U and I Group Plc

Proposed Residential Development, Bleachcroft Way, Stairfoot, Barnsley

Air Quality Assessment

September 2017

Executive Park, Avalon Way, Anstey, Leicester, LE7 7GR
Tel: +44 (0)116 234 8000
Nigel.mann@wyg.com

Document Control

Project:	Proposed Residential Development, Bleachcroft Way, Stairfoot, Barnsley
Client:	U and I Group Plc
Job Number:	A099152
File Origin:	O:\Acoustics Air Quality and Noise\Fee Earning Projects

Document Checking:

Prepared by:	Hannah Pearson *Environmental Consultant*	Initialled:	HP

Contributed by:	Haley Clowes *Environmental Technician*	Initialled:	HC

Checked by:	Samantha Lewis *Environmental Scientist*	Initialled:	SL

Verified by:	Nigel Mann *Director*	Initialled:	NM

Issue	Date	Status
1	25th November 2016	First Issue
2	29th November 2016	Second Issue: Minor Amendments
3	21st September 2017	Fourth Issue: Updated modelling using new traffic data and air quality monitoring data

Contents Page

1. Introduction 2
1.1 Site Location and Context 2
2. Policy and Legislative Context 3
2.1 Documents Consulted 3
2.2 Air Quality Legislative Framework 4
2.3 Planning and Policy Guidance 6
3. Assessment Methodology 8
3.1 Determining Significance of the Air Quality Effects 8
4. Baseline Conditions 10
4.1 Air Quality Review 10
4.2 Meteorology 11
4.3 Emission Sources 12
4.4 Sensitive Receptors 12
4.5 Ecological Receptors 13
5. Assessment of Air Quality Impacts - Construction Phase 14
5.1 Pollutant Sources 14
5.2 Particulate Matter (PM_{10}) 14
5.3 Dust 14
5.4 Methodology 15
5.5 Assessment Results 15
6. Assessment of Air Quality Impacts - Operational Phase 17
6.1 Existing and Predicted Traffic Flows 17
6.2 Background Concentrations 18
6.3 Model Verification 18
6.4 Summary of Model Inputs 20
6.5 ADMS Modelling Results 20
7. Mitigation 26
7.1 Construction Phase 26
7.2 Operational Phase 28
8. Conclusions 29

Figures

Figure 1 Air Quality Assessment Area
Figure 2 Leeds Bradford Airport 2016 Meteorological Station Wind Rose
Figure 3 Predicted Environmental Concentration of NO_2 – Contour Map

Appendices

Appendix A Construction Phase Assessment Methodology
Appendix B Theoretical Scenario Results

Executive Summary

WYG have undertaken an Air Quality Assessment for the proposed residential development at Bleachcroft Way, Stairfoot, Barnsley

The potential effects during the construction phase include fugitive dust emissions from site activities, such as demolition, earthworks, construction and trackout. The impacts during the operational phase take into account of exhaust emissions from additional road traffic generated due to the proposed development.

During the construction phase, it is anticipated that dust sensitive receptors will potentially experience increased levels of dust and particulate matter before using any mitigation and control measures. However, these are predicted to be short term and temporary impacts. Throughout this period, the potential impacts from construction on air quality will be managed through site specific mitigation measures detailed within this assessment. With these mitigation measures in place, the effects from the construction phase are not predicted to be significant.

The assessment of the significance of the effects associated with both the committed and proposed developments with respect to NO_2 exposure is determined to be 'negligible' for all existing residential receptors and the proposed receptors. With respect to predicted PM_{10} exposure, the significance of the proposed development is determined to be 'negligible' for all existing residential receptors and the proposed receptors.

Following the adoption of the recommended mitigation measures during the construction and operational phases, the development is not considered to be contrary to any of the national, regional or local planning policies.

Based on the assessment undertaken and data, methodology and assumptions used within this assessment it is concluded that the site is suitable for the proposed development.

1. Introduction

U and I Group Plc commissioned WYG Environmental Planning and Transport (WYG) to prepare an Air Quality Assessment to support an application for the proposed residential development at Bleachcroft Way, Stairfoot, Barnsley.

1.1 Site Location and Context

The approximate United Kingdom National Grid Reference (NGR) is approximately 437300, 404900. The site is bounded to the north by Bleachcroft Way and commercial properties, to the east by commercial properties and Wombwell Lane, to the south by agricultural land and to the west by the railway line. Reference should be made to Figure 1 for a map of the proposed development site and surrounding area.

The following assessment stages have been undertaken as part of this assessment:

- Baseline evaluation;
- Assessment of potential air quality impacts during the construction phase;
- Assessment of potential air quality impacts during the operational phase; and,
- Identification of mitigation measures (as required).

The results of the assessment are detailed in the following sections of this report.

The construction phase assessment considers the potential effects of dust and particulate emissions from site activities and materials movement based on a qualitative risk assessment method based on the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction' document, published in 2014.

The assessment of the potential air quality impacts that are associated with the operational phase has focused on the predicted impact of changes in ambient nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) as a result of the development at key local receptor locations. The changes have been referenced to EU air quality limits and UK air quality objectives and the magnitude and significance of the changes have been referenced to non statutory guidance issued by Environmental Protection UK (EPUK).

2. Policy and Legislative Context

2.1 Documents Consulted

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- National Planning Policy Framework, Department for Communities and Local Government, March 2012;
- Planning Practice Guidance: Air Quality, March 2014;
- The Air Quality Standards Regulations, 2010;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007;
- The Environment Act, 1995;
- Local Air Quality Management Technical Guidance LAQM.TG16, DEFRA, 2016;
- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07 - Air Quality, Highways Agency, 2007;
- Land-Use Planning & Development Control: Planning For Air Quality, EPUK & IAQM, 2015; and,
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM, 2014.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Department for Transport Matrix (www.dft.go.uk/matrix);
- emapsite.com;
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/);
- Planning Practice Guidance (http://planningguidance.planningportal.gov.uk/); and
- Barnsley Metropolitan Borough Council (https://www.barnsley.gov.uk/)

Site Specific Reference Documents

- 2016 Air Quality Annual Status Report for Barnsley Metropolitan Borough Council;
- 2017 Air Quality Annual Status Report for Barnsley Metropolitan Borough Council; and
- Barnsley Metropolitan Borough Council Core Strategy, adopted September 2011.

2.2 Air Quality Legislative Framework

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};
- **Directive 2000/69/EC** – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

UK Legislation

The Air Quality Standards Regulations (2010) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a

set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are presented in Table 2.1 along with European Commission (EC) Directive Limits and World Health Organisation (WHO) Guidelines.

Table 2.1 Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as[10]	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
PM_{10}	UK	50µg/m^3 by end of 2004 (max 35 exceedances a year)	24-hour mean	1st January 2005	50µg/m^3 by end of 2004 (max 35 exceedances a year)	1st January 2005	Retain Existing
	UK	40µg/m^3 by end of 2004	Annual mean	1st January 2005	40µg/m^3	1st January 2005	
$PM_{2.5}$	UK	25µg/m^3	Annual Mean	31st December 2010	25µg/m^3	1st January 2010	Retain Existing
NO_2	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-Hour Mean	31st December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1st January 2010	Retain Existing
	UK	40µg/m^3	Annual Mean	31st December 2005	40µg/m^3	1st January 2010	

Within the context of this assessment, the annual mean objectives are applied at the sensitive receptors such as residential properties, schools, hospital, care homes. For non-residential locations such as building facades of offices, DEFRA's TG16 guidance recommends assessing the short term limit of 200µg/m^3 over an hour not to be exceeded more than 18 times. TG16 Guidance states that exceedances are unlikely to occur where the annual mean is below 60µg/m^3.

