

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



GLADMAN DEVELOPMENTS LTD

HENTHORN ROAD, CLITHEROE

AIR QUALITY ASSESSMENT

AUGUST 2018

your earth our world



This page has been left blank intentionally

DATE ISSUED: 6th August 2018
JOB NUMBER: GM10068
REPORT NUMBER: 002
VERSION: V0.1
STATUS: FINAL

GLADMAN DEVELOPMENTS LTD

HENTHORN ROAD, CLITHEROE

AIR QUALITY ASSESSMENT

AUGUST 2018

PREPARED BY:

Matthew Barnes Senior Environmental Scientist
(Air Quality)



APPROVED BY:

Malcolm Walton Technical Director



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.



This page has been left blank intentionally

CONTENTS

EXECUTIVE SUMMARY	1
1 INTRODUCTION	2
2 LEGISLATION AND POLICY CONTEXT	3
3 ASSESSMENT METHODOLOGY	9
4 ASSESSMENT OF SIGNIFICANT CRITERIA	18
5 BASELINE SITUATION	23
6 IMPACT ASSESSMENT	27
7 SENSITIVITY ANALYSIS	36
8 ASSESSMENT OF SIGNIFICANCE	43
9 MITIGATION MEASURES	44
10 CONCLUSIONS	48

APPENDICES

Appendix A: Traffic Data

Appendix B: Wind Rose from East Midlands Meteorological Recording Station

Appendix C: Model Verification Procedure

Appendix D: Air Quality Assessment Results

Appendix E: Air Quality Sensitivity Analysis Results

DRAWINGS	TITLE	SCALE
GM10068-001	Existing Sensitive Receptors and Proposed Receptors	1:5000

This page has been left blank intentionally

EXECUTIVE SUMMARY

A detailed air quality assessment, based on the potential impacts of a proposed development on land off Henthorn Road, Clitheroe, has been conducted using the atmospheric dispersion model, ADMS-Roads. The proposed development consists of up to 110 residential properties and associated infrastructure.

Annual mean NO₂, PM₁₀ and PM_{2.5} concentrations have been modelled at thirteen existing and two proposed receptor locations, using the most recent Emission Factor Toolkit available from DEFRA (version 8). Predicted annual mean concentrations have been compared to the relevant air quality objectives.

The risk to human health due to construction activities has been qualitatively assessed to be medium for construction, earthworks, and for trackout. The risk of dust soiling effects is classed as low for earthworks, construction and for trackout. Mitigation measures have been proposed to further reduce any potential impacts based on best practice guidance.

The assessment has concluded that the operational phase of the development will result in concentrations of NO₂, PM₁₀ and PM_{2.5} remaining below the air quality objectives, both without and with the development for the assessed years of 2023 and 2028. The impact of the development is predicted to be negligible at all thirteen existing sensitive receptors that were assessed. Air quality effects are therefore considered to be not significant. The sensitivity analysis has also predicted that the operational phase of the development will result in concentrations of NO₂, PM₁₀ and PM_{2.5} remaining below the air quality objectives with a slight impact at one existing sensitive receptor.

The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives. 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

- 1.1.1 Wardell Armstrong LLP has been commissioned by Gladman Developments Ltd to undertake an air quality assessment for a proposed development situated off Henthorn Road, Clitheroe.
- 1.1.2 The proposed development site is located to the south west of Clitheroe, Lancashire. The site is bounded to the north east by recent residential development and to the north west by recent residential development and open land. The boundary of the site to the south east is formed by Henthorn Road, and beyond this there is new residential development and open land. Open land and Siddows Hall is located to the south west of the site. The site is currently open agricultural land.
- 1.1.3 From the information provided, it is understood that the proposals comprise the construction of up to 110 residential dwellings and the associated infrastructure across a site measuring 4.99 ha.
- 1.1.4 This report details the results of an air quality assessment undertaken in support of an outline 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, and also at proposed receptor locations within the development itself.
- 1.1.5 The report has been compiled using the most recent version of the Emission Factor Toolkit (version 8.0.1), which was released by DEFRA in December 2017.

2 LEGISLATION AND POLICY CONTEXT

2.1 Air Quality Legislation and National Air Quality Strategy

- 2.1.1 The Environment Act 1995 requires the UK government to prepare a National Air Quality Strategy. The UK National Air Quality Strategy (NAQS) was therefore published in March 1997 setting out policies for the management of ambient air quality. The Strategy sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide (NO₂), sulphur dioxide, carbon monoxide, lead, fine particulate matter (PM₁₀), benzene, 1, 3–butadiene and ozone.
- 2.1.2 The Strategy was reviewed and a Review Report¹ and Consultation Document² were published by the Department of the Environment, Transport and the Regions (DETR) in 1999. A revised version (The Air Quality Strategy (AQS) 2000), which supersedes the 1997 Strategy, was published in January 2000. The AQS 2000 strengthens the objectives for a number of pollutants with the exception of that for particulates, which was replaced with the less stringent EU limit value.
- 2.1.3 The objectives for the eight pollutants in the Strategy provide the basis of the implementation of Part IV of the Environment Act 1995. The Air Quality Strategy objectives for each pollutant, except ozone, were given statutory status in the Air Quality (England) Regulations, 2000³ and Air Quality (England) (Amendment) Regulations 2002⁴.
- 2.1.4 In 2007 the Air Quality Strategy was revised. This latest strategy⁵ does not remove any of the objectives set out in the previous strategy or its addendum, apart from replacing the provisional 2010 objective for PM₁₀ in England, Wales and Northern Ireland with the exposure reduction approach for PM_{2.5}. The UK Government and the Devolved Administrations have now therefore set new national air quality objectives for particulate matter smaller than 2.5µm diameter (PM_{2.5}).
- 2.1.5 EU Directive 2008/50/EC⁶ came into force in June 2008 and was transposed into legislation in England on 11th June 2010 as 'The Air Quality Standards Regulations

¹ Department of the Environment, Transport and the Regions, January 1999. Report on the Review of the National Air Quality Strategy, Proposals to amend the Strategy

² Department of the Environment, Transport and the Regions 1999, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document

³ The Air Quality (England) Regulations 2000. SI No 928

⁴ The Air Quality (Amendment) Regulations 2002

⁵ Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007

⁶ 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

2010⁷. This EU Directive consolidates existing air quality legislation and makes achievement of the objectives a national objective rather than a local one. It also provides a new regulatory framework for PM_{2.5}.

2.1.6 The current Air Quality Standards and Objectives, as set out in the Air Quality Standards Regulations 2010, are detailed in Table 1.

Table 1: UK Air Quality Objectives and Pollutants			
Pollutant	Objective	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	All local authorities
	50µg/m ³ not to be exceeded more than 7 times a year	24-hour mean	Scotland only
	40µg/m ³	Annual mean	All local authorities
	18µg/m ³	Annual mean	Scotland only
Particulate Matter (PM _{2.5})	25µg/m ³	Annual mean	England only
	10µg/m ³	Annual mean	Scotland only
Sulphur Dioxide (SO ₂)	266µg/m ³ not to be exceeded more than 35 times a year	15-minute mean	All local authorities
	350µg/m ³ not to be exceeded more than 24 times a year	1-hour mean	All local authorities
	125µg/m ³ not to be exceeded more than 3 times a year	24-hour mean	All local authorities
Benzene (C ₆ H ₆)	16.25µg/m ³	Running annual mean	All local authorities
	5µg/m ³	Annual mean	England and Wales only
	3.25µg/m ³	Running annual mean	Scotland and Northern Ireland only
1,3-Butadiene (C ₄ H ₆)	2.25µg/m ³	Running annual mean	All local authorities
Carbon Monoxide (CO)	10mg/m ³	Maximum daily running 8-hour mean	England, Wales and Northern Ireland only
	10mg/m ³	Running 8-hour mean	Scotland only
Lead (Pb)	0.5µg/m ³	Annual mean	All local authorities
	0.25µg/m ³	Annual mean	All local authorities

⁷ Statutory Instruments 2010 No. 1001 The Air Quality Standards Regulations 2010

2.2 Local Air Quality Management Guidance

- 2.2.1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007, establishes the framework for air quality improvements based on measures agreed at a national and international level. However, despite these measures, it is recognised that areas of poor air quality will remain and these should be dealt with through the Local Air Quality Management (LAQM) process using locally implemented measures.
- 2.2.2 LAQM legislation in the Environment Act 1995 requires local authorities to conduct periodic review and assessments of air quality. These aim to identify all those areas where the air quality objectives are being, or are likely to be, exceeded.
- 2.2.3 All authorities were required to undertake the first stage of review and assessment which concluded in September 2001. In those areas identified as having the potential to experience elevated levels of pollutants the authority was required to undertake a more detailed second stage review comprising two steps; Updating and Screening Assessments and Detailed Assessments. Where it was predicted that one or more of the air quality objectives would be unlikely to be met by the end of 2005, local authorities were required to proceed to a third stage and, if necessary, declare Air Quality Management Areas (AQMAs) and make action plans for improvements in air quality, in pursuit of the national air quality objectives.
- 2.2.4 An Evaluation Report, commissioned by the UK Government and Devolved Administrations in 2007, led to the publication of the LAQM Technical Guidance document LAQM.TG(09) in February 2009⁸. This technical guidance was subsequently updated following a consultation process, and in January 2016 the LAQM Technical Guidance document LAQM.TG(16) was published by Defra⁹.
- 2.2.5 LAQM.TG(16) presents the changes to the LAQM system across the UK. A new streamlined approach has been adopted in England and Scotland; however, Wales and Northern Ireland are still considering changes to LAQM and therefore work according to the previous regimes.

⁸ Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance Document LAQM.TG(09), February 2009

⁹ Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance Document LAQM.TG(16), April 2016

- 2.2.6 The previous structure of Review and Assessment, comprising Updating and Screening Assessments and Detailed Assessments has been replaced by the introduction of an Annual Status Report (ASR) for England and an Annual Progress Report (APR) for Scotland.
- 2.2.7 The ASR replaces all other reports which previously had to be submitted as part of the LAQM system including review and assessment and action plan progress reports, updating and screening assessments and detailed assessments.
- 2.2.8 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 still be used if there is any doubt.
- 2.2.9 Examples of where the Air Quality Objectives should/should not apply are also detailed in LAQM.TG(16) and are included in Table 2 below.

