will improve over time as older more polluting vehicles are replaced with cleaner, more efficient vehicles. A recent study provides evidence that the previous version of the EFT, EFT v9.0, may be relied upon to predict the 'most likely' future emissions reductions where model verification has been undertaken using monitored data from 2016 or later[9]. A further study in September 2020 concluded that the differences between the current EFT v.10.1 and the previous EFT v.9.0.1 are sufficiently small that previous work to validate the EFT remains valid for the most recent edition[10].

5.2.11 Based on the above factors, in accordance with the EPUK/IAQM guidance, the air quality effect of the proposed development is considered to be **not significant**.

Recommendations for Mitigation

5.2.12 The impact of the proposed development is predicted to be not significant for human receptors. However, mitigation measures will assist in reducing any potential impact and general best practice measures in relation to air quality could be implemented. These could include the provision of an electric vehicle charging point.

[9] https://www.aqconsultants.co.uk/news/march-2020/defra%E2%80%99s-emission-factor-toolkit-now-matching-measu

[10] Air Quality Consultants, Comparison of EFT v10 with EFT v9, September 2020

6 CONCLUSIONS

6.1 Construction Phase

6.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust and fine particulate matter effects from demolition, earthworks, construction and trackout associated with the proposed development, in accordance with guidance published by the IAQM.

6.1.2 With site specific mitigation measures in place, the significance of dust and fine particulate effects from demolition, earthworks, construction and trackout is considered to be **not significant**.

6.2 Operational Phase

Existing Sensitive Receptors

6.2.1 An air quality assessment has been undertaken to consider the potential impact of development generated vehicles on air quality at twelve existing sensitive human receptors.

6.2.2 The assessment has been undertaken in accordance with Defra guidance, by using the latest vehicle emission factors from EFT v10.1. In addition, a sensitivity analysis has been undertaken for NO_2 concentrations, in which base year pollutant concentrations and vehicle emission factors have been used in the opening / future year scenarios.

6.2.3 Pollutant concentrations in 2022 and 2027, with the development in place, are below the relevant annual mean objectives and limit values at the receptors considered.

6.2.4 The sensitivity analysis predicts that the development will have a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all twelve existing sensitive receptors considered in 2022 and 2027.

6.2.5 The sensitivity analysis is a highly conservative assessment in which future background pollution concentrations and vehicle emission factors remain the same as the 2019 base year scenario.

6.2.6 The effect of the proposed development on human receptors is therefore considered to be **not significant.**

6.3 Summary

6.3.1 The assessment demonstrates that the proposed development will not lead to an unacceptable risk from air pollution, nor will it lead to any breach of national

objectives as required by national policy. The proposed development is, therefore, in accordance with relevant national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed.

APPENDICES

Appendix A: Air Quality Legislation and Guidance

European Legislation

A.1 The European Union (EU) Ambient Air Quality Directive 2008/50/EC[1] (i.e. the CAFE Directive) came into force in June 2008. This EU Directive consolidates previous air quality legislation, with the exception of the 4th daughter Directive[2], and sets air quality limit values for seven pollutants. The Directive also provides a regulatory framework for fine particulate matter smaller than 2.5µm in diameter ($PM_{2.5}$).

A.2 EU Directive 2008/50/EC was transposed into legislation in the UK on 11th June 2010 as The Air Quality Standards Regulations 2010[3].

National Air Quality Strategy

A.3 The Environment Act 1995 requires the UK government to prepare a national Air Quality Strategy. The first UK strategy was published in March 1997, setting out policies for the management of ambient air quality. This was subsequently updated in 2007[4].

A.4 The 2007 strategy establishes the framework for air quality management in England, Scotland, Wales and Northern Ireland. Air quality standards and objectives are set out for eight pollutants which may potentially occur at levels that give cause for concern. The strategy also provides details of the role that local authorities are required to take in working towards improvements in air quality, known as the Local Air Quality Management (LAQM) regime.

Air Quality Standards and Objectives

A.5 Air quality standards and objectives are set out in the strategy for the following pollutants: nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), lead (Pb), fine particulate matter (PM_{10}), benzene (C_6H_6), 1, 3–butadiene (C_4H_6) and ozone (O_3).

[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
[2] Directive 2004/107/EC of the European Parliament and the Council of 15th December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air
[3] The Air Quality Standards Regulations 2010
[4] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007

A.6 Objectives for each pollutant, except O_3, were first given statutory status in the Air Quality Regulations 2000[5] and Air Quality (Amendment) Regulations 2002[6]. These objectives are defined in the strategy as:

"the maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale."

A.7 The EU limit values, transposed into UK legislation as The Air Quality Standards Regulations 2010, are mostly the same as the air quality objectives in terms of concentrations; however, there are differences in determining how compliance is achieved.

