OUGHTIBRIDGE MILL

Breathing New Life into this Former Industrial Site

Air Quality Assessment

March 2016

Air Quality Impact Assessment

Oughtibridge Mills, Oughtibridge

Prepared for: CEG

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REVISION SCHEDULE					
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1 Introduction

1.1 Brief

AECOM has been appointed by CEG to assess the impact of the proposals for Oughtibridge Mills Estate on local air quality. The proposed development and access routes are largely situated within Sheffield City Council's (SCC) administrative area, however part of the proposed development site also extends into Barnsley Metropolitan Borough Council (BMBC). The development proposals seek outline planning permission for demolition of existing buildings and structures and erection of residential development (use Class C3) with means of site access including a new vehicular bridge and a pedestrian/cycle bridge across the River Don, and associated landscaping and infrastructure works.

The Proposed Development is located in Oughtibridge to the north west of Sheffield just off Langsett Road North on the former Oughtibridge Mills site. The Site is located within the city wide Sheffield City Council Air Quality Management Area (AQMA). This AQMA was declared for exceedances of the annual mean and 1-hour mean nitrogen dioxide objective and the 24-hour mean particulate matter PM_{10} objective.

The potential effects on air quality are considered with respect to existing national and local policies for the better management of local air quality. Standard mitigation practices have been incorporated into the scheme design through environmental management measures, and additional mitigation measures are recommended where appropriate to minimise potential negative effects that may be experienced by sensitive receptors during the construction and operational phases of the Proposed Development.

1.2 Scope of Work

A review of the existing ambient air quality forms the basis for the prediction of current and future baseline conditions against which any identified impacts due to the Proposed Development are assessed.

During the construction phase of the Proposed Development, there is the potential for earthworks and construction activities to generate fugitive emissions of particulate matter (dust and PM_{10}). There is the risk of such emissions giving rise to significant adverse effects on amenity or health at receptors located within 350 m of the source of emissions (IAQM, 2014) unless appropriate mitigation measures are adopted. There are receptors located within 350 m of the Site boundary and therefore an assessment of the significance of effects from fugitive emissions of dust and PM_{10} from the Site has been undertaken. The assessment includes consideration of the risk of adverse effects associated with the potential track out of material at receptors located within 50 m of roads extending up to 500 m from the site access. There is one Site of Special Scientific Interest (SSSI) located within 3 kilometres of the site boundary. This is Wadsley Fossil Forest SSSI which is (2.9 kilometres south east of the site). There are no Ramsars, Special Areas of Conservation or Special Protection Areas within 3 kilometres of the site. These ecological receptors are located greater than 50 m from the site boundary and therefore have not been discussed any further (IAQM, 2014).

The potential for changes to long term and short term mean concentrations of particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2) to occur as a result of predicted changes in road traffic movements on the local road network have been considered specifically for the following scenarios:

- 2014 Baseline Scenario (using 2015 traffic counts factored back to 2014, 2014 meteorological data, 2011 traffic emissions factors and 2011 backgrounds);
- 2017 Without-Development Scenario (indicative opening year, using predicted 2017 traffic data, 2014 meteorological data, 2011 traffic emissions factors and 2011 backgrounds); and
- 2017 With Development Scenario (indicative opening year, using predicted 2017 traffic data, 2014 meteorological data, 2011 traffic emissions factors and 2011 backgrounds).

The air quality assessment uses predicted traffic flows for the Proposed Development derived by Bryan G Hall (Bryan G Hall, 2016). The potential change to emissions would occur as a result of a change in road traffic flow on the local road network.

As well as the consideration of impacts at nearby existing sensitive receptors, this assessment also considers the standard of air quality at the proposed residential receptors on the development site itself.

2 Legislation and Planning Policy Context

2.1 European Legislation

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC (Council of European Communities, 1996), its associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

2.2 National Legislation

Directive 2008/50/EC (Council of European Communities, 2008) is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 (H.M. Government, 2010), which came into force on 11th June 2010. These limit values are binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole.

2.2.1 National Planning Policy

National Planning Policy Framework (2012)

The National Planning Policy Framework (NPPF) was published in March 2012 (Department of Communities and Local Government, 2012), paragraph 109 of which states:

"The planning system should contribute to and enhance the natural and local environment by:
preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"

Annex 2 of the NPPF defines 'Pollution' as:

"Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light".