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Planning and Policy Guidance

National Policy

The National Planning Policy Framework (NPPF) principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG), which previously guided planning policy making. The NPPF broadly retains the principles of PPS 23: Planning and Pollution Control and states that:

> *'Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.'*

The Planning Practice Guidance (PPG) web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6 March 2014 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance:

> *'When deciding whether air quality is relevant to a planning application, local planning authorities should consider whether the development would:*
>
> *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
>
> *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.*
>
> *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
>
> *Give rise to potentially significant impact (such as dust) during construction for nearby sensitive locations.'*

Local Policy

Barnsley Metropolitan Borough Council (BMBC) adopted the Core Strategy in Septmeber 2011 which outlines the Council's broad planning strategy. Following a review of policies within the adopted Core Strategy, the following was identified as being relevant to the proposed development from an air quality perspective:

CSP 28 Reducing the Impact of Road Travel

We will reduce the impact of road travel by:

- *developing and implementing robust, evidence based air quality action plans to improve air quality*
- *working with our sub regional partners, fleet and freight operators to improve the efficiency of vehicles and goods delivery, and reduce exhaust emissions*
- *implementing measures to ensure the current road system is used efficiently*

and

CSP 41 Developments in Air Quality Management Areas

Development in air quality management areas will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), or that any such harmful effects can be mitigated against. We will only allow residential development in air quality management areas, where the developer provides an assessment that shows living conditions will be acceptable for future residents. We will only allow development in air quality management areas which could cause more air pollution, where the developer provides an assessment that shows there will not be a significantly harmful effect on air quality..

3. Assessment Methodology

The potential environmental effects of the operational phase of the proposed development are identified in so far as current knowledge of the site and development allows. The significance of potential environmental effects is assessed according to the latest guidance produced by EPUK and IAQM in January 2017.

The methodology used to determine the potential air quality effects of the construction phase of the proposed development has been derived from the IAQM 'Guidance on the Assessment of the Impacts of Dust from Demolition and Construction' document and is summarised in Section 5.

3.1 Determining Significance of the Air Quality Effects

The significance of the effects during the operational phase of the development is based on the latest guidance produced by EPUK and IAQM in January 2017. The guidance provides a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall significance of the air quality effects based on severity of air quality impacts.

The following rationale is used in determining the severity of the air quality effects at individual receptors:

1. The change in concentration of air pollutants, air quality effects, are quantified and evaluated in the context of AQOs. The effects are provided as a percentage of the Air Quality Assessment Level (AQAL), which may be an AQO, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)';
2. The absolute concentrations are also considered in terms of the AQAL and are divided into categories for long term concentration. The categories are based on the sensitivity of the individual receptor in terms of harm potential. The degree of harm potential to change increases as absolute concentrations are close to or above the AQAL;
3. Severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial, by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL;
4. The effects can be adverse when air quality concentration increase or beneficial when concentration decrease as a result of development;
5. The judgement of overall significance of the effects is then based on severity of effects on all the individual receptors considered; and,

6. Where a development is not resulting in any change in emissions itself, the significance of effect is based on the effect of surrounding sources on new residents or users of the development, i.e., will they be exposed to levels above the AQAL.

Table 3.1 Significance of Effects Matrix

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1	2-5	6-10	>10
≤75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109 of AQAL	Moderate	Moderate	Substantial	Substantial
≥110 of AQAL	Moderate	Substantial	Substantial	Substantial

In accordance with explanation note 2 of Table 6.3 of the EPUK & IAQM guidance. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as 'Negligible'.

4. Baseline Conditions

4.1 Air Quality Review

This section provides a review of the existing air quality in the vicinity of the proposed development site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the proposed development site has been defined from a number of sources, as described in the following sections.

Local Air Quality Management (LAQM)

As required under section 82 of the Environment Act 1995, Barnsley Metropolitan Borough Council (BMBC) has conducted an ongoing exercise to review and assess air quality within its area of jurisdiction. The assessments have indicated that concentrations of NO_2 and PM_{10} are above the relevant AQOs at a number of locations of relevant public exposure within the Council. BMBC has designated seven Air Quality Management Area (AQMA) which are described below:

- Barnsley AQMA No 1: An area along the M1 between Junction 35a and Junction 38, including Haigh, Darton, Cawthorne Dike, Higham, Dodworth, Gilroyd, Rockley, Birdwell, and Tankersley. The area extends 100m either side of the central reservation.
- Barnsley AQMA No 2: An area encompassing the A628 from junction 37 of the M1 to Town End roundabout, including part of Summer Lane from Town End roundabout to Wharncliffe Street.
- Barnsley AQMA No 3: An area encompassing the junction of the A61 Wakefield Road and Burton Road.
- Barnsley AQMA No 4: An area encompassing the southbound carriageway of the A61 Harborough Hill Road from the "PC World" gyratory to the southbound slip road of the A61 near to its junction with Queens Road.
- Barnsley AQMA No 5: An area encompassing the junction of Rotherham Road and Burton Road.
- Barnsley AQMA No 6: Incorporating the A616 road through Langsett.
- Barnsley AQMA No 7: Incorporating the southbound carriageway of the A61 Sheffield Road adjacent to the junction with the A6133 Cemetery Road.

The proposed development is not situated near any of the AQMA's and as such has not been included as part of the assessment.

Air Quality Monitoring

Monitoring of air quality within BMBC is undertaken through continuous and non-continuous monitoring methods. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the proposed development site.

Continuous

BMBC operates two automatic NO_2 monitoring stations. Station CM2 monitored NO_2 concentrations continuously throughout 2016. CM1 is within close proximity of the site, however does not have available data for 2016 and therefore no automatic monitoring stations have been used in model verification. The details of each station are shown in Table 4.1.

Table 4.1 Monitored Annual Mean NO_2 Concentrations

Site ID	X	Y	Location	Site Type	NO_2 Annual Mean Concentration 2016 ($\mu g/m^3$)
CM1	436298	405691	Barnsley A635	Roadside	N/A
CM2	432680	406174	Barnsley A628	Roadside	36.0

Non - Continuous Monitoring

BMBC operates a network of diffusion tubes. NO_2 concentrations were monitored at 49 locations in 2016. The closest diffusion tube is DT46 located approximately 100m east from the site boundary.

The representative diffusion tube data is from 2016 which is presented in Table 4.2.

Table 4.2 Monitored Annual Mean NO_2 Concentrations

Site ID	X	Y	Location	Site Type	NO_2 Annual Mean Concentration 2016 ($\mu g/m^3$)
DT46	437554	405291	Near to Supermarket site, Wombwell Lane	Kerbside	36.6
DT49	437528	405675	Doncaster Road, Ardsley	Roadside	37.3

As indicated in Table 4.2, diffusion tubes DT46 and DT49 did not exceed the relevant AQO (40 $\mu g/m^3$ annual mean) in 2016. All diffusion tubes lie within the extents of the main study area and as such have been utilised for model verification.

4.2 Meteorology

Meteorological conditions have significant influence over air pollutant concentrations and dispersion. Pollutant levels can vary significantly from hour to hour as well as day to day, thus any air quality predictions need to be based on detailed meteorological data. The ADMS model calculates the dispersion of pollutants on an hourly basis using a year of local meteorological data. The 2016 meteorological data used in the assessment is derived from Leeds Bradford Airport Metrological Station. This is the nearest meteorological station which is considered representative of the development site, with all the complete

parameters necessary for the ADMS model. Reference should be made to Figure 2 for an illustration of the prevalent wind conditions at the Leeds Bradford Airport Meteorological Station site.

4.3 Emission Sources

A desktop assessment has identified that traffic movements are likely to be the most significant local source of pollutants affecting the site and its surroundings. The principal traffic derived pollutants likely to impact local receptors are NO_2 and PM_{10}.

The assessment has therefore modelled all roads within the immediate vicinity of the proposed development site which are considered likely to experience significant changes in traffic flow as a result of the proposed development. Reference should be made to Figure 1 for a graphical representation of the traffic data utilised within the ADMS Roads 4.0 model.

It should be noted that the pollutant contribution of minor roads and rail sources that are not included within the dispersion model is considered to be accounted for via the use of background air quality levels.

4.4 Sensitive Receptors

Receptors that are considered as part of the air quality assessment are primarily those existing receptors that are situated along routes predicted to experience significant changes in traffic flow as a result of the proposed development.

The existing receptor locations are summarised in Table 4.3 and the spatial locations of all of the receptors are illustrated in Figure 1.

Table 4.3 Modelled Existing Sensitive Receptor Locations

Discrete Sensitive Receptor		UK NGR (m)	
		X	Y
R1*	Hunningley Primary School*	436917	405075
R2	45 Brocklehurst Avenue	436748	404690
R3	Highgrove Carehome	436965	405579
R4	568 Doncaster Road	437501	405680
R5	660 Doncaster Road	438031	405669
R6	Oakhill Primary School*	437490	405611
R7	49 Wombwell Lane	438094	404745
R8	368 Doncaster Road	436418	405717
R9*	Kendray Hospital*	436232	405650
R10	5 Grange Lane	437244	405707
R11	Scar Lane Play Area*	437879	405697
R12*	Kendray Recreation Ground	436670	404512
R13	1 Neville Avenue	436598	405675
R14*	The Keel Inn*	437385	405438
R15	3 Hunningley Close	437015	405548
R16	Highgrove Care Home	437132	405569
R17	86 Wombwell Lane	437566	405302

**Non-residential Receptor*

4.5 Ecological Receptors

Air quality impacts associated with the proposed re-development have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The Conservation of Habitats and Species Regulations (2010) require competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Protection Areas).