A.8 Whilst there is no specific objective for $PM_{2.5}$ in England and Wales, a limit value of 25µg/m^3 is referred to in the regulations, which has been adopted for use in this assessment (as recommended by the LAQM Helpdesk). An objective has been set for $PM_{2.5}$ in Scotland since early 2016.

A.9 Examples of where these objectives and limit values apply are detailed in the Defra LAQM Technical Guidance document LAQM.TG(16)[7] and are included in Table A1.

Table A1: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally 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 facades 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 and 8-hour mean	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties[a]	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

[5] The Air Quality Regulations 2000. SI No 928
[6] The Air Quality (Amendment) Regulations 2002
[7] Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(16), February 2018

Table A1: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	**Objectives Should Apply at:**	**Objectives Should Generally Not Apply at:**
1-hour mean	All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks 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 to which the public might reasonably be expected to spend one hour or longer	Kerbside sites where public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	
[a] *Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied*		

Local Air Quality Management

A.10 LAQM legislation in the Environment Act 1995 requires local authorities to conduct the periodic review and assessments of air quality. These aim to identify all those areas where the objectives are being, or are likely to be, exceeded. Where exceedances are likely to occur, local authorities are required to declare an Air Quality Management Area (AQMA).

A.11 LAQM.TG(16) presents a streamlined approach for LAQM in England and Scotland; however, Northern Ireland is still considering changes to LAQM and therefore works according to the previous regime.

A.12 The Welsh Government amended the LAQM regime in Wales in 2017 by issuing new statutory policy guidance in order to bring the system into line with the Well-being of Future Generations (Wales) Act 2015[8]. This aims to achieve compliance with the national air quality objectives in specific hotspots and to reduce exposure to pollution more widely, so as to achieve the greatest public health benefit.

[8] Well-being of Future Generations (Wales) Act 2015 (anaw 2)

A.13 Local authorities in England are required to produce Annual Status Reports (ASRs), and in Scotland and Wales, Annual Progress Reports (APRs). These replace all other reports which previously had to be submitted including Updating and Screening Assessments, Progress Reports and Detailed Assessments (which would be produced to assist with an AQMA declaration).

A.14 Local authorities now have the option of a fast track AQMA declaration option. This allows more expert judgement to be used and removes the need for a Detailed Assessment where a local authority is confident of the outcome. Detailed Assessments should however still be used if there is any doubt.

A.15 As part of the UK Government's requirement to improve air quality, selected local authorities in England are also currently investigating the feasibility of setting up Clean Air Zones (CAZs). These are areas where targeted action and co-ordinated resources aim to improve air quality within an urban setting, in order to achieve compliance with the EU limit values within the shortest possible time.

A.16 Five local authorities outside of London were initially selected to implement a CAZ by 2020 (Birmingham, Leeds, Nottingham, Derby and Southampton). A further 23 local authorities were subsequently chosen to investigate the feasibility of establishing a CAZ, and 33 local authorities may potentially have to proceed to this stage where compliance is not achieved.

National Planning Policy Framework

A.17 The National Planning Policy Framework (NPPF)[9], introduced in March 2012 and most recently updated in February 2019, requires that:

"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 AQMAs and CAZs, 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 plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.

[9] Ministry of Housing, Communities and Local Government, National Planning Policy Framework, February 2019

Planning decisions should ensure that any new development in AQMAs and CAZs is consistent with the local air quality action plan."

Planning Practice Guidance

A.18 The Planning Practice Guidance (PPG)[10], published in March 2014 and last updated in November 2019, states that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

A.19 Where a proposed development is anticipated to give rise to concerns about air quality, an appropriate assessment needs to be carried out. Where the assessment concludes that the proposed development (including mitigation) will not lead to an unacceptable risk from air pollution, prevent sustained compliance with national objectives or fail to comply with the requirements of the Habitats Regulations, then the local authority should proceed to decision with appropriate planning conditions and/or obligations.

[10] Department for Communities and Local Government. Planning Practice Guidance: Air Quality, November 2019

Appendix B: Methodology for Construction Phase Assessment

Institute of Air Quality Management Guidance

B.1 The methodology for the construction phase dust assessment is set out in guidance from the Institute of Air Quality Management (IAQM)[11].

Step 1

B.2 Step 1 is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing sensitive human receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

B.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

B.4 Where any of these criteria are met, it is necessary to proceed to Step 2.

Step 2

B.5 Step 2 determines the potential risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

B.6 The risk of dust impacts is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon the following two factors (known as Step 2A and Step 2B).

[11] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, February 2014

B.7 **Step 2A** assesses the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large. Examples of how the magnitude may be defined are included in Table B1.