Table 2: 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, car 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 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
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

Table 2: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	Objectives Should Apply at:	Objectives Should Generally Not Apply at:
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		

2.3 National Planning Policy and Guidance

2.3.1 The National Planning Policy Framework¹⁰ (NPPF), was introduced in July 2018. This requires that planning policies should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of AQMAs and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in AQMAs and Clean Air Zones is consistent with the local air quality action plan.

2.3.2 The Planning Practice Guidance¹¹, updated in March 2014, 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).

¹⁰ Department for Communities and Local Government. National Planning Policy Framework, July 2018

¹¹ Department for Communities and Local Government. Planning Practice Guidance: Air Quality, March 2014

2.3.3 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 a decision with appropriate planning conditions and/or obligations.

2.4 Ribble Valley Borough Council Local Air Quality Management Review and Assessment

2.4.1 Ribble Valley Borough Council (RVBC) is responsible for the management of air quality in the vicinity of the proposed development site. RVBC have declared one Air Quality Management Area (AQMA), located in Clitheroe, approximately 1.2 km to the east of the proposed development. The AQMA has been declared for exceedance of the annual mean objective for nitrogen dioxide (NO₂).

2.4.2 The 2017 Air Quality Annual Status Report, the most recent LAQM report available from RVBC, considered monitoring data collected for 2016. RVBC currently has four non-automatic (passive) air quality monitors located in the centre of Clitheroe.

2.4.3 In 2016, the most recent year for which monitoring data is available, the annual mean NO₂ concentration recorded ranged from 28.7 to 39.9 µg/m³.

2.4.4 The site is not located in the vicinity of any designated habitats.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 Consultation was undertaken, in a series of communications between 29th June 2018 and 10th July 2018, with Heather Barton, Head of Environmental Health Services and Robert Major, Principal Planning Officer at RVBC. An assessment methodology was provided with a summary detailed below:

- A construction phase dust assessment will be undertaken in accordance with the institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction (February 2014)'.
- Air dispersion modelling, using ADMS-Roads, will be undertaken to consider the potential impact of changing traffic flows, as a result of the proposed development, at existing receptor locations. Pollutant concentrations will also be predicted for locations considered representative of the proposed residential dwellings at the site. The assessment will consider nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}) concentrations;
- Traffic flow information will be provided by the appointed transport consultant for the project;
- The following scenarios will be considered within the air quality assessment:
- A verification and base year; and
- An opening year (2023), with and without the development in place.
- A future year (2028), with and without the development in place.
- The Emission Factor Toolkit (EFT) v8.0.1 and associated background data has now been published by Defra, and it is considered to be more accurate than the previous EFT version 7. It is understood that there is currently no basis for doubting the assumptions made in EFT v8.0.1. Therefore, we do not plan on incorporating a sensitivity analysis within our assessment.

- We have reviewed the 2017 Air Quality Annual Status Report for Ribble Valley Borough Council (RVBC) and have identified one NO₂ background monitoring site in Clitheroe, located near to the Industry park approximately 2km away from the proposed development site. Given the distance involved and the location of this background monitoring location, it is not considered that background NO₂ monitoring data from this location is representative for the proposed development. Given that there is no representative NO₂, PM₁₀ or PM_{2.5} background monitoring locations in the vicinity of the proposed development site, background concentrations will therefore be obtained from the 2015-based Defra default concentration maps.
- It is noted that four roadside NO₂ diffusion tubes are situated along Greenacre Street and the A671 Whalley Road, for which traffic flow data will be available. Therefore, bias adjusted NO₂ data from these monitoring locations will be used within the ADMS model verification procedure for predicted NO₂ concentrations.
- As there are no representative PM₁₀ or PM_{2.5} roadside monitoring locations along the roads for which traffic flow information is available, we will not be able to undertake verification of PM₁₀ or PM_{2.5} concentrations.
- We anticipate using meteorological data from the Bingley NO₂ meteorological recording station, which is considered to be the most representative of conditions across the study area.
- Predicted pollutant concentrations will be compared with the current air quality objectives as set out in the Air Quality Standards Regulations 2010. Changes in pollutant concentrations, as a result of the proposed development, will be calculated and compared against the recently published IAQM and Environmental Protection UK guidance document on planning for air quality: 'Land-Use Planning and Development Control: Planning for Air Quality' (January 2017).

- It is noted that the Clitheroe Sewage Treatment Works (STW) is located approximately 350m from the site boundary. We note that in the planning portal documents for the Ludlow Road development, which is nearer to the STW than the proposed development site, United Utilities did not make representation to RVBC on grounds of potential odour, and the possible detriment to their business should residents complain of odours from the STW. We therefore do not consider odour to be a significant issue for the proposed development site.

3.1.2 In response, via email on 5th July 2018, Mr Major confirmed that the proposed methodology appears to be agreeable.

3.1.3 In July 2018 the IAQM issued guidance that suggested that there are uncertainties relating to future year emission factors and the future UK fleet mix. It is important that these uncertainties are adequately accounted for when predicting future NO₂ concentrations. Therefore, a sensitivity analysis has also been undertaken, which assumes no improvement in NO_x emissions or background concentrations. This guidance was issued after the proposed methodology was sent to RVBC.

3.2 **Construction Phase Assessment – Dust and Fine Particulate Matter Emissions**

3.2.1 To assess the impacts associated with dust and PM₁₀ releases, during the construction phase of the development, an assessment has been undertaken in accordance with IAQM guidance¹².

Step 1

3.2.2 Step 1 of the assessment is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing human sensitive receptors within 350m 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).

3.2.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing ecological 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).

¹² Institute of Air Quality Management 'Guidance on the Assessment of Dust from Demolition and Construction', February 2014

3.2.4 As there are existing sensitive receptors locations within 350m of the site boundary, it is necessary to proceed to Step 2 of the assessment.

Step 2

3.2.5 Step 2 of the assessment determines the potential risk of dust and PM₁₀ arising in sufficient quantities to cause annoyance and/or health and/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.

3.2.6 The risk of dust and PM₁₀ effects is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon two factors:

- Step 2A – the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large; and
- Step 2B – the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

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

3.2.8 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
- Trackout.

Step 3

- 3.2.9 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 Authority¹³, recommended for use outside the capital by LAQM guidance and the IAQM guidance document itself. If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

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

Existing Sensitive Receptors – Human Receptors

- 3.2.11 The closest sensitive receptor locations to the proposed development are detailed in Table 3.

Table 3: Existing Dust Sensitive Receptors		
Receptor	Direction from the Site	Approximate Distance from the Site Boundary (m)
Existing residential properties on Yarrow Crescent	North East	20m at closest point.
Existing residential properties on Blakewater Road	East	30m at closest point.
Siddows Hall	South West	55m at closest point.

3.3 Operational Phase Assessment – Road Traffic Emissions

Modelling of Road Traffic Emissions

- 3.3.1 The air dispersion model ADMS-Roads (CERC, Version 4.1.1) has been used to assess the potential impact of development generated traffic on air quality at existing receptor locations. In addition, pollutant concentrations have been predicted within the site at locations which are considered to be representative of the proposed residential uses.

¹³ Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2006

3.3.2 The air dispersion model has been used to predict NO₂, PM₁₀ and PM_{2.5} concentrations, as these are the pollutants considered most likely to exceed the air quality objectives for human health.

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

- The base year (2016): This is the most recent year for which meteorological data and local pollution data are available;
- An opening year of the development (2023): This is considered both without the development and with the development in place; and
- A future year of the development (2028): This is considered both without the development and with the development in place.

Road Traffic Data

3.3.4 The ADMS-Roads model requires the input of detailed road traffic flow information for those routes which will be affected by the proposed development. The traffic flow information used in the assessment is included in Appendix A.

3.3.5 Detailed traffic flow information, for use in the ADMS-Roads air dispersion model, has been provided by Ashley Helme, the appointed transport consultant for the project.

3.3.6 Traffic flow information has been provided by the transport consultant as 24-hour Annual Average Daily Traffic (AADT) flows, with HGV percentages, for the following links:

- Henthorn Road;
- Lancaster Drive;
- B6243 Edisford Road;
- Eshton Terrace;
- Station Road;
- Moor Lane;
- Woone Lane;
- Moor Lane;
- Greenacre Street;
- Whalley Road;
- Primrose Road; and
- Proposed site access.

3.3.7 Air quality modelling has been carried out to predict pollutant concentrations, due to road traffic emissions, for a total of five scenarios:

- Scenario 1: 2016 Verification and Base Year;
- Scenario 2: 2023 Opening Year (Without Development);
- Scenario 3: 2023 Opening Year (With Development).
- Scenario 4: 2028 Future Year (Without Development); and
- Scenario 5: 2028 Future Year (With Development).

3.3.8 Full development occupancy has been assumed for both the 2023 and 2028 scenarios.

Meteorological Data

3.3.9 The meteorological data used in the air quality modelling has been obtained from ADM Limited. Meteorological data has been obtained for 2016 from the Bingley No. 2 Meteorological Recording Station. This is located approximately 35 km from the proposed development site and is considered to be the most representative of the conditions at the proposed development, due to its relative location.

3.3.10 The meteorological data provides hourly wind speed and direction information. The wind rose for the Bingley No.2 Meteorological Recording Station is included in Appendix B.

Existing Sensitive Receptor Locations

3.3.11 Representative existing sensitive receptor locations (identified as ESR 1 to ESR 13) have been considered in the air quality assessment.

3.3.12 Details of these are given in Table 4, and their locations are shown on drawing GM10068-001.

Table 4: Existing Sensitive Receptor Locations				
Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	2 Thorn Street	373803	441545	Residential
ESR 2	1 Henthorn Road	373827	441595	Residential
ESR 3	18 Lancaster Drive	373205	441512	Residential
ESR 4	10 Bawdlands	374004	441685	Residential

Table 4: Existing Sensitive Receptor Locations				
Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 5	Old Toll House, Parsons Lane	374178	441765	Residential
ESR 6	Moor Lane	374262	441483	Residential
ESR 7	20 Woone Lane	374114	441398	Residential
ESR 8	7 Eshton Terrace	374070	441372	Residential
ESR 9*	43 Whalley Road	374240	441309	Residential
ESR 10*	51 Whalley Road	374223	441260	Residential
ESR 11	153 Henthorn Road	373206	440924	Residential
ESR 12	139 Whalley Road	374114	440978	Residential
ESR 13	9 Primrose Road	374005	440700	Residential
*Located within the Clitheroe AQMA				

Proposed Sensitive Receptor Locations

- 3.3.13 Proposed sensitive receptor locations (identified as PR 1 to PR 2) have been selected within the proposed development site.
- 3.3.14 Pollutant concentrations at the proposed receptor locations have been predicted for scenarios 3 and 5 only (as detailed in paragraph 3.3.7). It is only necessary to consider the 'with development' scenarios for the proposed receptor locations as they will not experience any 'without development' conditions. It is not therefore necessary to consider the changes in pollutant concentrations at the proposed receptor locations.
- 3.3.15 Details of the proposed sensitive receptor locations are provided in Table 5, and their locations are shown on drawing GM10068-001.