A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the extents of the dispersion modelling assessment. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws together information on key environmental schemes and designations. Following a search within a 1km radius of the site boundary the following sites were identified:

- Stairfoot Brickworks: Site of Special Scientific Interest (SSSI)

Table 4.4 Modelled Existing Sensitive Receptor Locations

Discrete Sensitive Receptor		UK NGR (m)	
		X	Y
ER1	Stairfoot Brickworks (SSSI)	438128	404882

5. Assessment of Air Quality Impacts - Construction Phase

5.1 Pollutant Sources

Other than negligible emissions from construction vehicles and equipment, the main emissions during construction are likely to be dust and particulate matter generated during earth moving (particularly during dry months) or from construction materials. The main potential effects of dust and particulate matter are:

- Visual - dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
- Physical and/or chemical contamination and corrosion of artefacts;
- Coating of vegetation and soil contamination; and,
- Health effects due to inhalation e.g. asthma or irritation of the eyes.

A number of other factors such as the amount of precipitation and other meteorological conditions will also greatly influence the amount of particulate matter generated.

Construction activities can give rise to short-term elevated dust/PM_{10} concentrations in neighbouring areas. This may arise from vehicle movements, soiling of the public highway, demolition or windblown stockpiles.

5.2 Particulate Matter (PM_{10})

The UK Air Quality Standards seek to control the health implications of respirable PM_{10}. However, the majority of particles released from construction will be greater than this in size.

Construction works on site have the potential to elevate localised PM_{10} concentrations in the area. On this basis, mitigation measures should still be taken to minimise these emissions as part of good site practice.

5.3 Dust

Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. There are no formal standards or criteria for nuisance caused by deposited particles, however, a deposition rate of 200mg/m^2/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

Construction activities have the potential to suspend dust, which could result in annoyance of residents surrounding the site. Measures will be taken to minimise the emissions of dust as part of good site practice.

Recommended mitigation measures proportionate to the risk associated with the development and based on best practice guidance are discussed in the following sections.

5.4 Methodology

The construction phase assessment utilises the IAQM Guidance on the Assessment of Dust from Demolition and Construction document published in February 2014.

Four construction processes are considered; these are demolition, earthworks, construction and trackout. For each of these phases, the significance of the potential dust impacts is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore assessing worst case impacts. A full explanation of the methodology is contained in Appendix A.

5.5 Assessment Results

Based on the methodology detailed in Appendix A, the scale of the anticipated works has determined the potential dust emission magnitude for each process, as presented in the Table 5.1 below.

Table 5.1 Dust Emission Magnitude

Construction Process	Dust Emission Magnitude
Demolition	N/A
Earthworks	Large
Construction	Large
Trackout	Large

The sensitivity of the surrounding area to each construction process has been determined following stage 2B of the IAQM guidance. The assessment has determined the area sensitivities as shown in the Table 5.2.

Table 5.2 Sensitivity of the Area

Source	Area Sensitivity		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Medium	Low	Low
Construction	Medium	Low	Low
Trackout	Medium	Low	Low

The dust emission magnitude determined in Table 7 has been combined with the sensitivity of the area determined in Table 5.3, to determine the risk of impacts prior to the implementation of appropriate mitigation measures. The potential impact significance of dust emissions associated with the construction phase, without mitigation, is presented below.

Table 5.3 Impact Significance of Construction Activities without Mitigation

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM_{10}	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Medium	Low	Low
Construction	Medium	Low	Low
Trackout	Medium	Low	Low

Appropriate mitigation measures are detailed and presented in Section 7. Following the adoption of these measures, the subsequent impact significance of the construction phase is not predicted to be significant.

6. Assessment of Air Quality Impacts - Operational Phase

In the context of the proposed development, transportation is identified as the dominant emission source that is likely to cause potential risk of exposure of air pollutants at receptors.

The operational phase assessment therefore consists of the quantified predictions of the change in NO_2 and PM_{10} for the operational phase of the development due to changes in traffic movement. Predictions of air quality at the site have been undertaken for the operational phase of the development using ADMS Roads.

In accordance with the provided traffic data, as contained within the supporting Traffic Assessment (TA), the operational phase assessment has been undertaken with an assumed operational opening year of 2021. The assessment scenarios are therefore:

- 2016 Baseline = Existing baseline conditions;
- 2022 "Do Minimum" = Baseline conditions + committed development flows; and
- 2022 "Do Something" = Baseline conditions + committed development flows + proposed development flows.

6.1 Existing and Predicted Traffic Flows

Baseline 2016 data and projected 2022 'do minimum' and 'do something' traffic data has been obtained for the operational phase assessment in the form of Annual Average Daily Traffic figures (AADT).

The 2016 baseline and 2022 'do minimum' and 'do something' traffic flows were provided by Bryan G Hall Transport Consultants.

It is assumed the average vehicle speeds on the local road network in an opening year of 2022 will be broadly the same as the ones in 2016 as well.

Emission factors for the 2016 baseline and 2022 projected 'do minimum' and 'do something' scenarios have been calculated using the Emission Factor Toolkit Version 7.0 (2016).

For the purposes of the air quality assessment, only roads predicted to experience significant changes in flows have been included in the air quality model. These represent the primary access routes to the proposed development site. Where unavailable, traffic speeds have been estimated based on site observations and national speed limits.

A 50m 20km/hr slow down phase is included on each link at every junction and roundabout within the assessment. All of the roads within the dispersion model are illustrated in Figure 1. Detailed traffic figures are provided in the Table 6.1.

Table 6.1 Traffic Data

Link	Speed (km/h)	2016		2022			
		AADT	HGV %	Without Proposed Development		With Development	
				AADT	%HGV	AADT	%HGV
Doncaster Road West	64	14755	5.20	22626	5.20	23282	5.20
Hunningley Lane	64	14260	3.67	15519	3.67	15818	3.67
Bleachcroft Way	48	414	7.06	454	7.06	2110	7.06
Wombwell Lane	64	21344	3.45	23236	3.45	23443	3.45
Doncaster Road East	64	17078	3.30	18584	3.30	18688	3.30
A633	64	17492	5.10	18895	5.10	19234	5.10

6.2 Background Concentrations

The use of background concentrations within the modelling process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants include industrial, domestic and rail emissions within the vicinity of the study site.

Background concentrations as used within the prediction calculations were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the development site. In June 2014, DEFRA issued revised 2013 based background maps for nitrogen oxide (NO_X), NO_2, PM_{10} and $PM_{2.5}$ which incorporate updates to the input data used for modelling. 2016 background maps have been utilised throughout the assessment to provide a conservative assessment. The updated mapped background concentrations used in the assessment are summarised in Table 6.2.

Table 6.2 Published Background Air Quality Levels (µg/m^3)

UK NGR(m)		2016			
X	Y	NO_2	NO_x	PM_{10}	$PM_{2.5}$
436500	404500	16.6	24.0	15.3	11.2
437500	404500	15.4	22.0	15.8	11.1
436500	405500	17.9	26.2	15.1	11.1
437500	405500	17.3	25.1	15.7	10.9

6.3 Model Verification

Model verification involves the comparison of modelled data to monitored data in order to gain the best possible representation of current pollutant concentrations for the assessment years. The verification process is in general accordance with that contained in Section 7 of the TG16 guidance note and uses the most recently available diffusion tube monitoring data to best represent this.

The verification process consists of using the monitoring data and the published background air quality data in the UK National Air Quality Information Archive to calculate the road traffic contribution of NO_X at the monitoring locations. Outputs from the ADMS Roads model are provided as predicted road traffic contribution NO_X emissions. These are converted into predicted roadside contribution NO_2 exposure at the relevant receptor locations based on the updated approach to deriving NO_2 from NO_X for road traffic sources published in Local Air Quality Management TG16. The calculation was derived using the NO_X to NO_2 worksheet in the online LAQM tools website hosted by DEFRA.