Table B1: Determining the Dust Emission Magnitude of Construction Phase Activities

Activity	Dust Emission Class		
	Large	**Medium**	**Small**
Demolition	Total building volume >50,000m^3; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; Demolition activities >20m above ground level	Total building volume 20,000-50,000m^3; Potentially dusty construction material; Demolition activities 10-20m above ground level	Total building volume <20,000m^3; Construction material with low potential for dust release (e.g. metal cladding or timber)
Earthworks	Total site area >10,000m^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 >8m in height; Total material moved >100,000 tonnes	Total site area 2,500-10,000m^2; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 4-8m in height; Total material moved 20,000-100,000 tonnes	Total site area <2,500m^2; Soil type with large grain size (e.g. sand); <5 heavy earth moving vehicles active at any one time; Formation of bunds <4m in height; Total material moved <20,000 tonnes; Earthworks during wetter months
Construction	Total building volume >100,000m^3; On-site concrete batching; Sandblasting	Total building volume 25,000-100,000m^3; Potentially dusty construction material (e.g. concrete); On-site batching	Total building volume <25,000m^3; Construction material with a low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements[a] in any one day[b]; Potentially dusty surface material (e.g. high clay content); Unpaved road length >100m	10-50 HDV (>3,5t) outward movements[a] in any one day[b]; Moderately dusty surface material (e.g. high clay content); Unpaved road length 50-100m	<10 HDV (>3.5t) outward movements[a] in any one day[b]; Surface material with low potential for dust release; Unpaved road length <50m

a. A vehicle movement is a one way journey i.e. from A to B, and excludes the return journey
b. HDV movements during a construction project may vary over its lifetime, and the number of movements is the maximum not the average

B.8 **Step 2B** considers the sensitivity of the area to dust impacts which is defined as low, medium or high. The sensitivity categories for different types of receptors are described in Table B2.

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects

Sensitivity Category	Dust Soiling Effects	Health effects of PM_{10}	Ecological Effects
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}; Examples include residential properties, hospitals, schools, and residential care homes	Locations with an international or national designation and the designated features may be affected by dust soiling; Locations where there is a community of a particularly dust sensitive species; Examples include a Special Area of Conservation with dust sensitive features
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM_{10}; Examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; Locations with a national designation where the features may be affected by dust deposition; Examples include a Site of Special Scientific Interest with dust sensitive features

Table B2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects			
Sensitivity Category	**Dust Soiling Effects**	**Health effects of PM_{10}**	**Ecological Effects**
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would be expected to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition; Examples include a Local Nature Reserve with dust sensitive features

B.9 Based on the sensitivity of individual receptors, the overall sensitivity of the area to dust soiling, human health and ecological effects is then determined using the criteria detailed in Tables B3 to B5, respectively.

Table B3: Sensitivity of the Area to Dust Soiling Effects on People and Property[ab]					
Receptor Sensitivity	**Number of Receptors**	**Distance from Source (m)[c]**			
		<20m	**<50m**	**<100m**	**<350m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

a. The sensitivity to the area should be derived for each of the four activities
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur for up to 500m from large sites, 200m from medium sites and 50m from small sites, measured from the site exit. The impact declines with distance from the site and it is only necessary to consider trackout impacts up to 50m from the edge of the road

Table B4: Sensitivity of the Area to Human Health Impacts[ab]							
Receptor Sensitivity	**Annual Mean PM_{10} Concentration[c]**	**Number of Receptors[d]**	**Distance from Source (m)[e]**				
			<20m	**<50m**	**<100m**	**<200m**	**<350m**
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered
c. Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32µg/m^3 being the annual mean concentration at which an exceedance of the 24-hour mean objective is likely in England, Wales and Northern Ireland. In Scotland, there is an annual mean objective of 18µg/m^3
d. In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties
e. For trackout, distances should be measured from the side of the roads used by construction traffic

Table B5: Sensitivity of the Area to Ecological Impacts[ab]		
Receptor Sensitivity	**Distance from the Source (m)[c]**	
	<20	**<50**
High	High	Medium
Medium	Medium	Low
Low	Low	Low

a. *The sensitivity to the area should be derived for each of the four activities*
b. Only the highest level of sensitivity from the table needs to be considered
c. For trackout, distances should be measured from the side of the roads used by construction traffic

B.10 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

B.11 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Track-out.

B.12 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table B6.

Table B6: Risk of Dust Impacts for Demolition			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

B.13 The risk of dust being generated by earthworks and construction at the site is determined using the criteria in Table B7.

Table B7: Risk of Dust Impacts for Earthworks and Construction			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

B.14 The risk of dust being generated by track-out at the site is determined using the criteria in Table B8.

Table B8: Risk of Dust Impacts for Track-out			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3

B.15 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[12], recommended for use outside the capital by LAQM guidance, and the IAQM guidance document itself. Professional judgement should be used to determine the type and scale of mitigation measures required.