Table 5: Proposed Sensitive Receptor Locations			
Receptor Point	Location	Grid Reference	
		Easting	Northing
PR 1	To the south of the site, close to the site access Road	373000	440789
PR 2		373013	440817

Model Validation, Verification and Adjustment

3.3.16 LAQM.TG(16) recognises that model validation generally refers to detailed studies that have been carried out by the model supplier or a regulatory agency. The ADMS-Roads model has been validated by the supplier CERC.

3.3.17 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).

3.3.18 In 2016 RVBC operated four roadside pollutant monitoring locations along the road network for which traffic information is available. During consultation, it was discussed with RVBC that these locations would be used within the model verification procedure for the air quality assessment. The monitoring data that has been used in the model verification procedure is detailed in Table 6.

Table 6: NO ₂ Monitoring Data for 2016 Used for Verification Purposes				
Monitoring Location Reference	Type	Grid Reference		2016 Bias Adjusted NO ₂ Annual Average Concentration (µg/m ³)
		Easting	Northing	
Royal British Legion	Diffusion Tube	374233	441291	39.90
Greenacre Street	Diffusion Tube	374222	441315	28.70
57 Whalley Road	Diffusion Tube	374213	441240	36.60
85 Whalley Road	Diffusion Tube	374177	441153	32.10
<i>*NO₂ monitoring data provided by RVBC</i>				

3.3.19 Further details of the model verification can be found within Appendix C.

3.4 Information Sources

3.4.1 The following sources of information have been used in the preparation of this report:

- Ribble Valley Borough Council, 2017 LAQM Annual Air Quality Status Report;
- Meteorological data for 2016 from the Bingley No. 2 Meteorological recording station, obtained from ADM Limited; and
- Traffic flow information, provided by Ashley Helme Associates.

4 ASSESSMENT OF SIGNIFICANT CRITERIA

4.1 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

4.1.1 The IAQM guidance document¹⁴ details criteria for assessing the sensitivity of an area to dust soiling and health effects of PM₁₀ as summarised in Tables 7 to 9 below.

4.1.2 The guidance then goes on to provide significance criteria for the classification of dust soiling and human health effects from demolition, earthworks, construction activities and trackout, as summarised in Tables 10 to 12 below.

Sensitivity of the Area – Human Receptors

4.1.3 The sensitivity categories for different types of receptors, to both dust soiling effects and the health effects of PM₁₀, are described in Table 7.

Table 7: Sensitivity Categories for Human Receptors		
Sensitivity Category	Dust Soiling Effects	Health Effects of PM ₁₀
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.
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 .
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would expect 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.

¹⁴ Institute of Air Quality Management 'Guidance on the Assessment of Dust from Demolition and Construction', February 2014

4.1.4 Based upon the category of receptor sensitivity, the sensitivity of the area to dust soiling effects is determined using the criteria detailed in Table 8.

Table 8: Sensitivity of the Area to Dust Soiling Effects on People and Property					
Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<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

4.1.5 Based upon the category of receptor sensitivity, the sensitivity of the area to the health effects of PM₁₀ is determined using the criteria detailed in Table 9.

Table 9: Sensitivity of the Area to Human Health Impacts							
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)				
			<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

Table 9: Sensitivity of the Area to Human Health Impacts							
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)				
			<20m	<50m	<100m	<200m	<350m
		1 - 10	Low	Low	Low	Low	Low
		>10	Low	Low	Low	Low	Low
	24-28µg/m ³	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

Risk of Dust Impacts

- 4.1.6 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table 10.

Table 10: Risk of Dust Impacts - 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

- 4.1.7 The risk of dust being generated by earthworks and construction activities at the site is determined using the criteria in Table 11.

Table 11: Risk of Dust Impacts – 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

- 4.1.8 The risk of dust being generated by trackout from the site is determined using the criteria in Table 12.

Table 12: Risk of Dust Impacts – Trackout			
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

4.2 Operational Phase Assessment – Road Traffic Emissions

Assessing the Impact of a Proposed Development on Human Health

- 4.2.1 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM in relation to the assessment of the air quality impacts of proposed developments and their significance¹⁵.
- 4.2.2 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.
- 4.2.3 The impact descriptors for individual receptors are detailed in Table 13.

Table 13: 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

¹⁵ Environmental Protection UK and the Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality, May 2015

Table 13: 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
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

- 4.2.4 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'.
- 4.2.5 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.
- 4.2.6 A discussion of the impacts of the proposed development, and their significance, is included in section 6 and 7 of this report, respectively.

5 BASELINE SITUATION

5.1 Operational Phase Assessment – Road Traffic Emissions

Background Air Pollutant Concentrations

- 5.1.1 The ADMS assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed. The data may be derived through long term ambient measurements at background sites, remote from immediate sources of air pollution, or alternatively from the default concentration maps which have been provided for use by Defra with the revised LAQM.TG(16) guidance.
- 5.1.2 There are no representative NO₂, PM₁₀ or PM_{2.5} background monitoring locations in the vicinity of the proposed development. Background NO₂, PM₁₀ and PM_{2.5} concentrations have therefore been obtained from the 2015-based Defra default concentration maps, for the appropriate grid squares¹⁶.
- 5.1.3 The background pollutant concentrations used in this assessment are detailed in Table 14.

Table 14: Background NO_x, NO₂, PM₁₀ and PM_{2.5} Concentrations Obtained from the 2015-Based Defra Default Concentration Maps (Annual Mean Concentration in µg/m³)				
Receptors	Pollutant			
	Oxides of Nitrogen (NO _x)	Nitrogen Dioxide (NO ₂)	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
2016 Background Concentrations				
ESR 1 – ESR 3 (373500, 441500)	12.73	9.61	12.69	9.19
ESR 4 – ESR 10 (374500, 441500)	15.31	11.40	12.73	9.20
ESR 11, PR 1 and PR 2 (373500, 440500)	10.40	7.95	10.15	7.02
ESR 12 and ESR 13 (374500, 440500)	10.17	7.78	9.91	6.90
2023 Background Concentrations				
ESR 1 – ESR 3 (373500, 441500)	9.21	7.08	12.24	8.75
ESR 4 – ESR 10 (374500, 441500)	11.17	8.50	12.27	8.73
ESR 11, PR 1 and PR 2 (373500, 440500)	7.76	6.02	9.77	6.65
ESR 12 and ESR 13 (374500, 440500)	7.53	5.85	9.53	6.54
2028 Background Concentrations				
ESR 1 – ESR 3 (373500, 441500)	7.90	6.12	12.14	8.63

¹⁶ Defra Local Air Quality Management webpages (<http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>)

Table 14: Background NO_x, NO₂, PM₁₀ and PM_{2.5} Concentrations Obtained from the 2015-Based Defra Default Concentration Maps (Annual Mean Concentration in µg/m³)

Receptors	Pollutant			
	Oxides of Nitrogen (NO _x)	Nitrogen Dioxide (NO ₂)	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})
ESR 4 – ESR 10 (374500, 441500)	9.60	7.36	12.18	8.62
ESR 11, PR 1 and PR 2 (373500, 440500)	6.73	5.25	9.69	6.56
ESR 12 and ESR 13 (374500, 440500)	6.52	5.09	9.45	6.45

Modelled Baseline Concentrations

5.1.4 The baseline assessment (i.e. scenarios 1, 2 and 4) has been carried out for the existing sensitive receptors considered. The NO₂, PM₁₀ and PM_{2.5} concentrations are detailed in Table 15 and are also included in Appendix D.

Table 15: Predicted NO₂ (*Adjusted), PM₁₀ and PM_{2.5} (Unadjusted) concentrations at Existing Sensitive Receptor Locations for 2016, 2023 and 2028 'Without Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (µg/m ³)								
	Scenario 1: 2016 Base Year			Scenario 2: 2022 Opening Year			Scenario 4: 2028 Future Year		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
ESR 1	23.21	13.22	9.50	16.28	12.79	9.05	12.29	12.70	8.94
ESR 2	21.22	13.12	9.45	14.90	12.68	8.99	11.35	12.59	8.88
ESR 3	15.68	12.92	9.33	10.95	12.47	8.87	8.69	12.38	8.76
ESR 4	17.82	12.97	9.34	13.03	12.54	8.88	10.40	12.46	8.77
ESR 5	22.64	13.17	9.45	16.32	12.74	8.99	12.60	12.66	8.88
ESR 6	24.04	13.21	9.48	16.92	12.78	9.01	12.98	12.70	8.90
ESR 7	21.94	13.14	9.44	15.73	12.70	8.97	12.23	12.63	8.86
ESR 8	22.82	13.17	9.46	16.32	12.74	8.99	12.60	12.66	8.88
ESR 9	33.16	13.49	9.65	22.69	13.06	9.17	16.82	12.99	9.05
ESR 10	35.16	13.48	9.65	23.89	13.03	9.15	17.59	12.96	9.04
ESR 11	8.43	10.17	7.03	6.34	9.79	6.66	5.47	9.71	6.57
ESR 12	28.74	10.72	7.38	19.07	10.35	6.99	13.92	10.28	6.90
ESR 13	21.58	10.42	7.21	14.40	10.05	6.83	10.79	9.97	6.74

Table 15: Predicted NO₂ (*Adjusted), PM₁₀ and PM_{2.5} (Unadjusted) concentrations at Existing Sensitive Receptor Locations for 2016, 2023 and 2028 'Without Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (µg/m ³)								
	Scenario 1: 2016 Base Year			Scenario 2: 2022 Opening Year			Scenario 4: 2028 Future Year		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
*NO ₂ concentrations obtained by inputting predicted NO _x concentrations into the NO _x to NO ₂ calculator ¹⁷ in accordance with LAQM.TG(16)									

Scenario 1: 2016 Verification and Base Year

- 5.1.5 The 2016 baseline annual mean NO₂ concentrations (adjusted) are predicted to range from 8.45 to 35.16 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.
- 5.1.6 The 2016 baseline annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 10.17 to 13.49 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.
- 5.1.7 The 2016 baseline annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 7.03 to 9.65 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 2: 2023 Opening Year, Without Development

- 5.1.8 The 2023 opening year 'without development' annual mean NO₂ concentrations (adjusted) are predicted to range from 6.34 to 23.89 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.
- 5.1.9 The 2023 opening year 'without development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 9.79 to 13.06 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

¹⁷ NO_x to NO₂ Calculator, Defra Local Air Quality Management web pages (<http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html>)

5.1.10 The 2023 opening year 'without development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 6.66 to 9.17 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 4: 2028 Future Year, Without Development

5.1.11 The 2028 future year 'without development' annual mean NO₂ concentrations (adjusted) are predicted to range from 5.47 to 17.59 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

5.1.12 The 2028 future year 'without development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 9.71 to 12.99 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

5.1.13 The 2028 future year 'without development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 6.57 to 9.05 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

6 IMPACT ASSESSMENT

6.1.1 The main activities involved with the construction phase of works are as follows:

- **Earthworks** which may be required prior to the construction phase of works.
Sources of dust can include:
 - Cleaning the site;
 - Stripping and stockpiling of topsoil and subsoil;
 - Ground excavation;
 - Bringing in, tipping and spreading materials on site;
 - Stockpiling materials;
 - Levelling ground;
 - Trenching;
 - Road construction; and
 - Vehicle movements on site roads;
- **Construction** which will involve the construction of individual building access roads, the commercial/office buildings and associated car parking areas and the residential buildings themselves; and
- **Trackout** which 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.