A model correction factor of 0.00015 was applied to roadside predicted NO_X concentrations before converting to NO_2. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations. Table 6.3 summarises the final model/monitored data correlation following the application of the model correction factor.

Table 6.3 Comparison of Roadside Modelling & Monitoring Results for NO_2

Tube location	NO_2 µg/m^3		
	Monitored NO_2	Modelled NO_2	Difference (%)
DT46	36.60	36.53	0.20
DT49	37.30	37.37	-0.18

The final model produced data at the monitoring locations to within 10% of the monitoring results, as the requirement by TG16 guidance.

The final verification model correlation coefficient (representing the model uncertainty) is 1.00. The 'ideal value' correlation coefficient recommended in Box 7.17 of TG16 is 1.00. The model is therefore considered to be verified and suitably representative of local emissions and exposures.

6.4 Summary of Model Inputs

Table 6.4 Summary of ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**Leeds Bradford Airport Station**, hourly sequential data
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1m** representing a typical surface roughness for **Cities and Woodlands**
Latitude	Allows the location of the model area to be set	United Kingdom = **52.84**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Cities and Large Towns= **30m.**
Elevation of Road	Allows the height of the road link above ground level to be specified.	All road links were set at ground level = **0m**.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**Urban (Not London)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a "street canyon".	No canyons used within the model
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EfT database of traffic emission factors.	The **EFT** Version **7.0 (2016)** dataset was used.
Year	Predicted EfT emissions rates depend on the year of emission.	**2016** data for verification and baseline operational phase assessment **2022** data for the operational phase assessment.

6.5 ADMS Modelling Results

Traffic Assessment

The ADMS Model has predicted concentrations of NO_2 and PM_{10} at relevant receptor locations adjacent to roads likely to be effected by the development, as summarised in the following tables. Only receptors close to roads where there is predicted to be a change in emissions have been assessed.

Assessment Scenario:

For the operational year of 2022, assessment of the effects of emissions from the proposed traffic associated with the scheme, has been undertaken using the Department for Transport (DfT) 2022 emissions rates which take into account of the rate of reduction in emission from road vehicles into the future with the following factors

- 2016 Baseline = (2016 Traffic) Existing baseline conditions;
- 2022 "Do Minimum" = Baseline conditions + committed development flows;
- 2022 "Do Something"= Baseline conditions + committed development flows + proposed development flows; and,

Nitrogen Dioxide

Table 6.5 presents a summary of the predicted change in NO_2 concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'do minimum' and 'do something' scenarios.

Table 6.5 Predicted Annual Average Concentrations of NO_2 at Receptor Locations

Receptor		NO_2 (µg/m^3)			
		Baseline 2016	No development 2022	With development 2022	Development Contribution
R1*	Hunningley Primary School	25.28	22.41	22.52	0.11
R2	45 Brocklehurst Avenue	26.20	22.48	22.60	0.12
R3	Highgrove Carehome	30.04	26.87	27.11	0.24
R4	568 Doncaster Road	34.44	27.91	28.06	0.15
R5	660 Doncaster Road	28.46	23.63	23.71	0.08
R6	Oakhill Primary School	36.08	28.85	29.04	0.19
R7	49 Wombwell Lane	29.01	23.98	24.06	0.08
R8	368 Doncaster Road	29.32	27.08	27.32	0.24
R9*	Kendray Hospital	25.09	23.61	23.77	0.16
R10	5 Grange Lane	38.20	30.44	30.69	0.25
R11	Scar Lane Play Area	28.01	23.87	23.95	0.08
R12*	Kendray Recreation Ground	23.07	20.52	20.60	0.08
R13	1 Neville Avenue	31.39	28.74	29.02	0.28
R14*	The Keel Inn	55.82	41.47	42.42	0.95
R15	3 Hunningley Close	29.32	25.76	25.98	0.22
R16	Highgrove Care Home	39.82	33.20	33.58	0.38
R17	86 Wombwell Lane	36.79	29.55	29.81	0.26
PR1	Proposed Residential Receptor	22.63	20.49	20.80	0.31
PR2	Proposed Residential Receptor	22.09	20.17	20.43	0.26
PR3	Proposed Residential Receptor	21.29	19.69	19.84	0.15
PR4	Proposed Residential Receptor	20.69	19.32	19.42	0.10
PR5	Proposed Residential Receptor	18.65	17.36	17.42	0.06
PR6	Proposed Residential Receptor	18.45	17.23	17.30	0.07
PR7	Proposed Residential Receptor	18.28	17.13	17.19	0.06
PR8	Proposed Residential Receptor	18.44	17.23	17.29	0.06
PR9	Proposed Residential Receptor	18.85	17.47	17.57	0.10
PR10	Proposed Residential Receptor	21.22	19.64	19.75	0.11
PR11	Proposed Residential Receptor	21.43	19.77	19.90	0.13
PR12	Proposed Residential Receptor	22.02	20.11	20.42	0.31
PR13	Proposed Residential Receptor	22.15	20.21	20.32	0.11
PR14	Proposed Residential Receptor	19.70	17.99	18.07	0.08
PR15	Proposed Residential Receptor	18.72	17.40	17.46	0.06

Receptor		NO_2 (µg/m³)			
		Baseline 2016	No development 2022	With development 2022	Development Contribution
PR16	Proposed Residential Receptor	18.10	17.02	17.07	0.05
PR17	Proposed Residential Receptor	25.28	22.41	22.52	0.11
ER1	Stairfoot Brickworks (SSSI)	28.98	23.90	23.98	0.08
Annual Mean AQO not to be exceeded		**40 µg/m³**			
Equivalent Short Term AQO for non-residential Receptors		**60 µg/m³**			

**Non-residential Receptor*

All modelled existing receptors are predicted to meet the respective long or short term AQO for NO_2 in both the 'do minimum' and 'do something' scenarios.

As indicated in Table 6.5, the maximum predicted increase in the annual average exposure to NO_2 at any existing residential receptor, due to changes in traffic movements associated with the development, is 0.38 µg/m³ at Highgrove Care Home (R16).

The significance of changes in traffic flow associated with the development with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in Table 6.6.

Table 6.6 Significance of Effects at Key Receptors (NO_2)

NO_2 Significance Effects at Key Receptors				
Receptor	Change Due to Development (DS-DM) (µg/m³)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
R1*	0.11	0%	<75% of AQAL	Negligible
R2	0.12	0%	<75% of AQAL	Negligible
R3	0.24	1%	<75% of AQAL	Negligible
R4	0.15	0%	<75% of AQAL	Negligible
R5	0.08	0%	<75% of AQAL	Negligible
R6	0.19	1%	<75% of AQAL	Negligible
R7	0.08	0%	<75% of AQAL	Negligible
R8	0.24	1%	<75% of AQAL	Negligible
R9*	0.16	0%	<75% of AQAL	Negligible
R10	0.25	1%	76-94% of AQAL	Negligible
R11	0.08	0%	<75% of AQAL	Negligible
R12*	0.08	0%	<75% of AQAL	Negligible
R13	0.28	1%	<75% of AQAL	Negligible
R14*	0.95	2-5%	103-109% of AQAL	Moderate
R15	0.22	1%	<75% of AQAL	Negligible
R16	0.38	1%	76-94% of AQAL	Negligible
R17	0.26	1%	<75% of AQAL	Negligible
PR1	0.59	2-5%	<75% of AQAL	Negligible
PR2	0.31	1%	<75% of AQAL	Negligible
PR3	0.26	1%	<75% of AQAL	Negligible
PR4	0.15	0%	<75% of AQAL	Negligible
PR5	0.10	0%	<75% of AQAL	Negligible

NO_2 Significance Effects at Key Receptors				
Receptor	Change Due to Development (DS-DM) (µg/m³)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
PR6	0.06	0%	<75% of AQAL	Negligible
PR7	0.07	0%	<75% of AQAL	Negligible
PR8	0.06	0%	<75% of AQAL	Negligible
PR9	0.06	0%	<75% of AQAL	Negligible
PR10	0.10	0%	<75% of AQAL	Negligible
PR11	0.11	0%	<75% of AQAL	Negligible
PR12	0.13	0%	<75% of AQAL	Negligible
PR13	0.31	1%	<75% of AQAL	Negligible
PR14	0.11	0%	<75% of AQAL	Negligible
PR15	0.08	0%	<75% of AQAL	Negligible
PR16	0.06	0%	<75% of AQAL	Negligible
PR17	0.05	0%	<75% of AQAL	Negligible
ER1	0.08	0%	<75% of AQAL	Negligible
0% means a change of <0.5%				

**Non-residential Receptor*

The magnitude of the effects of changes in traffic flow as a result of the proposed development, with respect to NO_2 exposure for existing residential receptors including those within the AQMA, is determined to be 'imperceptible'. The significance is determined to be 'negligible' at all residential receptors, based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

Particulate Matter

Table 6.7 presents a summary of the predicted change in annual mean PM_{10} concentrations at relevant receptor locations, due to changes in traffic flow associated with the development, based on modelled 'no development' and 'with development' scenarios.