B.16 If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

B.17 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

[11] Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2006

Professional Judgement

B.18 The IAQM guidance makes reference to the use of professional judgement when assessing the risks of dust and fine particulate matter from demolition and construction sites. Details of the experience of the personnel involved with the project are provided in **Appendix D**.

Appendix C: Methodology for Operational Phase Assessment

Air Dispersion Modelling Inputs

C.1 The air dispersion model ADMS-Roads (CERC, Version 5.0) has been used to assess the potential air quality impacts associated with development-generated road traffic emissions. This dispersion model is widely used and accepted for the purpose of undertaking assessments to support both planning and Environmental Permit applications.

Traffic Flow Data

C.2 The ADMS-Roads model requires the input of detailed road traffic flow data for those routes which may be affected by the proposed development. Traffic flow data has been obtained for this project by SCP, the appointed transport consultants for the project. The study extent of the model is shown in Figure C.1.

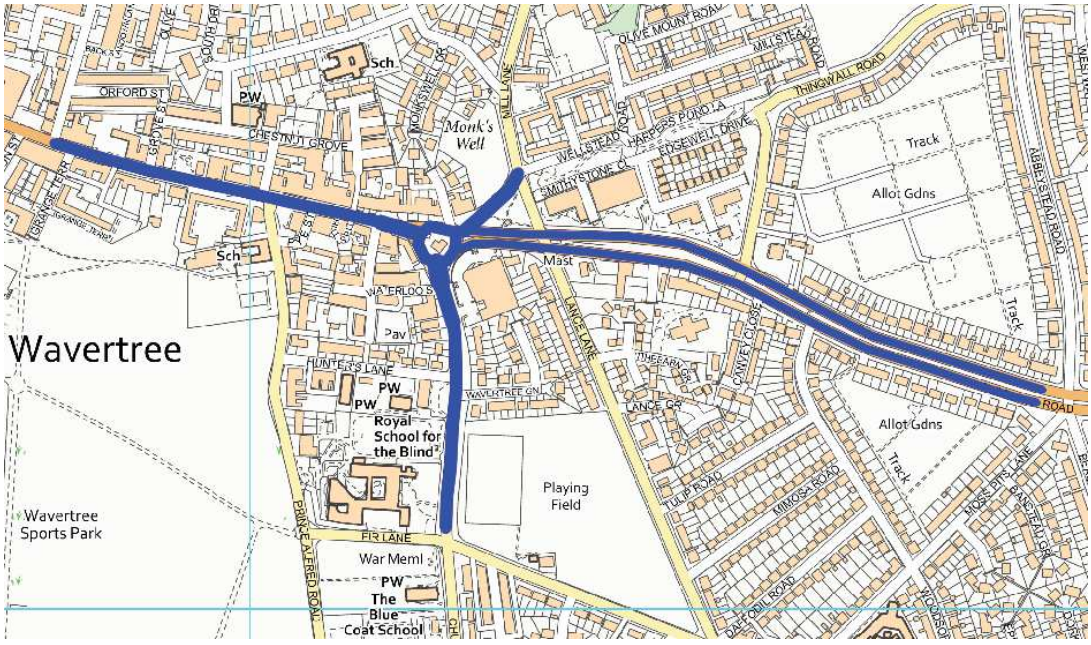


Figure C.1: Study Extent of Air Dispersion Model. The roads modelled in the assessment can be seen in blue ('*Reproduced from Ordnance Survey Maps © Crown Copyright All Rights Reserved Licence No. 0100031673')*

C.3 Data has been provided as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages. No average speed information was available and therefore speed limits have been used, with a reduction to 25kph in locations where congestion or the slowing down of vehicles would be expected.

C.4 The traffic flow data used in the assessment is included in Table C1.

Table C1: 24-hour AADT traffic data used in the assessment										
Link Name	**Scenario 1: 2019 Verification and Base Year**		**Scenario 2: 2022 Opening Year, Without Development**		**Scenario 3: 2022 Opening Year, With Development**		**Scenario 4: 2027 Future Year, Without Development**		**Scenario 5: 2027 Future Year, With Development**	
	LGV	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**	**LGV**	**HGV**
Church Road North (South of site access)	16438	575	17192	601	17408	609	18225	637	18442	645
Church Road North (North of site access)	16970	575	17748	601	17965	609	18815	637	19032	645
High Street	18439	1018	19285	1064	19488	1076	20444	1128	20647	1140
Childwall Road	17632	1052	18441	1100	18590	1109	19550	1166	19699	1175
Lake Road	4802	197	5022	206	5204	214	5324	219	5506	226

Vehicle Emission Factors

C.5 The air quality assessment has used vehicle emission factors calculated using the Emissions Factor Toolkit (EFT) version 10.1, released in August 2020. This is the most up-to-date version of the EFT currently available.