There are both national and local policies for the control of air pollution and local action plans for the management of local air quality within the SCC area. The effect of the Proposed Development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities when making decisions for individual planning applications. Paragraph 124 of the NPPF states:

"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 National Planning Practice Guidance (NPPG) (Department of Communities and Local Government, 2014), provides a summary of the air quality issues set out in the NPPF and goes on to note that the assessment should include the following information:

- The existing air quality in the study area (existing baseline)
- The future air quality without the development in place (future baseline), and
- The future air quality with the development in place (with mitigation)

The guidance then advises that the application should proceed to decision with appropriate planning conditions or planning obligation, if the proposed development (including mitigation) would not lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or fail to comply with the requirements of the Habitats Regulations.

2.2.2 National Air Quality Strategy

The UK National Air Quality Strategy (Defra, 2000) was initially published in 2000, under the requirements of the Environment Act 1995 (H.M. Government, 1995). The most recent revision of the strategy (Defra, 2007) sets objective values for key pollutants as a tool to help Local Authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality (England) Regulations 2000 (H.M. Government, 2000) and later amendments (H.M. Government, 2002).

The air quality objective values referred to above have been set down in regulation solely for the purposes of local air quality management. Under the local air quality management regime SCC and BMBC has a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the governing local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. Consequently it is not unusual for the boundary of an AQMA to include within it relevant locations where air quality is not at risk of exceeding an air quality objective. The UK's national air quality objective values for the pollutants of relevance to this assessment are displayed in **Table 2.1**.

Table 2.1: Air Quality Objective Values for England

POLLUTANT	AVERAGING PERIOD	OBJECTIVE VALUE	MAX PERMITTED EXCEEDANCES	TARGET DATE
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3	None	31/12/05
	Hourly Mean	200 µg/m^3	18 times per year	31/12/05
Particulate Matter (PM_{10})	Annual Mean	40 µg/m^3	None	31/12/04
	24-hour	50 µg/m^3	35 times per year	31/12/04
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m^3	None	2020

2.3 Local Air Quality Management

2.3.1 Sheffield City Council

Under the requirements of Part IV of the Environment Act (1995) (H.M. Government, 1995), SCC has carried out a phased review and assessment of local air quality within the city (SCC, 2012).

Sheffield City Council has one AQMA in its administrative area. This AQMA covers the entire eastern part of Sheffield city containing major built up areas. The AQMA is declared for annual and 1-hour nitrogen dioxide objectives, and the 24-hour PM_{10} objectives.

The most recent air quality review and assessment report for SCC available on the internet is the 2012 Updating and Screening Assessment (SCC, 2012). The following conclusions were reached from the most recent diffusion tube monitoring under taken in Shropshire Council's administrative area:

"Sheffield City Council has examined the results from monitoring in the district. The whole urban area of the city is an AQMA for PM_{10} and nitrogen dioxide; the objectives for all the remaining 5 pollutants are not breached, therefore there is no need to proceed to a Detailed Assessment."

2.3.2 Barnsley Metropolitan Borough Council

Under the requirements of Part IV of the Environment Act (1995) (H.M. Government, 1995), BMBC has carried out a phased review and assessment of local air quality within their administrative area (BMBC, 2015a, 2015b).. BMBC has seven AQMAs in its administrative area which are all declared for an exceedance of the annual mean nitrogen dioxide objective, they are described below:

- Barnsley AQMA No. 1 which consists of 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 100 metres either side of the centre reservation;
- Barnsley AQMA No 2A which consists of 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 which consists of an area encompassing the junction of the A61 Wakefield Road and Burton Road;
- Barnsley AQMA No 4 which consists of 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 junctions with Queens Road;
- Barnsley AQMA No 5 which consists of an area encompassing the junction of Rotherham Road and Burton Road. This AQMA was declared for an exceedance of the annual mean nitrogen dioxide objective;
- Barnsley AQMA No 6 which incorporates the A616 road through Langsett; and
- Barnsley AQMA No 7 which incorporates the southbound carriageway of the A61 Sheffield Road adjacent to the junction with the A6133 Cemetery Road.