6.1.2 No demolition activities are proposed within the site boundary. As a result, the potential effects associated with demolition activities do not need to be considered further in this assessment.

Step 2A

6.1.3 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from demolition, earthworks, construction and trackout in the absence of site specific mitigation.

6.1.4 Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

Step 2B

- 6.1.5 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in Tables 7 to 9, for demolition, earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling and human health effects.
- 6.1.6 For earthworks and construction, there are currently between 10 and 100 receptor locations (mainly residential) within 0-50m of where these activities may take place, which is assumed to be the site boundary for the purposes of this assessment.
- 6.1.7 For trackout, there are between 10 and 100 receptor locations (mainly residential) within 50m of where trackout may occur for a distance of up to 500m from the site entrance.

Step 2C

- 6.1.8 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area.
- 6.1.9 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in Tables 10 to 12.

Summary

- 6.1.10 Table 16 details the results of Step 2 of the construction phase assessment for human receptors.

Table 16: Construction Phase Dust Assessment (Step 2) – Human Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
Step 2A				
Dust Emission Magnitude	N/A	Large ^a	Large ^b	Medium ^c
Step 2B				
Sensitivity of Closest Receptors	N/A	High	High	High
Sensitivity of Area to Dust Soiling Effects	N/A	Medium	Medium	Medium
Sensitivity of Area to Human Health Effects	N/A	Low ^d	Low ^d	Low ^d
Step 2C				

Table 16: Construction Phase Dust Assessment (Step 2) – Human Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
Dust Risk: Dust Soiling	N/A	Medium Risk	Medium Risk	Low Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk
a. Total site area estimated to be more than 10,000m². b. Total building volume estimated to be more than 100,000m³. c. Number of construction phase vehicles estimated to be between 10-50 movements per day. d. Background annual mean PM₁₀ concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2016, as detailed in Table 16.				

6.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

- 6.2.1 The impact assessment has been carried out for the representative existing sensitive receptor locations. Tables 17 - 19 show the changes in pollutant concentrations for the 2023 opening year and 2028 Future Year, for both the 'Without Development' and 'With Development' scenarios. The NO₂, PM₁₀ and PM_{2.5} concentrations are also included in Appendix D.

Table 17: Predicted NO ₂ (*Adjusted) Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios						
Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQUAL	Without Development	With Development	Percent Change Relative to AQUAL
ESR 1	16.28	16.79	1.28	12.29	12.63	0.85
ESR 2	14.90	15.24	0.85	11.35	11.57	0.55
ESR 3	10.95	11.03	0.20	8.69	8.74	0.13
ESR 4	13.03	13.17	0.35	10.40	10.47	0.18
ESR 5	16.32	16.51	0.48	12.60	12.74	0.35
ESR 6	16.92	17.05	0.32	12.98	13.08	0.25
ESR 7	15.73	15.90	0.43	12.23	12.34	0.27
ESR 8	16.32	16.55	0.58	12.60	12.74	0.35
ESR 9	22.69	22.93	0.60	16.82	16.95	0.32

Table 17: Predicted NO₂ (*Adjusted) Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios

Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL
ESR 10	23.89	24.16	0.67	17.59	17.71	0.30
ESR 11	6.34	6.66	0.80	5.47	5.68	0.53
ESR 12	19.07	19.20	0.32	13.92	14.02	0.25
ESR 13	14.40	14.51	0.27	10.79	10.88	0.23
<i>NO₂ concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO₂ calculator¹⁸ in accordance with LAQM.TG(16)</i>						

Table 18: Predicted PM₁₀ Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios

Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL
ESR 1	12.79	12.82	0.08	12.70	12.73	0.08
ESR 2	12.68	12.70	0.05	12.59	12.61	0.05
ESR 3	12.47	12.48	0.01	12.38	12.38	0.01
ESR 4	12.54	12.55	0.02	12.46	12.46	0.02
ESR 5	12.74	12.75	0.03	12.66	12.67	0.03
ESR 6	12.78	12.79	0.02	12.70	12.71	0.03
ESR 7	12.70	12.71	0.03	12.63	12.64	0.02
ESR 8	12.74	12.75	0.04	12.66	12.67	0.03
ESR 9	13.06	13.07	0.04	12.99	13.00	0.03
ESR 10	13.03	13.05	0.04	12.96	12.97	0.02
ESR 11	9.79	9.81	0.05	9.71	9.72	0.04
ESR 12	10.35	10.35	0.02	10.28	10.29	0.02
ESR 13	10.05	10.05	0.02	9.97	9.98	0.02

¹⁸ NO_x to NO₂ Calculator, Defra Local Air Quality Management web pages (<http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html>)

Table 19: Predicted PM_{2.5} Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios

Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL
ESR 1	9.05	9.07	0.07	8.94	8.95	0.07
ESR 2	8.99	9.00	0.04	8.88	8.89	0.04
ESR 3	8.87	8.88	0.01	8.76	8.76	0.01
ESR 4	8.88	8.88	0.02	8.77	8.77	0.01
ESR 5	8.99	8.99	0.02	8.88	8.88	0.03
ESR 6	9.01	9.01	0.02	8.90	8.91	0.02
ESR 7	8.97	8.97	0.02	8.86	8.86	0.02
ESR 8	8.99	9.00	0.03	8.88	8.88	0.03
ESR 9	9.17	9.17	0.03	9.05	9.06	0.03
ESR 10	9.15	9.16	0.03	9.04	9.05	0.02
ESR 11	6.66	6.67	0.04	6.57	6.58	0.04
ESR 12	6.99	7.00	0.02	6.90	6.91	0.02
ESR 13	6.83	6.83	0.01	6.74	6.74	0.02

Scenario 3: 2023 Opening Year, With Development

- 6.2.2 The 2023 opening year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 6.66 to 24.16 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.
- 6.2.3 The 2023 opening year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 9.81 to 13.07 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

6.2.4 The 2023 opening year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 6.67 to 9.17 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 5: 2028 Future Year, With Development

6.2.5 The 2028 future year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 5.68 to 17.71 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

6.2.6 The 2028 future year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 9.72 to 13.00 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

6.2.7 The 2028 future year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 6.58 to 9.06 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Assessment of Impact

6.2.8 Using the descriptors detailed in Table 13, the impact of the proposed development can be assessed at each of the existing sensitive receptors considered.

6.2.9 The impact on NO₂ concentrations in 2023 is detailed in Table 20.

Table 20: Impact on NO ₂ Concentrations in 2023			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 and ESR 2	1%	<75%	Negligible
ESR 3 – ESR 7	<0.5%*	<75%	Negligible
ESR 8 – ESR 11	1%	<75%	Negligible
ESR 12 and ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

6.2.10 The impact on NO₂ concentrations in 2028 is detailed in Table 21.

Table 21: Impact on NO ₂ Concentrations in 2028			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 and ESR 2	1%	<75%	Negligible
ESR 3 – ESR 10	<0.5%*	<75%	Negligible
ESR 11	1%	<75%	Negligible
ESR 12 and ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

6.2.11 The impact on PM₁₀ concentrations in 2023 and 2028 is detailed in Table 22.

Table 22: Impact on PM ₁₀ Concentrations in 2023 and 2028			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 – ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

6.2.12 The impact on PM_{2.5} concentrations in 2023 and 2028 is detailed in Table 23.

Table 23: Impact on PM _{2.5} Concentrations in 2023 and 2028			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 – ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

Proposed Sensitive Receptor Locations

6.2.13 Air pollutant concentrations have also been modelled for the proposed receptor locations, for the 2023 and 2028 ‘with development’ scenarios, as detailed in Table 24. The NO₂, PM₁₀ and PM_{2.5} concentrations are also included in Appendix D.

Table 24: Predicted NO₂ (Adjusted), PM₁₀ and PM_{2.5} Concentrations (Unadjusted) at Proposed Sensitive Receptor Locations for the 2023 and 2028 'With Development' Scenarios						
Proposed Receptor Location	2023 Calculated Annual Mean Concentrations (µg/m³)			2028 Calculated Annual Mean Concentrations (µg/m³)		
	NO₂	PM₁₀	PM_{2.5}	NO₂	PM₁₀	PM_{2.5}
PR 1	6.40	9.79	6.66	5.50	9.71	6.57
PR 2	6.39	9.79	6.66	5.50	9.71	6.57

Scenario 3: 2023 Opening Year, With Development

6.2.14 The 2023 opening year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 6.39 to 6.40 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

6.2.15 The 2023 opening year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to be 9.79 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

6.2.16 The 2023 opening year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to be 6.66 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 5: 2028 Future Year, With Development

6.2.17 The 2028 future year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to be 5.50 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

6.2.18 The 2028 future year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to be 9.71 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

6.2.19 The 2028 future year 'with development' annual mean $\text{PM}_{2.5}$ concentrations (unadjusted) are predicted to be $6.57 \mu\text{g}/\text{m}^3$ for the two proposed receptor locations considered. Exceedance of the annual mean target concentration for $\text{PM}_{2.5}$ ($25 \mu\text{g}/\text{m}^3$) is not predicted to occur.