C.6 As discussed in the section 3.3 of the report, a recent study provides evidence that the previous version of the EFT, EFT v9.0, may be relied upon to predict the 'most likely' future emissions reductions where model verification has been undertaken using monitored data from 2016 or later[13]. A further study in September 2020 concluded that the differences between the current EFT v.10.1 and the previous EFT v.9.0.1 are sufficiently small that previous work validating the current EFT remains valid[14].

C.7 However, in accordance with the guidance, a sensitivity analysis has been undertaken which has applied 2019 background pollution concentrations and vehicle emission factors to the 2022 opening and 2027 future year scenarios to provide a conservative upper-bound to the assessment.

Meteorological Data

C.8 The meteorological data used in the air quality modelling has been obtained from ADM Limited and is from the Liverpool recording station, covering the period between 1st January and 31st December 2019. This has complete data capture for wind and temperature.

C.9 The Liverpool recording station is located approximately 7km from the proposed development and is considered to be the most representative of the conditions at the proposed development, due to its relative location and similar altitude.

C.10 The 2019 wind rose for the Liverpool Meteorological Recording Station is shown in Figure C2.

[13] https://www.aqconsultants.co.uk/news/march-2020/defra%E2%80%99s-emission-factor-toolkit-now-matching-measu

[14] Air Quality Consultants, Comparison of EFT v10 with EFT v9, September 2020

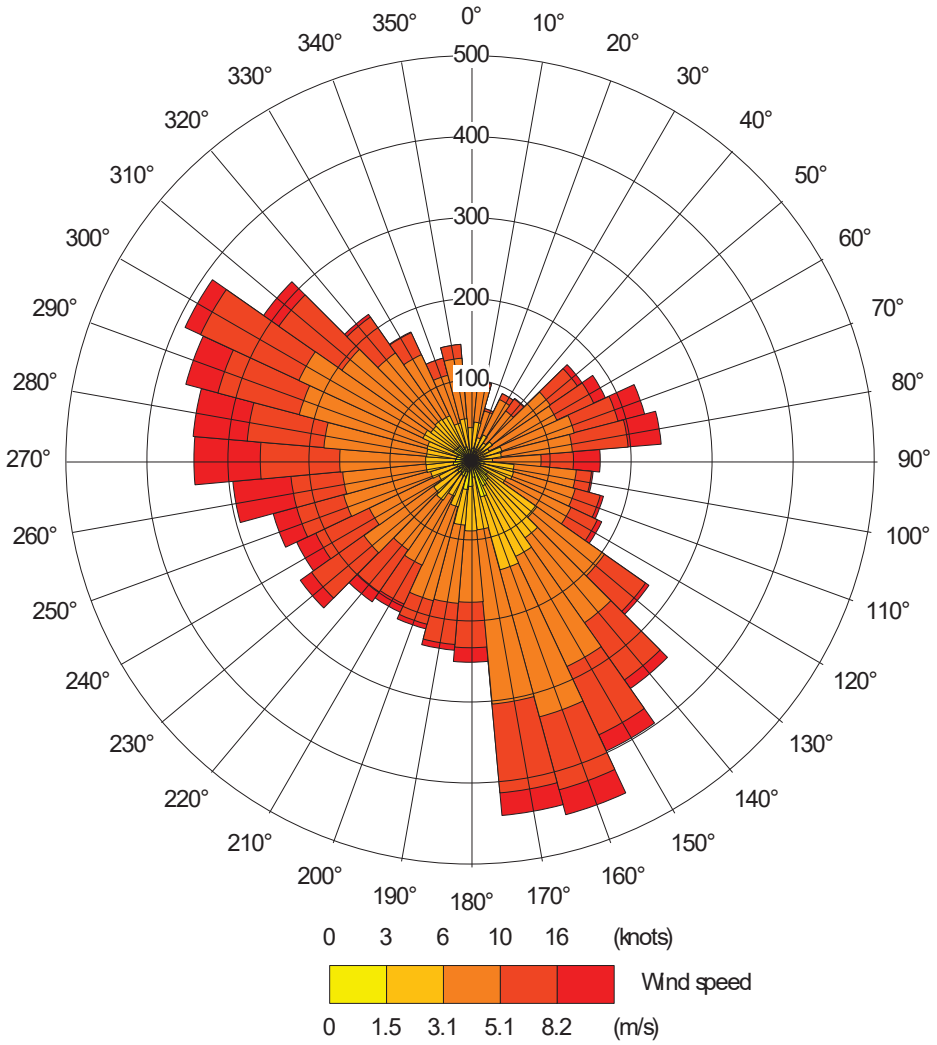


Figure C.2: 2019 Wind Rose for the Liverpool Meteorological Station

Dispersion and Meteorological Site Characteristics

C.11 The characteristics for the dispersion site and meteorological sites, included in the ADMS-Roads model, are detailed in Table C2.