The nearest AQMA to the Proposed Development is Barnsley AQMA No 1. This AQMA is 7km from the Proposed Development. As none of these AQMAs are near to the Proposed Development then the road traffic associated with the Proposed Development is not expected to affect air quality within these AQMAs.

2.4 Local Planning Policy

2.4.1 Sheffield Core Strategy

Sheffield City Council adopted its Core Strategy in 2009 (SCC, 2009). This Core Strategy adheres to the Planning and Compulsory Purchase Act 2004. There are several policies regarding air quality, these are highlighted below:

"Policy CS 51 – Transport Priorities.

The strategic priorities for transport are:

a. *Promoting choice by development alternatives to the car*
b. *Maximising accessibility*
c. *Containing congestion levels*

d. Improving air quality
e. Improving road safety
f. Supporting economic objectives through demand management measures and sustainable travel initiatives."

"Policy CS 66 – Air Quality

Action to protect air quality will be taken in all areas of the city. Further action to improve air quality will be taken across the built-up area, and particularly where residents in road corridors with high levels of traffic are directly exposed to levels of pollution above national targets."

Currently SCC are at the consultation stage of producing a new Local Plan. This local plan will be for the whole of Sheffield and will guide the future of the city by setting out how and where development will take place up to 2034.

2.4.2 Sheffield City Council Air Quality Action Plan

A new Air Quality Action Plan (AQAP) for Sheffield in 2015 was approved by Cabinet on the 11th of July 2012 (SCC, 2015a). Action 6 highlights policies for new developments, this is highlighted below:

"Action 6: Develop policies to support better air quality

We will introduce and enforce a planning policy to ensure that for significant developments predictable resulting loss of air quality would be appropriately mitigated.

We will expect all new developments to implement or support actions that make a positive contribution to improving air quality, such as reducing the demand for fuel consumption."

2.4.3 Barnsley Metropolitan Borough Council Core Strategy

Barnsley adopted its Core Strategy in September 2011 (BMBC, 2011). Policies specific to air quality are highlighted below:

"CSP 41 Development 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 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 an air quality management area, 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 and Effect Significance Criteria

There is currently no statutory guidance on the method by which an air quality impact assessment should be undertaken. Several non-statutory bodies have published their own guidance relating to air quality and development control (EPUK and IAQM, 2015), the assessment of the significance of air quality effects (IAQM, 2009) and to the assessment of dust from demolition and construction (IAQM, 2014).

This section will explain the methods used to assess the significance of:

- The impact of fugitive emissions of particulate matter from construction phase activities; and
- The impact of road traffic exhaust emissions associated with the Proposed Development.

Potentially affected air quality sensitive receptors have been identified for each element of the assessment and the magnitude of the change in air quality statistics at each receptor has been considered. The methods used to determine the significance of effect associated with air quality impacts are described later in this section.

This section of this report presents the following:

- Identification of the information sources that have been consulted throughout preparation of this chapter;
- Details of the consultation undertaken with respect to Air Quality;
- The methodology behind the assessment of Air Quality effects, including the criteria for the determination of the sensitivity of receptors and magnitude of change from the existing or 'baseline' condition;
- An explanation as to how the identification and assessment of potential Air Quality effects has been reached; and
- The significance criteria and terminology for assessment of the residual effects to Air Quality.

3.1 Assessment Methodology

3.1.1 Methodology for Determining Baseline Conditions and Sensitive Receptors

SCC undertakes monitoring throughout their administrative area, monitoring concentrations of nitrogen dioxide in support of its local air quality management review and assessment process.

There is one diffusion tube operated by SCC in Deepcar which is suitable for model verification for this Proposed Development. This diffusion tube information is outlined in Section 4.1.1.

AECOM were commissioned to undertake a three month diffusion tube survey. The locations of the diffusion tubes are shown in **Table 3.1**, Figure 1 displays the air quality study area near Oughtibridge, Figure 2 displays the air quality study area near Deepcar and Figure 3 displays the air quality study area near Middlewood. Figures 1 to 3 can be found in Appendix A.