7 SENSITIVITY ANALYSIS

7.1 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

- 7.1.1 Current evidence suggests that NO₂ background concentrations and emissions are not decreasing in accordance with expected reductions. At present, there is uncertainty about how background NO₂ concentrations will change in future years.
- 7.1.2 To provide a robust assessment, a sensitivity analysis has been undertaken for the 2023 and 2028 Future Year scenarios. This analysis assumes that there will be no improvement in background air quality between 2016 and 2023/2028. 2016 background pollutant concentrations and vehicle emission factors have therefore been applied to the 2023 and 2028 Future Year scenarios.
- 7.1.3 The results of the sensitivity analysis, undertaken for the thirteen existing sensitive receptor locations, are detailed in Tables 25 - 27 and detailed in Appendix E.

Table 25: Predicted NO ₂ (*Adjusted) Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality						
Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL
ESR 1	25.07	25.93	2.15	25.53	26.41	2.20
ESR 2	22.85	23.38	1.32	23.26	23.78	1.30
ESR 3	16.36	16.48	0.30	16.56	16.69	0.33
ESR 4	19.07	19.32	0.63	19.37	19.56	0.47
ESR 5	24.61	24.89	0.70	25.00	25.34	0.85
ESR 6	26.03	26.23	0.50	26.52	26.83	0.77
ESR 7	23.65	23.92	0.68	24.21	24.46	0.63
ESR 8	24.73	25.16	1.08	25.27	25.58	0.77
ESR 9	36.37	36.81	1.10	37.19	37.51	0.80
ESR 10	38.80	39.32	1.30	39.71	39.96	0.63
ESR 11	8.48	8.99	1.28	8.51	9.02	1.28
ESR 12	31.09	31.29	0.50	31.86	32.08	0.55
ESR 13	23.02	23.18	0.40	23.55	23.87	0.80

Table 25: Predicted NO₂ (*Adjusted) Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality

Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL

NO₂ concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO₂ calculator¹⁹ in accordance with LAQM.TG(16)

Table 26: Predicted PM₁₀ Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality

Receptor	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	Without Development	With Development	Percent Change Relative to AQAL	Without Development	With Development	Percent Change Relative to AQAL
ESR 1	13.29	13.33	0.09	13.31	13.35	0.09
ESR 2	13.18	13.20	0.05	13.20	13.22	0.05
ESR 3	12.94	12.95	0.01	12.95	12.96	0.01
ESR 4	13.02	13.03	0.02	13.04	13.04	0.02
ESR 5	13.25	13.26	0.03	13.27	13.28	0.04
ESR 6	13.30	13.30	0.02	13.32	13.33	0.03
ESR 7	13.20	13.22	0.03	13.23	13.24	0.03
ESR 8	13.25	13.26	0.04	13.27	13.28	0.03
ESR 9	13.62	13.64	0.04	13.65	13.67	0.03
ESR 10	13.61	13.62	0.04	13.64	13.65	0.03
ESR 11	10.17	10.19	0.05	10.17	10.19	0.05
ESR 12	10.82	10.83	0.02	10.85	10.86	0.03
ESR 13	10.48	10.49	0.02	10.51	10.52	0.03

¹⁹ NO_x to NO₂ Calculator, Defra Local Air Quality Management web pages (<http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html>)

Table 27: Predicted PM_{2.5} Concentrations at Existing Sensitive Receptor Locations for the 2023 and 2028 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality						
Receptor	2023 Calculated Annual Mean Concentrations (µg/m³)			2028 Calculated Annual Mean Concentrations (µg/m³)		
	Without Development	With Development	Percent Change Relative to AQUAL	Without Development	With Development	Percent Change Relative to AQUAL
ESR 1	9.55	9.57	0.08	9.56	9.58	0.08
ESR 2	9.48	9.50	0.05	9.49	9.51	0.05
ESR 3	9.34	9.34	0.01	9.35	9.35	0.01
ESR 4	9.37	9.38	0.02	9.38	9.38	0.02
ESR 5	9.50	9.51	0.03	9.51	9.52	0.03
ESR 6	9.53	9.54	0.02	9.54	9.55	0.03
ESR 7	9.48	9.48	0.03	9.49	9.50	0.03
ESR 8	9.50	9.51	0.04	9.51	9.52	0.03
ESR 9	9.73	9.74	0.04	9.75	9.76	0.03
ESR 10	9.73	9.74	0.04	9.75	9.76	0.03
ESR 11	7.03	7.04	0.05	7.03	7.04	0.05
ESR 12	7.44	7.45	0.02	7.46	7.47	0.02
ESR 13	7.24	7.25	0.02	7.26	7.26	0.03

Scenario 3: 2023 Opening Year, With Development

- 7.1.4 The 2023 opening year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 8.99 to 39.32 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.
- 7.1.5 The 2023 opening year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 10.19 to 13.64 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.
- 7.1.6 The 2023 opening year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 7.04 to 9.75 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 5: 2028 Future Year, With Development

- 7.1.7 The 2028 future year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 9.02 to 39.96 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.
- 7.1.8 The 2028 future year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to range from 10.19 to 13.67 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.
- 7.1.9 The 2028 future year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to range from 7.04 to 9.76 µg/m³ for the thirteen existing sensitive receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Assessment of Impact

- 7.1.10 Using the descriptors detailed in Table 13, the impact of the proposed development can be assessed at each of the existing sensitive receptors considered.
- 7.1.11 The impact on NO₂ concentrations in 2023 is detailed in Table 28.

Table 28: Impact on NO₂ Concentrations in 2023			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1	2-5%	<75%	Negligible
ESR 2	1%	<75%	Negligible
ESR 3	<0.5%*	<75%	Negligible
ESR 4 – ESR 8	1%	<75%	Negligible
ESR 9	1%	76-94%	Negligible
ESR 10	1%	95-102%	Slight
ESR 11	1%	<75%	Negligible
ESR 12	1%	76-94%	Negligible
ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

- 7.1.12 The impact on NO₂ concentrations in 2028 is detailed in Table 29.

Table 29: Impact on NO ₂ Concentrations in 2023			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1	2-5%	<75%	Negligible
ESR 2	1%	<75%	Negligible
ESR 3 and ESR 4	<0.5%*	<75%	Negligible
ESR 5 – ESR 8	1%	<75%	Negligible
ESR 9	1%	76-94%	Negligible
ESR 10	1%	95-102%	Slight
ESR 11	1%	<75%	Negligible
ESR 12	1%	76-94%	Negligible
ESR 13	1%	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

7.1.13 The impact on PM₁₀ concentrations in 2023 and 2028 is detailed in Table 30.

Table 30: Impact on PM ₁₀ Concentrations in 2023 and 2028			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 – ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

7.1.14 The impact on PM_{2.5} concentrations in 2023 and 2028 is detailed in Table 31.

Table 31: Impact on PM _{2.5} Concentrations in 2023 and 2028			
Proposed Receptor Location	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1 – ESR 13	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible			

Proposed Sensitive Receptor Locations

7.1.15 Air pollutant concentrations have also been modelled for the proposed receptor locations, for the 2023 and 2028 'with development' scenarios, as detailed in Table 32. The NO₂, PM₁₀ and PM_{2.5} concentrations are also included in Appendix D.

Table 32: Predicted NO₂ (Adjusted), PM₁₀ and PM_{2.5} Concentrations (Unadjusted) at Proposed Sensitive Receptor Locations for the 2023 and 2028 'With Development' Scenarios, Assuming no Improvement in Air Quality						
Proposed Receptor Location	2023 Calculated Annual Mean Concentrations (µg/m ³)			2028 Calculated Annual Mean Concentrations (µg/m ³)		
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
PR 1	8.58	10.18	7.03	8.59	10.18	7.03
PR 2	8.56	10.18	7.03	8.57	10.18	7.03

Scenario 3: 2023 Opening Year, With Development

7.1.16 The 2023 opening year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 8.56 to 8.58 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

7.1.17 The 2023 opening year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to be 10.18 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

7.1.18 The 2023 opening year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to be 7.03 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

Scenario 5: 2028 Future Year, With Development

7.1.19 The 2028 future year 'with development' annual mean NO₂ concentrations (adjusted) are predicted to range from 8.57 to 8.59 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for NO₂ (40µg/m³) is not predicted to occur.

7.1.20 The 2028 future year 'with development' annual mean PM₁₀ concentrations (unadjusted) are predicted to be 10.18 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean objective concentration for PM₁₀ (40µg/m³) is not predicted to occur.

The 2028 future year 'with development' annual mean PM_{2.5} concentrations (unadjusted) are predicted to be 7.03 µg/m³ for the two proposed receptor locations considered. Exceedance of the annual mean target concentration for PM_{2.5} (25µg/m³) is not predicted to occur.

8 ASSESSMENT OF SIGNIFICANCE

8.1 Operational Phase Assessment – Road Traffic Emissions

8.1.1 The significance of the overall effects of the proposed development has been assessed. This assessment is based on professional judgement and takes into account a number of factors, including:

- Baseline pollutant concentrations in 2016 for NO₂, PM₁₀ and PM_{2.5} are below the relevant annual mean objective at all thirteen receptors.
- Baseline pollutant concentrations in 2023 and 2028 are all below the relevant annual mean objectives;
- The sensitivity analysis predicts that the pollutant concentrations in 2023 and 2028 are all below the relevant annual mean objectives;
- Taking into account the results of the air quality impact assessment and the sensitivity analysis, the assessment predicts a negligible impact on concentrations of PM₁₀ and PM_{2.5} in 2023 and 2028 at all thirteen existing sensitive receptor locations, with the development in place;
- Taking into account the results of the air quality impact assessment, the assessment predicts a negligible impact on concentrations of NO₂ in 2023 and 2028 at all thirteen existing sensitive receptor locations, with the development in place;
- Taking into account the results of the air quality sensitivity analysis, the assessment predicts a negligible impact on concentrations of NO₂ in 2023 and 2028 at twelve of the thirteen existing sensitive receptor locations, and a slight impact at one receptor with the development in place; and
- All pollutant concentrations within the proposed development site are predicted to be well below the relevant annual mean objectives both in the air quality impact assessment and the sensitivity analysis for both 2023 and 2028.

8.1.2 Based on the above factors, in accordance with the EPUK/IAQM guidance, the effect of the proposed development on human health is considered to be 'not significant'.

9 MITIGATION MEASURES

9.1 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

Step 3

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

9.1.2 Step 2C of the construction phase assessment identified that:

- The risk of dust soiling effects is classed as medium for earthworks and construction, and low for trackout; and
- The risk of human health effects is classed as low for earthworks, construction and for trackout;

9.1.3 This assumes that no mitigation measures are applied, except those required by legislation. Site specific mitigation measures do not need to be recommended if the risk category is negligible.