Table 6.7 Predicted Annual Average Concentrations of PM_{10} at Receptor Locations

Receptor		PM_{10} (µg/m³)			
		Baseline 2016	No development 2022	With development 2022	Development Contribution
R1*	Hunningley Primary School	16.59	16.61	16.64	0.04
R2	45 Brocklehurst Avenue	17.40	17.41	17.45	0.04
R3	Highgrove Carehome	17.54	18.19	18.27	0.08
R4	568 Doncaster Road	19.15	19.19	19.23	0.05
R5	660 Doncaster Road	18.60	18.62	18.65	0.02
R6	Oakhill Primary School	19.32	19.33	19.39	0.06
R7	49 Wombwell Lane	18.46	18.46	18.49	0.03
R8	368 Doncaster Road	17.53	18.44	18.53	0.09
R9*	Kendray Hospital	16.59	17.13	17.19	0.06
R10	5 Grange Lane	19.85	20.04	20.12	0.09
R11	Scar Lane Play Area	17.96	17.98	18.00	0.02
R12*	Kendray Recreation Ground	16.70	16.70	16.73	0.03

Receptor		PM_{10} (µg/m³)			
		Baseline 2016	No development 2022	With development 2022	Development Contribution
R13	1 Neville Avenue	17.99	19.08	19.19	0.11
R14*	The Keel Inn	22.46	22.38	22.67	0.29
R15	3 Hunningley Close	18.02	18.50	18.57	0.07
R16	Highgrove Care Home	19.82	20.63	20.75	0.13
R17	86 Wombwell Lane	19.99	20.04	20.12	0.08
PR1	Proposed Residential Receptor	16.72	16.72	16.91	0.19
PR2	Proposed Residential Receptor	16.71	16.71	16.82	0.10
PR3	Proposed Residential Receptor	16.61	16.62	16.70	0.08
PR4	Proposed Residential Receptor	16.47	16.47	16.52	0.05
PR5	Proposed Residential Receptor	16.35	16.35	16.38	0.03
PR6	Proposed Residential Receptor	16.43	16.44	16.45	0.02
PR7	Proposed Residential Receptor	16.38	16.39	16.41	0.02
PR8	Proposed Residential Receptor	16.35	16.35	16.37	0.02
PR9	Proposed Residential Receptor	16.38	16.38	16.40	0.02
PR10	Proposed Residential Receptor	16.45	16.45	16.48	0.03
PR11	Proposed Residential Receptor	16.43	16.44	16.47	0.03
PR12	Proposed Residential Receptor	16.47	16.47	16.52	0.04
PR13	Proposed Residential Receptor	16.57	16.58	16.67	0.10
PR14	Proposed Residential Receptor	16.62	16.63	16.66	0.03
PR15	Proposed Residential Receptor	16.62	16.63	16.65	0.03
PR16	Proposed Residential Receptor	16.43	16.44	16.46	0.02
PR17	Proposed Residential Receptor	16.32	16.32	16.34	0.01
ER1	Stairfoot Brickworks (SSSI)	18.43	18.43	18.46	0.03
Annual Mean AQO not to be exceeded		**40 µg/m³**			

**Non-residential Receptor*

As indicated in Table 6.7, the maximum predicted increase in the annual average exposure to PM_{10} at any existing residential receptor, due to changes in traffic movements associated with the development, is 0.13 µg/m³ at Highgrove Care Home (R16).

All modelled receptor locations are predicted to meet the AQO for PM_{10} in both the 'do minimum' and 'do something' scenarios.

The significance of changes in traffic flow associated with the development with respect to annual mean PM_{10} exposure has been assessed with reference to the criteria in section 3. The outcomes of the assessment are summarised in Table 6.8.

Table 6.8 Significance of Effects at Key Receptors (Particulate Matter)

PM_{10} Significance Effects at Key Receptors				
Receptor	Change Due to Development (DS-DM) (µg/m³)	% Change in Concentration Relative to AQAL	% Annual Mean Concentration in Assessment Year	Significance
R1*	0.04	0%	<75% of AQAL	Negligible
R2	0.04	0%	<75% of AQAL	Negligible
R3	0.08	0%	<75% of AQAL	Negligible
R4	0.05	0%	<75% of AQAL	Negligible

PM_{10} Significance Effects at Key Receptors				
Receptor	**Change Due to Development (DS-DM) (µg/m³)**	**% Change in Concentration Relative to AQAL**	**% Annual Mean Concentration in Assessment Year**	**Significance**
R5	0.02	0%	<75% of AQAL	Negligible
R6	0.06	0%	<75% of AQAL	Negligible
R7	0.03	0%	<75% of AQAL	Negligible
R8	0.09	0%	<75% of AQAL	Negligible
R9 *	0.06	0%	<75% of AQAL	Negligible
R10	0.09	0%	<75% of AQAL	Negligible
R11	0.02	0%	<75% of AQAL	Negligible
R12*	0.03	0%	<75% of AQAL	Negligible
R13	0.11	0%	<75% of AQAL	Negligible
R14*	0.29	0%	<75% of AQAL	Negligible
R15	0.07	0%	<75% of AQAL	Negligible
R16	0.13	0%	<75% of AQAL	Negligible
R17	0.08	0%	<75% of AQAL	Negligible
PR1	0.19	0%	<75% of AQAL	Negligible
PR2	0.10	0%	<75% of AQAL	Negligible
PR3	0.08	0%	<75% of AQAL	Negligible
PR4	0.05	0%	<75% of AQAL	Negligible
PR5	0.03	0%	<75% of AQAL	Negligible
PR6	0.02	0%	<75% of AQAL	Negligible
PR7	0.02	0%	<75% of AQAL	Negligible
PR8	0.02	0%	<75% of AQAL	Negligible
PR9	0.02	0%	<75% of AQAL	Negligible
PR10	0.03	0%	<75% of AQAL	Negligible
PR11	0.03	0%	<75% of AQAL	Negligible
PR12	0.04	0%	<75% of AQAL	Negligible
PR13	0.10	0%	<75% of AQAL	Negligible
PR14	0.03	0%	<75% of AQAL	Negligible
PR15	0.03	0%	<75% of AQAL	Negligible
PR16	0.02	0%	<75% of AQAL	Negligible
PR17	0.01	0%	<75% of AQAL	Negligible
ER1	0.03	0%	<75% of AQAL	Negligible
0% means a change of <0.5%				

**Non-residential Receptor*

The magnitude of the effects of changes in traffic as a result of the proposed development, with respect to annual mean PM_{10} exposure, for existing residential including those within the AQMA, is determined to be 'imperceptible'. The significance has been determined to be 'negligible' based on the methodology outlined in section 3. Given the quantitative nature of the assessment and the verification of the air quality dispersion model, the confidence of the assessment is deemed to be 'high'.

7. Mitigation

7.1 Construction Phase

The dust risk categories have been determined in Section 5 for each of the four construction activities. The assessment has determined that the potential impact significance of dust emissions associated with the construction phase of the proposed development is 'medium risk' at the worst affected receptors.

Using the methodology described in Appendix A, appropriate site specific mitigation measures associated with the determined level of risk can be found in Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction. The mitigation measures have been divided into general measures applicable to all sites and measures applicable specifically to demolition, earthworks, construction and trackout. They are categorised into 'highly recommended' and 'desirable' measures. In the absence of appropriate regional guidance, to ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable

The mitigation measures for the proposed development are detailed in Table 7.1 and Table 7.2 below:

Table 7.1 Highly Recommended Construction Phase Mitigation Measures

Communications
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information
Dust Management
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to the local authority when asked.
Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period
Avoid site runoff of water or mud.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Ensure all vehicles switch off engines when stationary - no idling vehicles.

Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Avoid bonfires and burning of waste materials.
Earthworks
No Action Required.
Construction
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10m from receptors where possible.

Table 7.2 Desirable Construction Phase Mitigation Measures

Communication
No action required
Dust Management
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once
Construction
Avoid scabbling (roughening of concrete surfaces) if possible.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust

Trackout
No Action Required.

Following the implementation of the mitigation measures detailed in the tables above, the impact significance of the construction phase is not considered to be significant.

7.2 Operational Phase

Traffic

Although an assessment of road traffic exhaust emissions has predicted no exceedances of the AQO, implementing measures to promote sustainable travel could result in fewer vehicle trips and therefore a reduction in associated vehicle emissions. This is likely to result in reductions of the mean roadside concentrations of traffic-related pollutant concentrations.

The following mitigation measures aim to increase the number of residents travelling to and from the site on foot, by cycle and/or by public transport. As such the number of trips to and from the site made by private car, and especially the single occupancy private car, will be reduced. The following measures are considered best practice but should not be regarded as an exhaustive list of potential mitigation options:

- Minimise reliance upon motor vehicle use through a Framework Travel Plan;
- Promote alternative transport options;
- Inclusion of integrated cycle paths into surrounding environments; and,
- Inclusion of pedestrian walkways into surrounding environments.

8. Conclusions

WYG have undertaken an Air Quality Assessment for proposed residential development at Land at Bleachcroft Way, Barnsley in accordance with the methodology and parameters described within this report.

Prior to the implementation of appropriate mitigation measures, the potential impact significance of dust emissions associated with the construction phase of the proposed development has potential as 'medium' at some worst affected receptors without mitigation. However, appropriate site specific mitigation measures have been recommended based on Section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition, Earthworks, Construction and Trackout. It is anticipated that with these appropriate mitigation measures in place, the risk of adverse effects due to emissions from the construction phase will not be significant.

For Scenario 1, the 2022 assessment of the effect of emissions from traffic associated with the scheme, has determined that the maximum predicted increase in the annual average exposure to NO_2 at any existing residential receptors is likely to be 0.38 µg/m^3 at Highgrove Care Home (R16).

For PM_{10}, the maximum predicted increase in the annual average exposure at any existing residential receptor is likely to be 0.13 µg/m^3 at Highgrove Care Home (R16).

The assessment of the significance of the effects of the proposed development with respect to NO_2 exposure is determined to be 'moderate' at The Keel Inn (R14) and 'negligible' for all residential receptors. With respect to predicted PM_{10} exposure, the significance of the proposed development is determined to be 'negligible'.

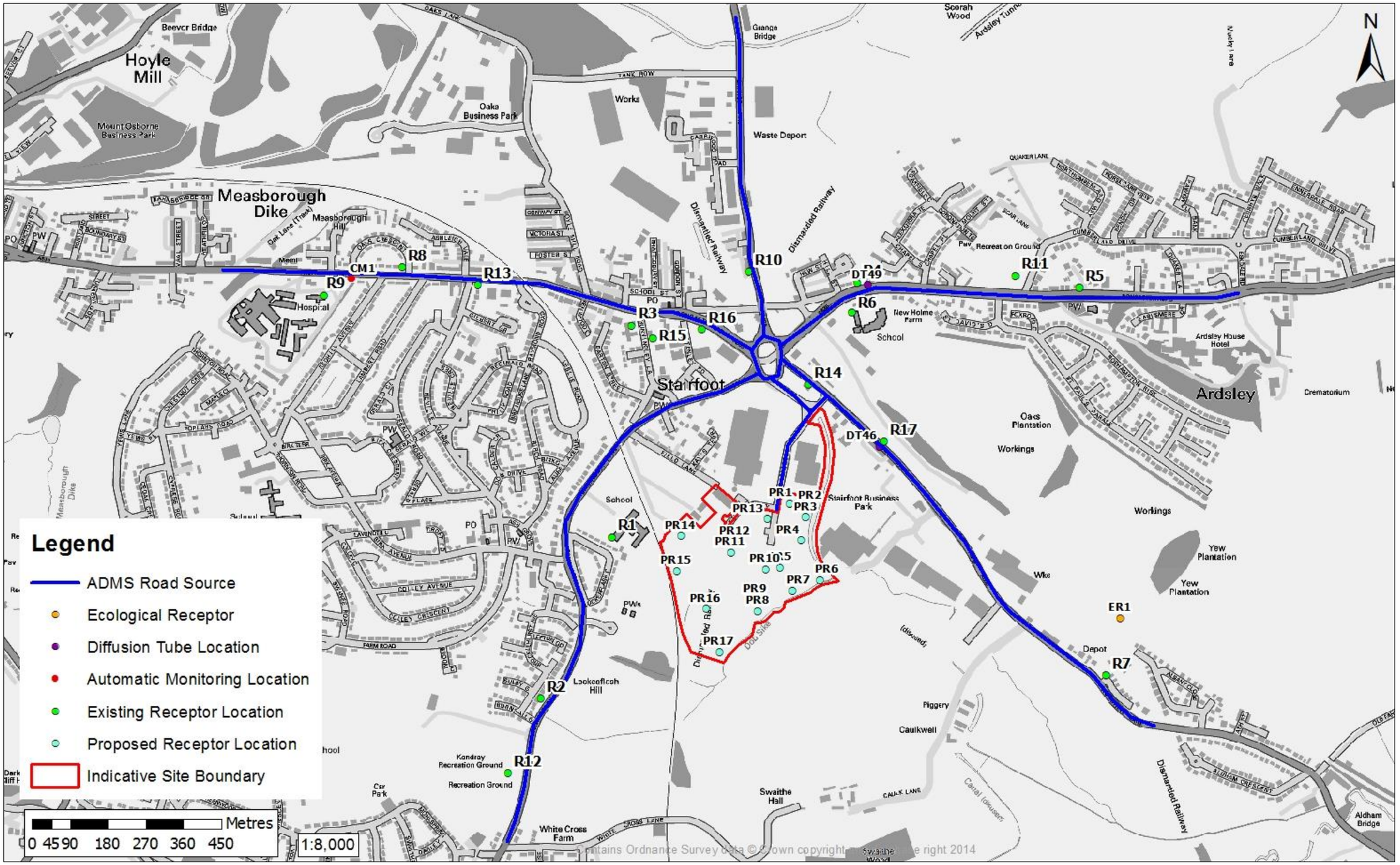
The assessment of the significance of the effects of the proposed development with respect to NO_2 exposure in the theoretical scenario is determined to be 'negligible' for all receptors.

With respect to predicted PM_{10} exposure, the significance of the proposed development in the theoretical scenario is determined to be 'negligible', based on assumptions detailed throughout the report.

In conclusion, following the adoption of the recommended mitigation measures, the proposed development is not considered to be contrary to any of the national and local planning policies.