Table C2: Dispersion and Meteorological Site Characteristics

Setting	Dispersion Site	Meteorological Site
Surface Roughness	1.0m	0.02m
Surface Albedo	0.23	0.23
Minimum Monin-Obukhov Length	30m	1m
Priestley-Taylor Parameter	1	1

NO_x to NO_2 Conversion

C.12 In accordance with the guidance within LAQM.TG(16), the ADMS-Roads model has been run to predict the road-contribution NO_x concentrations for each receptor location. These have then been converted to NO_2 concentrations using the Defra NO_x to NO_2 calculator[15].

Model Validation and Verification

C.13 LAQM.TG(16) refers to model validation as *"the general comparison of modelled results against monitoring data carried out by model developers"*. ADMS-Roads is widely accepted by regulatory authorities for use in this type of assessment.

C.14 Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads air dispersion model is achieved by modelling concentration(s) at existing monitoring location(s) in the vicinity of the proposed development, and comparing the modelled concentration(s) with the measured concentration(s).

C.15 Following review of the LCC 2019 monitoring data, it is understood there are two roadside air quality monitoring locations in close proximity to the proposed development site (Ref: S8 and S20).

C.16 In order to verify the model, traffic data from the Department for Transport (DfT) has been used within the assessment.

C.17 As no PM_{10} or $PM_{2.5}$ monitoring locations are situated along roads where traffic flow data is available, it has not been possible to carry out model verification for modelled PM_{10} or $PM_{2.5}$ concentrations.

C.18 The monitoring data that has been used in the model verification procedure is detailed in Table C3.

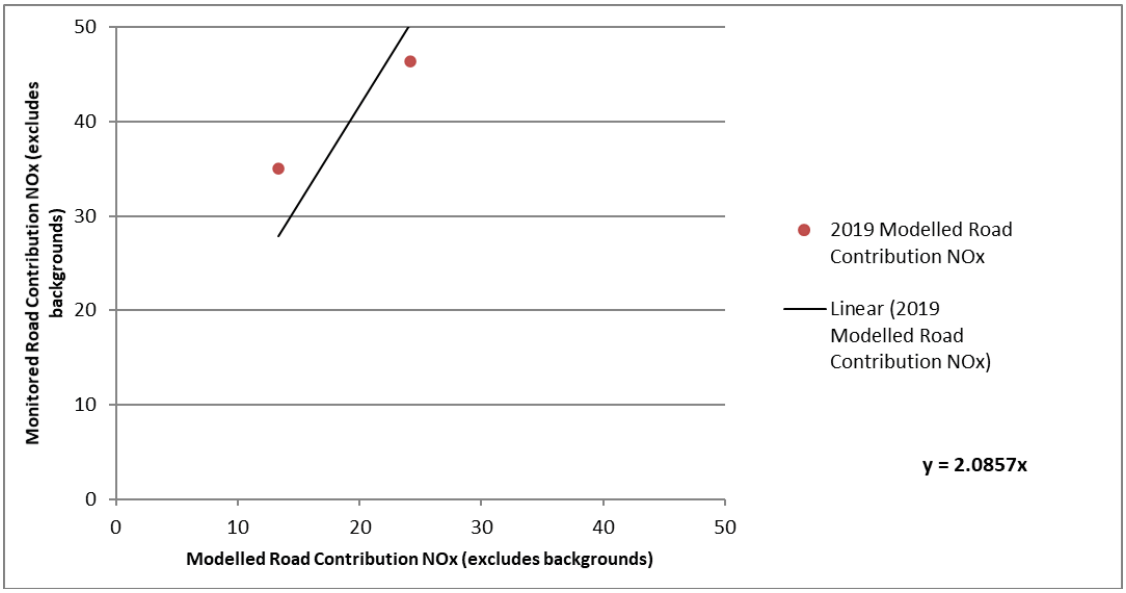
Table C3: NO_2 Monitoring Data Used for Verification Purposes

Monitoring Location Reference	Type	Approximate Grid Reference		2019 Bias Adjusted NO_2 Annual Average Concentration (µg/m^3)
		Easting	Northing	
S8	Roadside Diffusion Tube	339634	388318	39.20
S20		338976	388486	33.90

[15] Defra Local Air Quality Management web pages [http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html]

C.19 The modelled road-contribution NO_x concentration for the diffusion tube has been compared against the measured road-contribution NO_x concentration for the same location. The measured concentrations have been derived using the Defra NO_x to NO_2 calculator, taking into account the background NO_x concentration for the local area.

C.20 The comparison is shown in the below graph. The equation of the trend line is based on linear regression through zero, which provides an overall adjustment factor of 2.0857.