9.1.4 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'.

9.1.5 A best practice dust mitigation plan will be written and implemented for the site. This will set out the practical measures that could be incorporated as part of a best working practice scheme. This will take into account the recommendations included within the IAQM guidance, which may include but are not limited to:

- Ensure effective water suppression is used during demolition operations;
- 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 being continuously in use;
- Ensuring that all vehicles will be sheeted when loaded;
- 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);
- Confining vehicles to areas of the site where appropriate dust control measures can be in operation;
- 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.

9.1.6 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 log book and made available to RVBC on request.

9.1.7 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

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

- 9.1.9 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'.

9.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

- 9.2.1 An air quality assessment has been undertaken to consider the potential impact of development-generated vehicles on air quality at ten existing sensitive human receptor locations.
- 9.2.2 Pollutant concentrations in 2023 and 2028 with the development in place, are below the relevant annual mean objectives at all thirteen receptor locations considered.
- 9.2.3 Taking into consideration the results of the impact assessment, it is predicted that the development will have a negligible impact on concentrations of NO₂, PM₁₀ and PM_{2.5} at all thirteen existing sensitive receptors considered in 2023 and 2028. Air quality effects are therefore considered to be 'not significant'.

Proposed Sensitive Receptor Locations

- 9.2.4 The assessment has also predicted pollutant concentrations at two proposed receptor locations within the proposed residential development site.
- 9.2.5 Predicted NO₂, PM₁₀ and PM_{2.5} concentrations are below the annual mean air quality objectives/target concentrations, for 2023 and 2028, at the proposed sensitive receptor locations considered. Air quality effects within the site are, therefore, considered to be 'not significant'.

Mitigation Strategies

- 9.2.6 Based on professional judgement, it is considered that mitigation measures should be employed. Mitigation measures could include:
- The implementation of a green travel plan, as well as documents showing local public transportation routes for future residents;
 - EV recharging points within the development (wall mounted or free standing in garage or off-street points);
 - Support local walking and cycling initiatives;
 - Support measures to reduce the need to travel;
 - Support measures to reduce polluting motorised vehicle use;

- Measures to support improved public transport;
- Bike/e-bike hire schemes; and
- Installing low/ultra-low NO_x boilers at proposed dwellings.

10 CONCLUSIONS

10.1 Construction Phase Assessment – Dust and Fine Particulate Matter Emissions

- 10.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust effects from earthworks, construction and trackout associated with the proposed development, in accordance with guidance published by the IAQM.
- 10.1.2 The risk of dust soiling effects is classed as medium for earthworks and construction, and low for trackout. The risk of human health effects is classed as low for earthworks, construction, and for trackout.
- 10.1.3 With site specific mitigation measures in place, such as those detailed in Section 9 of this report, the significance of dust effects from earthworks, construction and trackout is considered to be 'not significant'.

10.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

- 10.2.1 An air quality assessment has been undertaken to consider the potential impact of development-generated vehicles on air quality at thirteen existing sensitive human receptor locations.
- 10.2.2 Pollutant concentrations in 2023 and 2028, with the development in place, are below the relevant annual mean objectives at all thirteen receptor locations considered. Air quality effects are, therefore, considered to be 'not significant'.

Proposed Sensitive Receptor Locations

- 10.2.3 The assessment has predicted pollutant concentrations at two proposed receptor locations within the proposed residential development site.
- 10.2.4 Predicted NO₂, PM₁₀ and PM_{2.5} concentrations are below the annual mean air quality objectives/target concentrations, for 2023 and 2028, at the proposed sensitive receptor locations considered. Air quality effects within the site are, therefore, considered to be 'not significant'.
- 10.2.5 It is considered that the true concentration will lie somewhere between the results of the air quality assessment and the sensitivity analysis.

Recommendations for Mitigation

- 10.2.6 The impact from the construction phase of the proposed development is predicted to be not significant. However, mitigation measures will assist in reducing any potential impact resulting from the development.
- 10.2.7 It is also considered that the implementation of the mitigation measures, such as those detailed in section 9 of this report, should be used in order to assist with reducing any potential impacts from the operational phase of the proposed development.

Summary

- 10.2.8 The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, or to any breach in national objectives as required by national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

This page has been left blank intentionally

Appendix A:
Traffic Flow Information
Used in the Air Quality Assessment

This page has been left blank intentionally

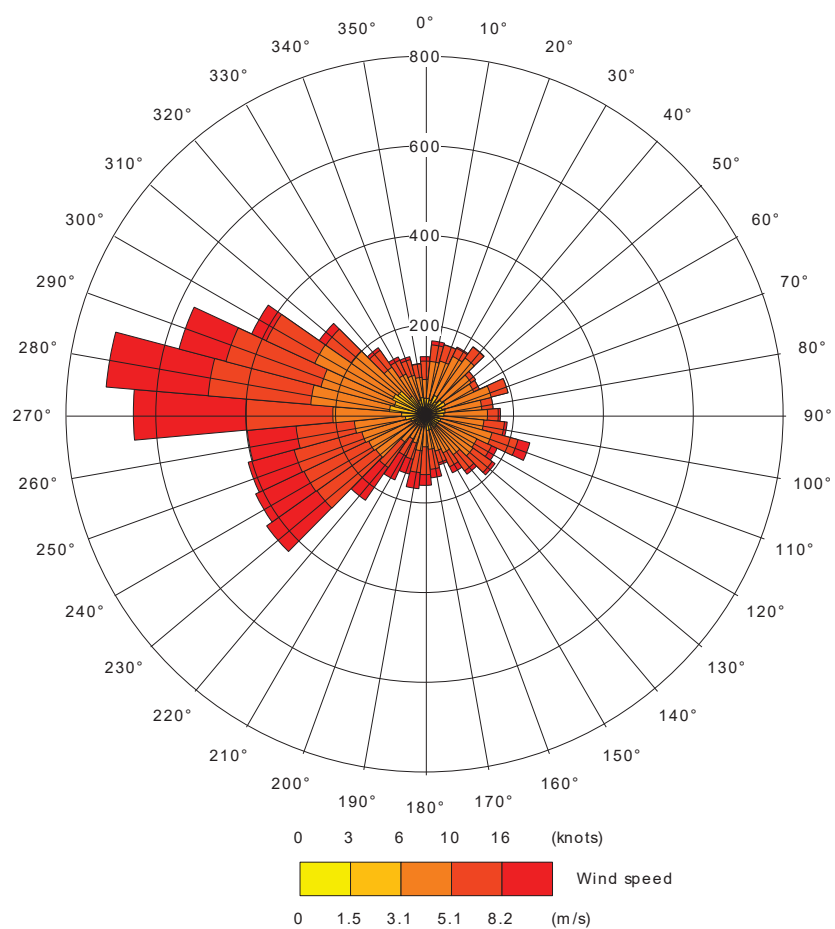
24 Hour Annual Average Daily Traffic (AADT) Flows, Provided by Ashley Helme on 18th July 2018

Link Name	Scenario 1: 2016 Verification and Base Year		Scenario 2: 2023 Opening Year, Without Development		Scenario 3: 2023 Opening Year, With Development		Scenario 4: 2028 Future Year, Without Development		Scenario 5: 2028 Future Year, With Development	
	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
Henthorn Road N	307	0	335	0	988	0	349	0	1001	0
Site Access	0	0	0	0	653	0	0	0	653	0
Lancaster Drive	2313	40	2605	45	2701	47	2707	47	2804	48
B6243 Edisford Road W	5553	166	6139	183	6234	186	6385	191	6479	194
B6243 Edisford Road E	7149	161	8007	180	8272	186	8325	187	8589	193
Henthorn Road	2909	35	3383	41	3650	44	3511	43	3779	46
Henthorn Road N	2721	87	3173	102	3436	110	3294	105	3556	114
Eshton Terrace	7361	120	8251	134	8530	139	8578	139	8857	144
Henthorn Road S	6070	149	7046	173	7587	187	7315	180	7856	193
Station Road	8582	275	10237	328	10500	336	10618	340	10880	348
B6243 W	8697	159	10306	189	10571	194	10691	196	10957	201
Moor Lane S	9754	364	11309	422	11468	428	11742	438	11901	444
Woone Lane	6284	128	7373	150	7534	154	7652	156	7814	159
B6243 E	8608	158	10208	187	10474	192	10590	194	10856	199
B6243 W	8309	161	10295	199	10560	205	10663	207	10928	212
Woone Lane N	6373	130	7470	152	7631	156	7753	158	7914	162
Greenacre Street	2894	96	3306	109	3376	112	3433	114	3505	116
Eshton Terrace	8037	206	9614	247	9890	254	9969	256	10246	263
Whalley Road N	12453	519	14532	605	14712	613	15084	629	15265	636
Whalley Road S	12177	534	14307	627	14513	636	14847	651	15053	660
Greenacre Street	3111	106	3542	121	3613	123	3680	126	3751	128
Whalley Road N	14872	636	16620	711	16827	719	17279	739	17486	748
Whalley Road S	16060	687	17951	767	18201	778	18663	798	18913	809

Link Name	Scenario 1: 2016 Verification and Base Year		Scenario 2: 2023 Opening Year, Without Development		Scenario 3: 2023 Opening Year, With Development		Scenario 4: 2028 Future Year, Without Development		Scenario 5: 2028 Future Year, With Development	
	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
Primrose Road	2415	52	2670	57	2715	58	2777	60	2821	61