Figures

Figure 1 Air Quality Assessment Area



Contains Ordnance Survey data © Crown copyright and database right 2014

Figure 2 Leeds Bradford Airport 2016 Meteorological Station Wind Rose

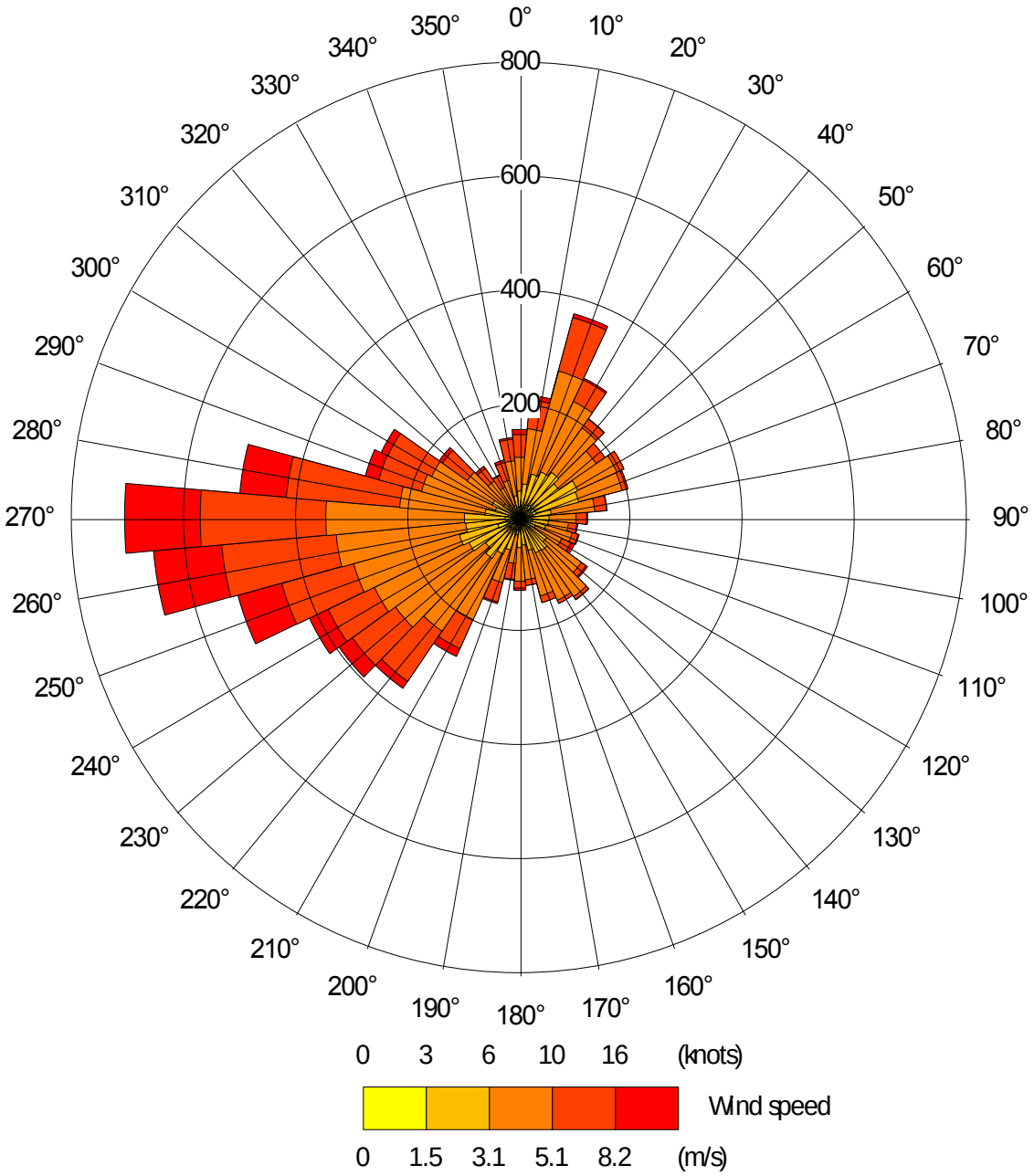
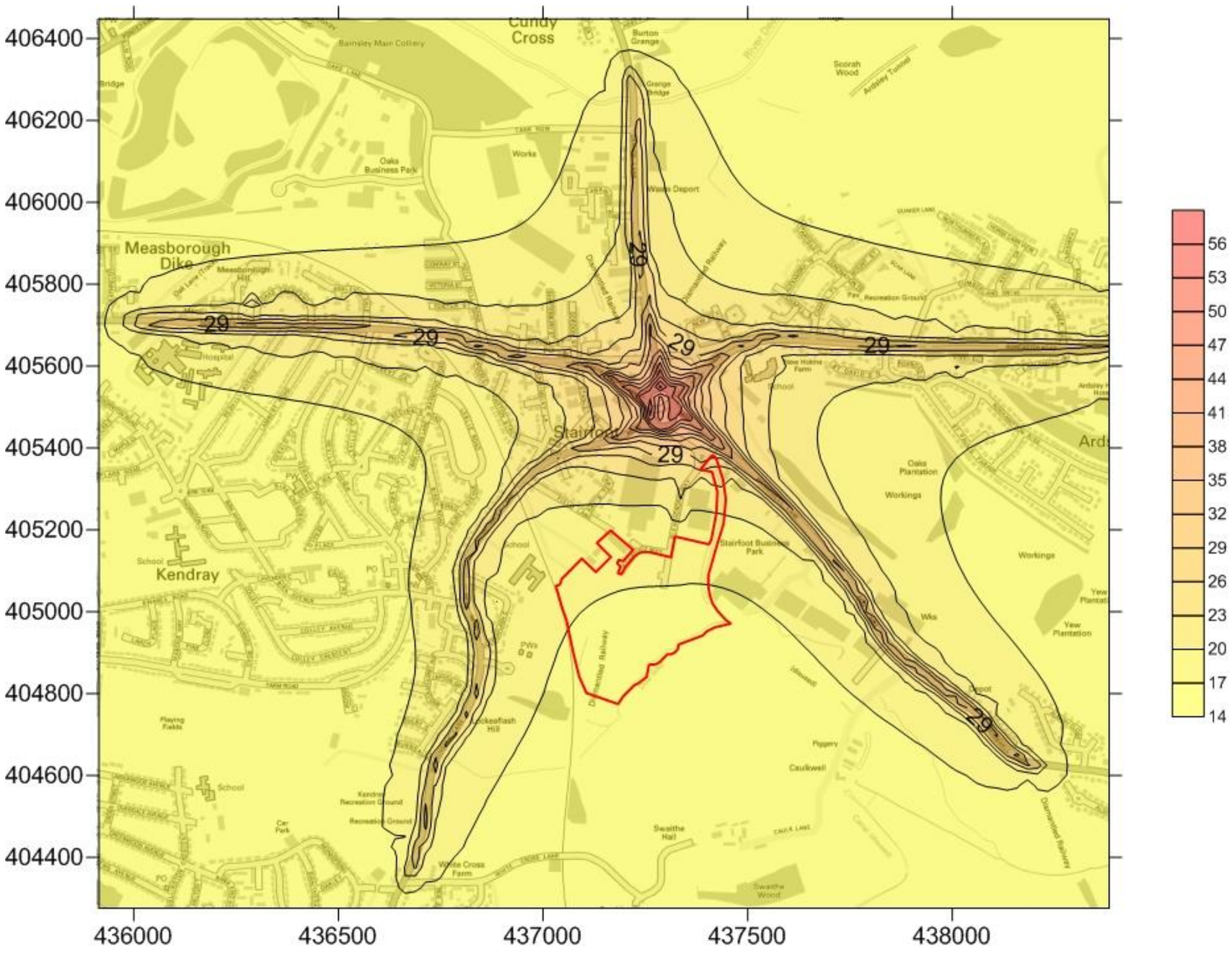


Figure 3 Predicted Environmental Concentration of NO_2 – Contour Map



Appendix A Construction Phase Assessment Methodology

The following information sets out the adopted approach to the construction phase impact assessment in accordance with the aforementioned IAQM guidance[1].

Step 1 – Screen the Requirement for a more Detailed Assessment

An assessment is required if there are sensitive receptors within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the surrounding road network, or within 500m from the site entrance. A detailed assessment is also required if there is an ecological receptor within 50m of the site boundary.

Step 2A – Define the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude for the demolition phase has been determined based on the below criteria:

- *Large*: Total building volume >50 000m^3, potentially dusty construction (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level;
- *Medium*: Total building volume 20 000m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20m above ground level; and,
- *Small*: Total building volume <20 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude for the planned earthworks has been determined based on the below criteria:

- *Large:* Total site area >10 000m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), > 10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100 000 tonnes;
- *Medium*: Total site area 2 500m^2 – 10 000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m-8m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- *Small:* Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude for the construction phase has been determined based on the below criteria:

- *Large:* Total building volume >100 000m^3, on site concrete batching; sandblasting
- *Medium:* Total building volume 25 000m^3 – 100 000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching; and,
- *Small:* Total building volume <25 000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

The dust emission magnitude for trackout has been determined based on the below criteria:

- *Large:* >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- *Medium:* 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m; and,

[1] Institute of Air Quality Management 2014. *Guidance on the Assessment of dust from demolition and construction.*

- *Small:* <10 HGV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B - Defining the Sensitivity of the Area

Sensitivities of People to Dust Soiling Effects

- *High:*
  - Users can reasonably expect a enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably expect to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land; and,
  - Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.
- *Medium:*
  - Users can reasonably 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 by soiling;
  - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land; and,
  - Indicative examples include parks and places of work.
- *Low:*
  - The enjoyment of amenity would not reasonably be expected;
  - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling;
  - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land; and,
  - Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A1– Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
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

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of People to the Health Effects of PM_{10}

- *High:*
  - Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the

case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day);

- Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.

- *Medium:*
  - Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day); and,
  - Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.