C.21 This adjustment factor has been applied to the modelled road-contribution NO_x concentrations. The total NO_2 concentrations have been derived by combining the adjusted road-contribution NO_x concentration and background NO_2 concentration, using the Defra NO_x to NO_2 calculator.

C.22 A final comparison has been made between the total measured NO_2 concentrations and total modelled NO_2 concentrations, as shown in Table C4. Following adjustment, modelled concentrations are within 10% of measured concentrations.

Table C4: Comparison Between Measured and Monitored NO_2 Concentrations

Monitoring Location Reference	Measured Total NO_2 Concentration ($\mu g/m^3$)	Modelled Total NO_2 Concentration ($\mu g/m^3$)	Difference (%)
S8	39.20	40.94	4.44
S20	33.90	30.52	-9.97

C.23 A Root Mean Square Error (RMSE) calculation has been undertaken as part of the model verification for NO_2 concentrations. This has been carried out for the monitoring location included within the model verification, in accordance with the guidance detailed in LAQM.TG(16).

C.24 The RMSE calculation following adjustment is detailed in Table C5.

Table C5: RMSE Calculation for Nitrogen Dioxide Concentrations

Diffusion Tube Location	After Verification			
	Observed Value	Predicted Value	Difference	RMSE
S8	39.20	40.94	1.74	**2.69**
S20	33.90	30.52	-3.38	

C.25 An RMSE of 2.69 µg/m^3 is 6.72% of the NO_2 annual mean air quality objective. LAQM.TG(16) states that *"ideally an RMSE value within 10% of the objective would be derived"*, a value of within 25% is considered acceptable. Therefore, the model is considered to be performing to an acceptable standard.

Assessment Criteria

Assessing the Impact of a Proposed Development on Human Receptors

C.26 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM[16] with relation to the assessment of the air quality impacts of proposed developments and their significance.

C.27 The impact of a development is usually assessed at specific receptors, and takes into account both the long-term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

C.28 The impact descriptors for individual receptors are detailed in Table C6.

[16] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017

Table C6: Impact Descriptors for Individual Receptors				
Long Term Average Concentration at Receptor in Assessment Year*	**Percentage 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
**Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5% or 0.2µg/m^3) should be described as Negligible*				

Determining the Significance of Effects

C.29 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

C.30 Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

- The existing and future air quality in the absence of the development;
- The extent of the current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Appendix D: Professional Experience of Assessors

D.1 The assessment of air quality impacts, and the significance of the associated effects, takes into account the professional judgement of the assessor. Details of the experience of the personnel involved with the project are provided below:

Dr Matthew Barnes — **Senior Environmental Scientist**
BSc (Hons), MSc, PhD

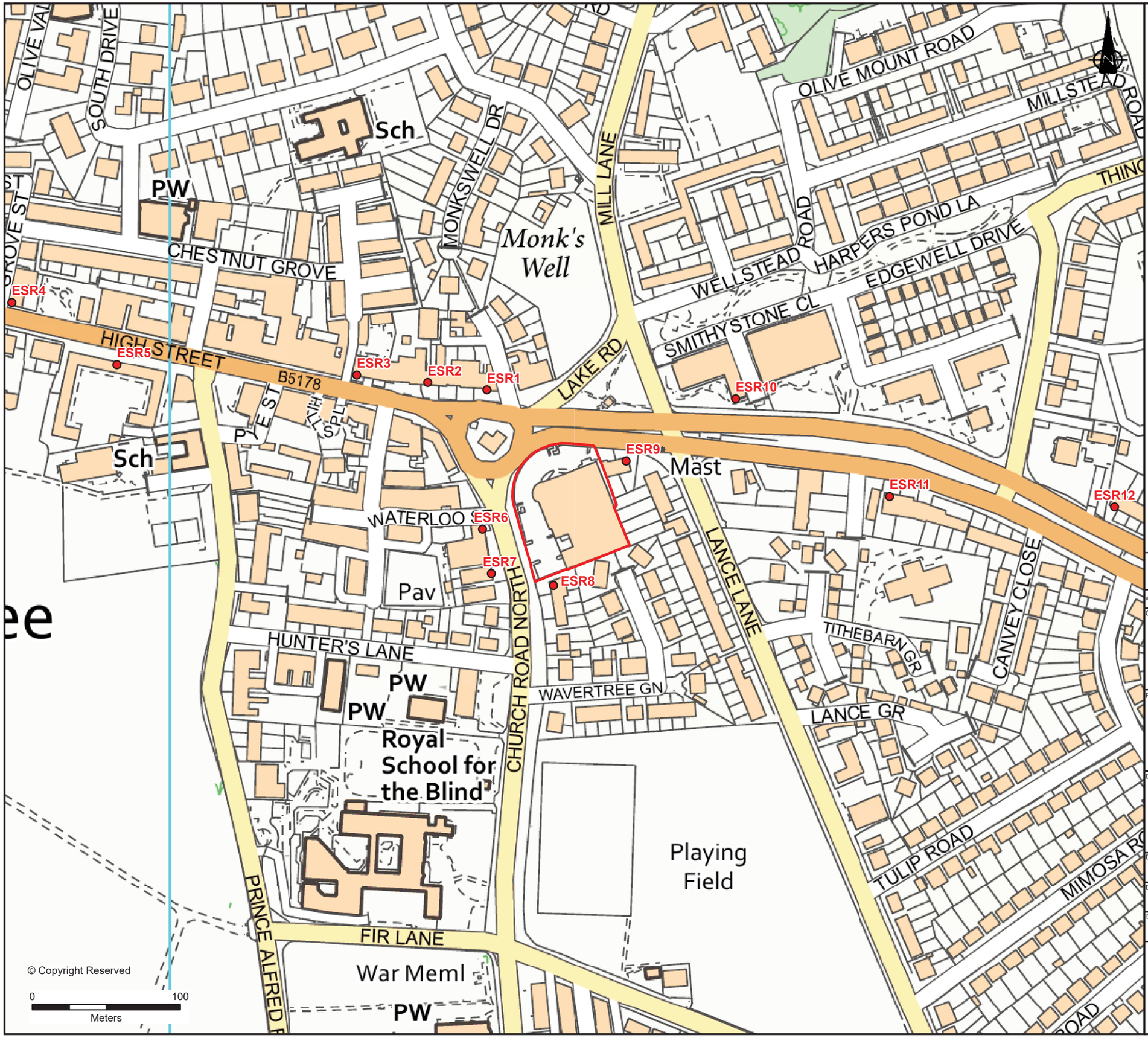
Matthew joined Wardell Armstrong in September 2016 as an Air Quality Scientist, following 18 months working as an air quality technical officer in a local authority. Before that he completed a BSc in Environmental Science, an MSc in Environmental Informatics and a PhD in Atmospheric Science, specialising in modelling urban air pollution. The majority of his work is carried out in support of planning applications and, therefore, he has experience of undertaking air quality assessments for a wide range of projects, small and large, including residential developments, commercial developments and mixed-use developments.