Appendix B:
2016 Wind Rose for Bingley No. 2
Meteorological Recording Station

This page has been left blank intentionally



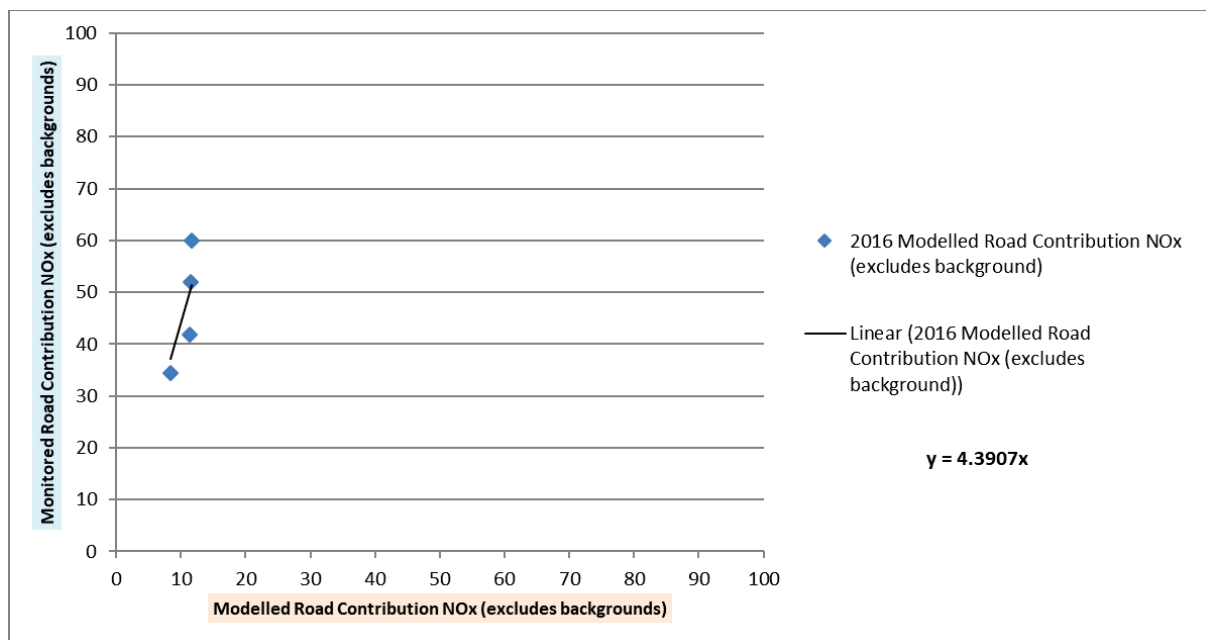
This page has been left blank intentionally

Appendix C:
Model Verification Procedure

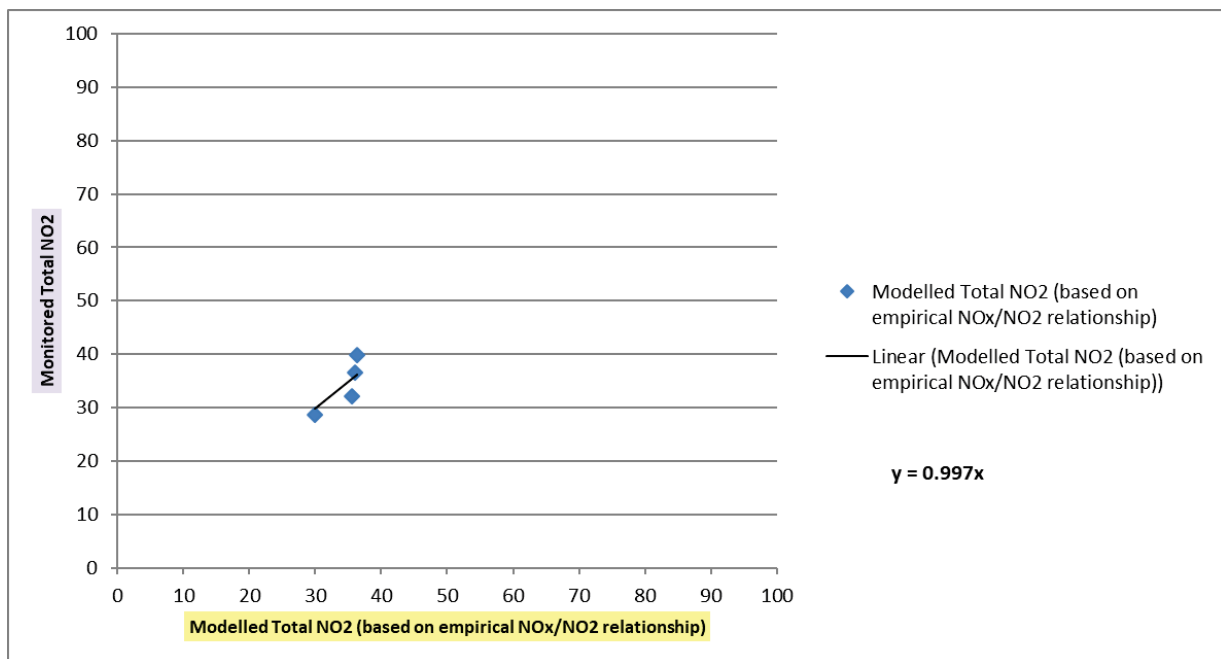
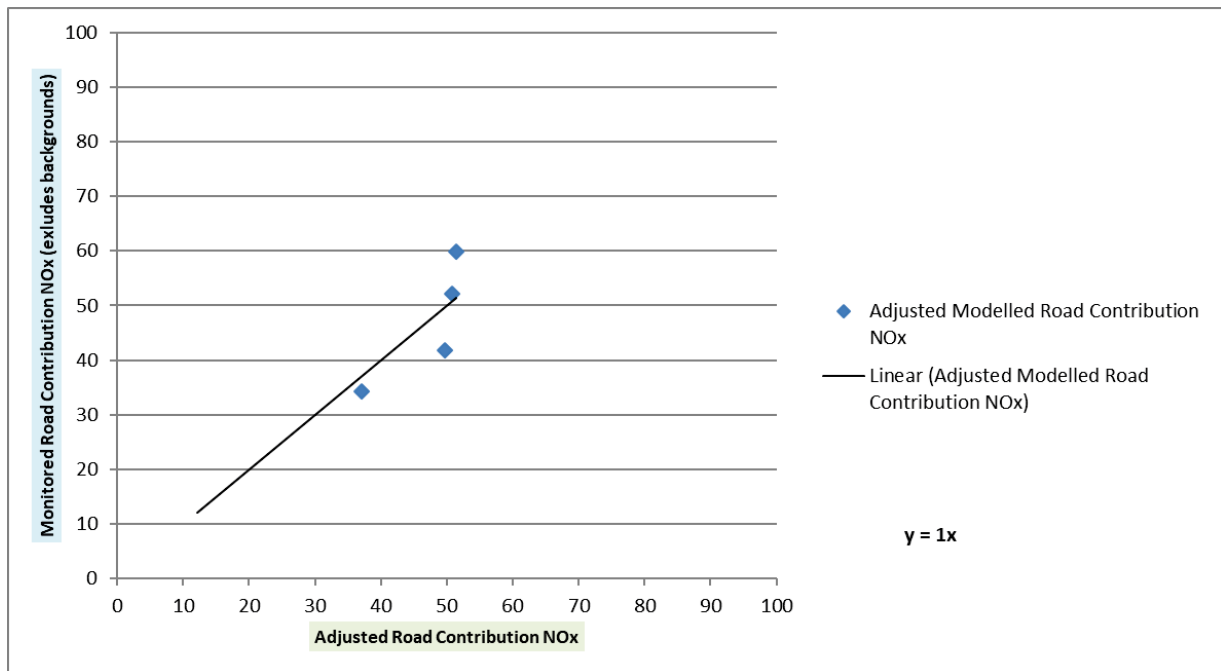
This page has been left blank intentionally

Adjustment Factor

Address	2016 Monitored Total NO2	2016 Monitored Total NOx	2016 Background NO2	2016 Background NOx	Monitored Road Contribution NO2 (total - background)	Monitored Road Contribution NOx (excludes background)	Modelled Road Contribution NOx (excludes background)
Royal British Legion	39.90	75.20	11.40	15.31	28.50	59.89	11.71
Greenacre Street	28.70	15.31	11.40	15.31	17.30	34.33	8.46
57 Whalley Road	36.60	15.31	11.40	15.31	25.20	52.05	11.57
85 Whalley Road	32.10	15.31	11.40	15.31	20.70	41.78	11.32



Address	Ratio of Monitored Road Contribution NOx / Modelled Road Contribution NOx	Adjustment Factor for Modelled Road Contribution	Adjusted Modelled Road Contribution NOx	Adjusted Modelled Total NOx (including background NOx)	Modelled Total NO2 (based on empirical NOx / NO2 relationship)	Monitored Total NO2	% Difference [(modelled - monitored) / monitored] x 100
Royal British Legion	5.11		51.42	66.73	36.33	39.90	-8.95
Greenacre Street	4.06		37.13	52.44	29.99	28.70	4.49
57 Whalley Road	4.50		50.82	66.13	36.07	36.60	-1.45
85 Whalley Road	3.69		49.71	65.02	35.60	32.10	10.90
		4.3907					



Appendix D:
Air Quality Assessment Results

This page has been left blank intentionally

Annual Mean NO_x, NO₂, (Adjusted) PM₁₀ and PM_{2.5} (Unadjusted) Concentrations in µg/m³

Receptor	2016 Verification and Base Year				2023 'Without' Development				2023 'With' Development				2028 'Without' Development				2028 'With' Development			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}
ESR 1	39.04	23.21	13.22	9.50	26.44	16.28	12.79	9.05	27.44	16.79	12.82	9.07	19.50	12.29	12.70	8.94	20.15	12.63	12.73	8.95
ESR 2	34.97	21.22	13.12	9.45	23.77	14.90	12.68	8.99	24.42	15.24	12.70	9.00	17.69	11.35	12.59	8.88	18.11	11.57	12.61	8.89
ESR 3	24.07	15.68	12.92	9.33	16.30	10.95	12.47	8.87	16.45	11.03	12.48	8.88	12.66	8.69	12.38	8.76	12.75	8.74	12.38	8.76
ESR 4	27.43	17.82	12.97	9.34	19.55	13.03	12.54	8.88	19.81	13.17	12.55	8.88	15.26	10.40	12.46	8.77	15.41	10.47	12.46	8.77
ESR 5	36.99	22.64	13.17	9.45	25.83	16.32	12.74	8.99	26.19	16.51	12.75	8.99	19.46	12.60	12.66	8.88	19.72	12.74	12.67	8.88
ESR 6	39.85	24.04	13.21	9.48	26.99	16.92	12.78	9.01	27.25	17.05	12.79	9.01	20.19	12.98	12.70	8.90	20.39	13.08	12.71	8.91
ESR 7	35.56	21.94	13.14	9.44	24.70	15.73	12.70	8.97	25.02	15.90	12.71	8.97	18.75	12.23	12.63	8.86	18.96	12.34	12.64	8.86
ESR 8	37.35	22.82	13.17	9.46	25.82	16.32	12.74	8.99	26.27	16.55	12.75	9.00	19.46	12.60	12.66	8.88	19.72	12.74	12.67	8.88
ESR 9	59.47	33.16	13.49	9.65	38.54	22.69	13.06	9.17	39.04	22.93	13.07	9.17	27.76	16.82	12.99	9.05	28.00	16.95	13.00	9.06
ESR 10	64.02	35.16	13.48	9.65	41.02	23.89	13.03	9.15	41.59	24.16	13.05	9.16	29.30	17.59	12.96	9.04	29.54	17.71	12.97	9.05
ESR 11	11.27	8.43	10.17	7.03	8.33	6.34	9.79	6.66	8.91	6.66	9.81	6.67	7.12	5.47	9.71	6.57	7.51	5.68	9.72	6.58
ESR 12	51.81	28.74	10.72	7.38	32.63	19.07	10.35	6.99	32.90	19.20	10.35	7.00	23.23	13.92	10.28	6.90	23.43	14.02	10.29	6.91
ESR 13	36.66	21.58	10.42	7.21	23.44	14.40	10.05	6.83	23.65	14.51	10.05	6.83	17.15	10.79	9.97	6.74	17.32	10.88	9.98	6.74
PR 1									8.45	6.40	9.79	6.66				8.94	7.19	5.50	9.71	6.57
PR 2									8.43	6.39	9.79	6.66				8.88	7.18	5.50	9.71	6.57