- *Low:*
  - Locations where human exposure is transient; and,
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A2 - Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 ·g/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32 ·g/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 – 28 ·g/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 ·g/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Sensitivities of Receptors to Ecological Effects

- *High:*
  - Locations with an international or national designation and the designated features may be affected by dust soiling;
  - Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain; and,
  - Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.

- *Medium:*

- Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown;
- Locations with a national designation where the features may be affected by dust deposition; and,
- Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.

- *Low:*
  - Locations with a local designation where the features may be affected by dust deposition; and,
  - Indicative example is a local Nature Reserve with dust sensitive features.

The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout, using the following table:

Table A3 - Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Note - The likely routes the construction traffic will use should also be included to enable the presence of trackout receptors to be included in the assessment. As a general guidance, without site-specific mitigation, trackout may occur along the public highway up to 500 m from large sites (as defined in step 2A), 200 m from medium sites and 50 m from small sites, as measured from the site exit.

Step 2C - Defining the Risk of Impacts

The risk of impacts with no mitigation is determined by combining the dust emission magnitude determined in Step 2A and the sensitivity of the area determined in Step 2B.

The following tables provide a method of assigning the level of risk for each activity.

Demolition

Table A4 - 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

Earthworks

Table A5 - Risk of Dust Impacts, Earthworks

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

Construction

Table A6 - Risk of Dust Impacts, 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

Trackout

Table A7 - 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

Step 3 – Site Specific Mitigation

The dust risk categories for each of the four activities determined in Step 2C should be used to define the appropriate, site-specific mitigation measures to be adopted.

These mitigation measures are contained within section 8.2 of the IAQM Guidance on the Assessment of Dust from Demolition and Construction.

Appendix B Theoretical Scenario Results

Scenario 2 (Theoretical Scenario) Results

For Theoretical Scenario 2 using the 2016 traffic emission rate, the assessment has determined that all modelled existing and proposed receptors are predicted to exceed the AQO, in both the 'do minimum' and 'do something' scenario for NO_2. All receptor locations are expected to meet the AQO, in both the 'do minimum' and 'do something' scenario for PM_{10}. This assessment can be seen as 'worst case' and for information only, and the findings in the main body of the report should be used for informing appropriate mitigation.

Table B1 Theoretical Scenario NO_2 Results

Receptor		NO_2 (µg/m^3)			
		Baseline 2016	Do Minimum 2022	Do Something 2022	Development Contribution (DS-DM)
R1*	Hunningley Primary School	25.28	26.10	26.31	0.21
R2	45 Brocklehurst Avenue	26.20	27.08	27.31	0.23
R3	Highgrove Carehome	30.04	34.34	34.80	0.46
R4	568 Doncaster Road	34.44	36.26	36.57	0.31
R5	660 Doncaster Road	28.46	29.62	29.78	0.16
R6	Oakhill Primary School	36.08	38.05	38.45	0.40
R7	49 Wombwell Lane	29.01	30.12	30.28	0.16
R8	368 Doncaster Road	29.32	34.52	34.99	0.47
R9*	Kendray Hospital	25.09	28.47	28.78	0.31
R10	5 Grange Lane	38.20	**41.03**	**41.52**	0.49
R11	Scar Lane Play Area	28.01	29.07	29.23	0.16
R12*	Kendray Recreation Ground	23.07	23.68	23.83	0.16
R13	1 Neville Avenue	31.39	37.29	37.83	0.54
R14*	The Keel Inn	55.82	**59.03**	**60.78**	1.75
R15	3 Hunningley Close	29.32	32.98	33.40	0.42
R16	Highgrove Care Home	39.82	**46.19**	**46.91**	0.72
R17	86 Wombwell Lane	36.79	38.47	38.98	0.51
PR1	Proposed Residential Receptor	22.78	23.41	24.57	1.16
PR2	Proposed Residential Receptor	22.63	23.23	23.86	0.63
PR3	Proposed Residential Receptor	22.09	22.64	23.17	0.53
PR4	Proposed Residential Receptor	21.29	21.75	22.06	0.31
PR5	Proposed Residential Receptor	20.69	21.08	21.28	0.20
PR6	Proposed Residential Receptor	18.65	19.01	19.15	0.14
PR7	Proposed Residential Receptor	18.45	18.79	18.93	0.14
PR8	Proposed Residential Receptor	18.28	18.61	18.73	0.12
PR9	Proposed Residential Receptor	18.44	18.79	18.93	0.14
PR10	Proposed Residential Receptor	18.85	19.25	19.45	0.20
PR11	Proposed Residential Receptor	21.22	21.69	21.92	0.23
PR12	Proposed Residential Receptor	21.43	21.92	22.20	0.28
PR13	Proposed Residential Receptor	22.02	22.58	23.19	0.61
PR14	Proposed Residential Receptor	22.15	22.74	22.95	0.21
PR15	Proposed Residential Receptor	19.70	20.21	20.37	0.16
PR16	Proposed Residential Receptor	18.72	19.11	19.24	0.13

Receptor		NO_2 (µg/m³)			
		Baseline 2016	Do Minimum 2022	Do Something 2022	Development Contribution (DS-DM)
PR17	Proposed Residential Receptor	18.10	18.41	18.51	0.10
ER1	Stairfoot Brickworks (SSSI)	28.98	30.09	30.25	0.16
Annual Mean AQO not to be exceeded		**40 µg/m³**			

**Non-residential receptor*

Table B2 Theoretical Scenario PM_{10} Results

Receptor		PM_{10} (µg/m³)			
		Baseline 2016	Do Minimum 2022	Do Something 2022	Development Contribution (DS-DM)
R1*	Hunningley Primary School	16.59	16.76	16.86	0.09
R2	45 Brocklehurst Avenue	17.40	17.59	17.46	-0.14
R3	Highgrove Carehome	17.54	18.51	18.66	0.15
R4	568 Doncaster Road	19.15	19.54	19.04	-0.50
R5	660 Doncaster Road	18.60	18.87	18.19	-0.68
R6	Oakhill Primary School	19.32	19.73	19.25	-0.49
R7	49 Wombwell Lane	18.46	18.72	18.37	-0.35
R8	368 Doncaster Road	17.53	18.74	18.90	0.16
R9*	Kendray Hospital	16.59	17.33	17.45	0.12
R10	5 Grange Lane	19.85	20.46	20.01	-0.46
R11	Scar Lane Play Area	17.96	18.20	17.67	-0.52
R12*	Kendray Recreation Ground	16.70	16.83	16.68	-0.15
R13	1 Neville Avenue	17.99	19.41	19.59	0.18
R14*	The Keel Inn	22.46	23.15	22.94	-0.22
R15	3 Hunningley Close	18.02	18.81	18.34	-0.47
R16	Highgrove Care Home	19.82	21.19	20.78	-0.41
R17	86 Wombwell Lane	19.99	20.39	19.93	-0.46
PR1	Proposed Residential Receptor	16.72	16.83	16.49	-0.34
PR2	Proposed Residential Receptor	16.71	16.83	16.39	-0.44
PR3	Proposed Residential Receptor	16.61	16.72	16.26	-0.46
PR4	Proposed Residential Receptor	16.47	16.55	16.06	-0.50
PR5	Proposed Residential Receptor	16.35	16.42	15.90	-0.52
PR6	Proposed Residential Receptor	16.43	16.50	15.87	-0.63
PR7	Proposed Residential Receptor	16.38	16.45	15.82	-0.63
PR8	Proposed Residential Receptor	16.35	16.41	15.78	-0.63
PR9	Proposed Residential Receptor	16.38	16.44	15.81	-0.63
PR10	Proposed Residential Receptor	16.45	16.52	15.90	-0.62
PR11	Proposed Residential Receptor	16.43	16.52	16.01	-0.51
PR12	Proposed Residential Receptor	16.47	16.56	16.06	-0.51
PR13	Proposed Residential Receptor	16.57	16.68	16.23	-0.44
PR14	Proposed Residential Receptor	16.62	16.73	16.22	-0.52
PR15	Proposed Residential Receptor	16.62	16.72	16.09	-0.63
PR16	Proposed Residential Receptor	16.43	16.51	15.87	-0.63
PR17	Proposed Residential Receptor	16.32	16.38	15.74	-0.64
ER1	Stairfoot Brickworks (SSSI)	18.43	18.69	18.34	-0.35
Annual Mean AQO not to be exceeded		**40 µg/m³**			

**Non-residential receptor*