Mark Dawson — **Technical Director and Service Lead**
BSc (Hons) MA (Env Law) Dip (Air Pollution Control) Dip (Acoustics & Noise Control) CEnv MIEnvSc MIOA MIAQM FRMetS

Mark holds a Bachelor of Science degree in Geography, the Diploma in Air Pollution Control, the Diploma in Acoustics and Noise Control and a Masters degree in Environmental Law and Policy. Mark is a Chartered Environmentalist and Member of the Institute of Environmental Sciences, Institute of Acoustics, Institute of Air Quality Management and Fellow of the Royal Meteorological Society. Mark has over 30 years' experience in regulation and consultancy. Having given evidence to over forty planning inquiries, Mark is experienced in putting forward persuasive technical arguments in plain English. Mark is the service lead for acoustics and air quality at Wardell Armstrong. He is involved in noise and air quality impact studies for mineral and waste operations and for residential, commercial, industrial and retail development. The majority of the work is carried out in support of planning

applications and Mark has long experience of dealing with environmental health officers and planning officers.

Drawing



Notes:

Reproduced from Ordnance Survey Maps
© Crown Copyright All Rights Reserved
Licence No. 0100031673

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

LIDL GB LIMITED

PROJECT

LIDL WAVERTREE

DRAWING TITLE

EXISTING SENSITIVE RECEPTOR LOCATIONS

DRG No.	REV
GM11714-001	A

DRG SIZE	SCALE	DATE
A3	1:2,500	29/03/2021

DRAWN BY	CHECKED BY	APPROVED BY
CT	MB	MD

wardell armstrong
BOLTON | TEL 01204 227 227
WWW.WARDELL-ARMSTRONG.COM
BIRMINGHAM · CARDIFF · CARLISLE · EDINBRUGH · GLASGOW · LONDON · MANCHESTER · NEWCASTLE UPON TYNE · SHEFFIELD · STOKE ON TRENT

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BURY ST EDMUNDS
6 Brunel Business Court
Eastern Way
Bury St Edmunds
Suffolk
IP32 7AJ
Tel: +44 (0)1284 765 210

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial
Estate Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
2 West Regent Street
Glasgow
G2 1RW
Tel: +44 (0)141 433 7210

LEEDS
36 Park Row
Leeds
LS1 5JL
Tel: +44 (0)113 831 5533

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFORD
PI House
R/O 23 Clifton Road
Shefford
Bedfordshire
SG17 5AF
Tel: +44 (0)1462 850 483

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International offices:

ALMATY
29/6 Satpaev Avenue Regency
Hotel
Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: +7(495) 626 07 67

wardell armstrong