This page has been left blank intentionally

Appendix E:
Air Quality Sensitivity Analysis Results

This page has been left blank intentionally

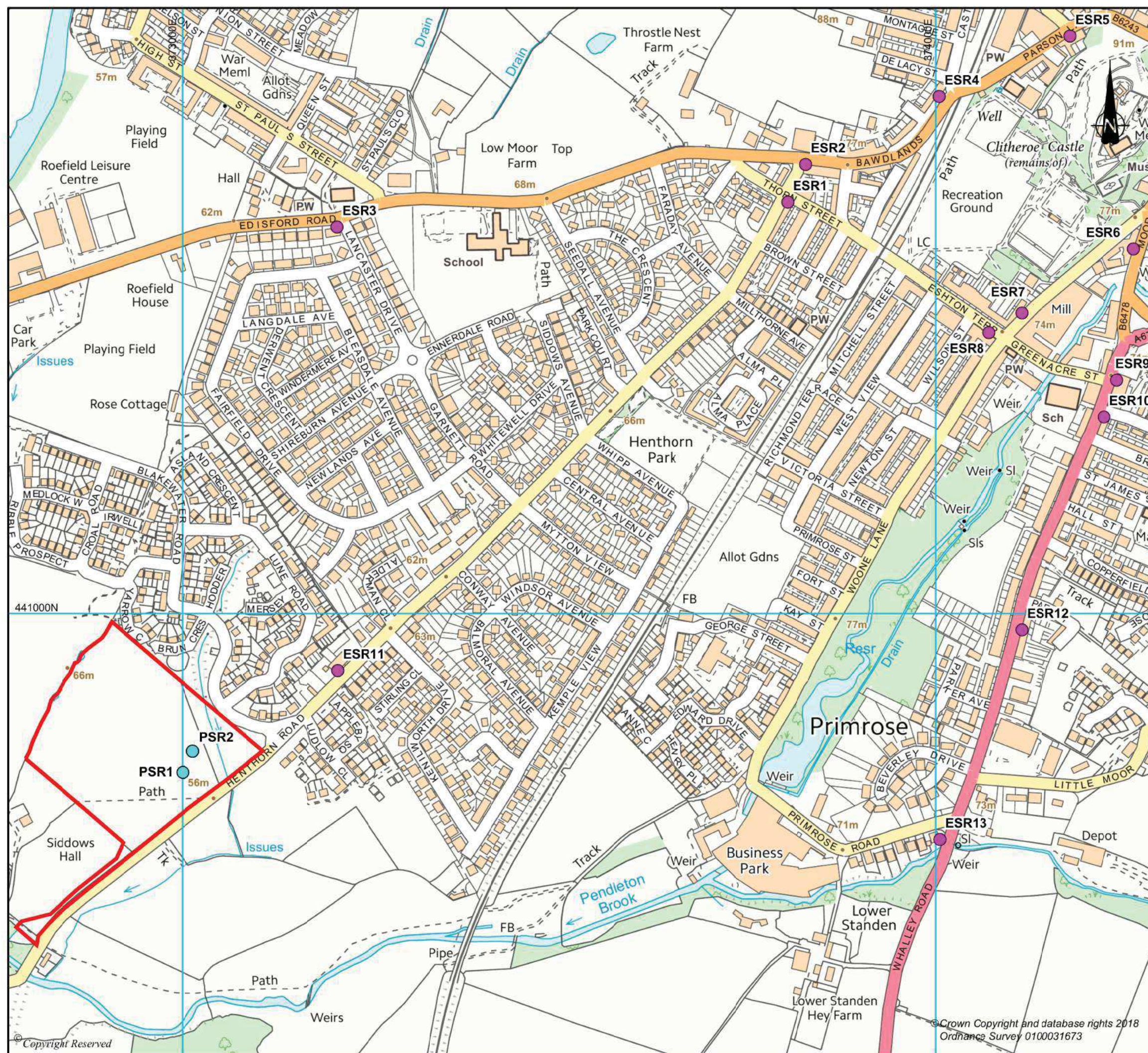
Annual Mean NO_x, NO₂, (Adjusted) PM₁₀ and PM_{2.5} (Unadjusted) Concentrations in µg/m³

Receptor	2016 Verification and Base Year				2023 'Without' Development				2023 'With' Development				2028 'Without' Development				2028 'With' Development			
	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}	NO _x	NO ₂	PM ₁₀	PM _{2.5}
ESR 1	39.04	23.21	13.22	9.50	42.88	25.07	13.29	9.55	44.70	25.93	13.33	9.57	43.86	25.53	13.31	9.56	45.70	26.41	13.35	9.58
ESR 2	34.97	21.22	13.12	9.45	38.28	22.85	13.18	9.48	39.37	23.38	13.20	9.50	39.12	23.26	13.20	9.49	40.21	23.78	13.22	9.51
ESR 3	24.07	15.68	12.92	9.33	25.37	16.36	12.94	9.34	25.61	16.48	12.95	9.34	25.78	16.56	12.95	9.35	26.02	16.69	12.96	9.35
ESR 4	27.43	17.82	12.97	9.34	29.87	19.07	13.02	9.37	30.36	19.32	13.03	9.38	30.46	19.37	13.04	9.38	30.83	19.56	13.04	9.38
ESR 5	36.99	22.64	13.17	9.45	41.02	24.61	13.25	9.50	41.60	24.89	13.26	9.51	41.83	25.00	13.27	9.51	42.54	25.34	13.28	9.52
ESR 6	39.85	24.04	13.21	9.48	43.97	26.03	13.30	9.53	44.40	26.23	13.30	9.54	45.00	26.52	13.32	9.54	45.65	26.83	13.33	9.55
ESR 7	35.56	21.94	13.14	9.44	39.04	23.65	13.20	9.48	39.61	23.92	13.22	9.48	40.19	24.21	13.23	9.49	40.71	24.46	13.24	9.50
ESR 8	37.35	22.82	13.17	9.46	41.26	24.73	13.25	9.50	42.16	25.16	13.26	9.51	42.40	25.27	13.27	9.51	43.04	25.58	13.28	9.52
ESR 9	59.47	33.16	13.49	9.65	66.81	36.37	13.62	9.73	67.86	36.81	13.64	9.74	68.74	37.19	13.65	9.75	69.50	37.51	13.67	9.76
ESR 10	64.02	35.16	13.48	9.65	72.54	38.80	13.61	9.73	73.81	39.32	13.62	9.74	74.73	39.71	13.64	9.75	75.33	39.96	13.65	9.76
ESR 11	11.27	8.43	10.17	7.03	11.37	8.48	10.17	7.03	12.30	8.99	10.19	7.04	11.42	8.51	10.17	7.03	12.35	9.02	10.19	7.04
ESR 12	51.81	28.74	10.72	7.38	57.04	31.09	10.82	7.44	57.49	31.29	10.83	7.45	58.79	31.86	10.85	7.46	59.28	32.08	10.86	7.47
ESR 13	36.66	21.58	10.42	7.21	39.64	23.02	10.48	7.24	39.96	23.18	10.49	7.25	40.74	23.55	10.51	7.26	41.39	23.87	10.52	7.26
PR 1									11.54	8.58	10.18	7.03					11.56	8.59	10.18	7.03
PR 2									11.52	8.56	10.18	7.03					11.53	8.57	10.18	7.03

This page has been left blank intentionally

Drawing

This page has been left blank intentionally



DO NOT SCALE FROM THIS DRAWING

KEY

SITE BOUNDARY

EXISTING SENSITIVE RECEPTOR LOCATION

PROPOSED SENSITIVE RECEPTOR LOCATION

B

Site Boundary amended.

06/08/18

SJB

MB

MW

A

First Issue

25/07/18

SJB

MB

MW

REVISION

DETAILS

DATE

DRN

CHKD

APPD

CLIENT

Gladman Developments Ltd

PROJECT

Henthorne Road, Clitheroe

DRAWING TITLE

Existing and Proposed Sensitive Receptor Locations

CRG No.

GM10068-001

REV

B

CRG SIZE

A3

SCALE

1:5000

DATE

25/07/18

DRAWN BY

SJB

CHECKED BY

MB

APPROVED BY

MW

STOKE-ON-TRENT (HEAD OFFICE)

TEL 01782 276700

WEB: WWW.WARDELL-ARMSTRONGS.COM

☐ BIRMINGHAM

☐ EDINBURGH

☐ MANCHESTER

☐ CARDIFF

☐ GLASGOW

☐ NEWCASTLE UPON TYNE

☐ CARLISLE

☐ LEIGH

☐ SHEFFIELD

☐ CROYDON

☐ LONDON

☐ TAUNTON

wardell armstrong

your earth our world

© Crown Copyright and database rights 2018
Ordnance Survey 0100031673

N:\GM\GM10068 - HENTHORN ROAD CLITHEROE\03 - DESIGN\AUTOCAD\GM10068-001-B_EXISTING AND PROPOSED SENSITIVE RECEPTOR LOCATIONS.DWG

This page has been left blank intentionally

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)178 227 6700

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

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

CUMBRIA
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)122 856 4820

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

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

MANCHESTER (City Centre)
76 King Street
Manchester
M2 4NH
Tel: +44 (0)161 817 5038

MANCHESTER (Greater)
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

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

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thornccliffe Park
Chapelton
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

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