Table 3.1: Location Specific Diffusion Tubes

TUBE I.D	LOCATION	SITE TYPE	NATIONAL GRID REFERENCE
DT1	Entrance to Oughtibridge Mill	Site specific tube	430098, 394161
DT2	Langsett Road North near White Hart Pub	Roadside	430676, 393437
DT3	Station Street near The Pheasant Pub	Roadside	431059, 393335
DT4	Church street near Church	Roadside	430574, 393289
DT5	Langsett Road North near to Bedford Road	Roadside	430769, 393711

TUBE I.D	LOCATION	SITE TYPE	NATIONAL GRID REFERENCE
DT6	Main Road (north of site)	Roadside	429842, 394452
DT7	Don Avenue	Background	429584, 394625
DT8	Middlewood Road	Roadside	431843, 391922
SCC1	Carr Road, Deepcar	Urban Background	428818, 397977

3.1.2 Receptors Potentially Affected by Emissions from Construction Phase Works

When assessing the impact of dust emissions generated during demolition and construction works, receptors are defined as the nearest potentially sensitive receptor to the perimeter of the Site in each direction. These receptors have the potential to experience impacts of greater magnitude due to dusts generated by the works, when compared with other more distant receptors, or less sensitive receptors, and as such represent examples of worst-case exposure. The identification of sensitive receptors considers residential properties and other potentially sensitive properties such as schools and hospitals or industrial premises.

There are several receptors in the vicinity of the site which have the potential to be adversely affected by construction phase works. These receptors are located on Langsett Road North, Spring Grove Gardens and Green Lane. The impact on properties further from the Site boundary has therefore not been considered further in this assessment.

3.1.3 Receptors Potentially Affected by Emissions from Road Traffic

The concentration of pollutants associated with road traffic at the roadside or at sensitive receptors is influenced by a number of factors. These include background pollution levels and the amount of traffic emissions, which is dictated by traffic flow rates, composition and speed, which is influenced by engine size, fuel type and type of vehicle (HGV, car etc.).

The air quality objective values for pollutants associated with road traffic have been set by the Expert Panel of Air Quality Standards at a level below the lowest concentration at which the more sensitive members of society have been observed to be adversely affected by exposure to each pollutant. Therefore all receptors that represent exposure of the public are of equal sensitivity as any member of the public could be present at those locations.

Impacts from baseline road traffic emissions have been quantified at seventeen existing representative receptors, four proposed receptors and two committed receptors in the vicinity of the Proposed Development Site. The receptors are listed in **Table 3.2**, Figure 1 displays the air quality study area near Oughtibridge, Figure 2 displays the air quality study area near Deepcar and Figure 3 displays the air quality study area near Middlewood. These figures are located in Appendix A.

Table 3.2: Air Quality Sensitive Receptors

RECEPTOR	DESCRIPTION	NATIONAL GRID REFERENCE	
		X	Y
R1	2 Carr Road, Deepcar	428827	397979
R2	231 Langsett Road North, Oughtibridge	429802	394735
R3	74 Langsett Road North, Oughtibridge	429925	394376
R4	21 Langsett Road North, Oughtibridge	430035	394119
R5	9 Myers Avenue, Oughtibridge	430641	393830

RECEPTOR	DESCRIPTION	NATIONAL GRID REFERENCE	
		X	Y
R6	2 Bedford Road, Oughtibridge	430754	393720
R7	24 Langsett Road North, Oughtibridge	430690	393485
R8	17 Orchard Street, Oughtibridge	430732	393423
R9[1]	White Hart Public House[1] Oughtibridge	430677	393444
R10	20 Church Street, Oughtibridge	430582	393305
R11	8 Bridge Street, Oughtibridge	430719	393355
R12	4 Waterside, Oughtibridge	430840	393370
R13	63 Station Lane, Oughtibridge	431079	393354
R14	7 Langsett Road North, Oughtibridge	430704	393316
R15	8a Low Road, Oughtibridge	430988	393041
R16	114 Langsett Road South, Oughtibridge	430918	393035
R17	322 Middlewood Road North, Middlewood	431756	391994
C1[2]	Committed Development in Deepcar	429976	397830
C2[2]	Committed Development in Deepcar	428915	397921
P1*	Proposed Property near the site entrance	430002	394357
P2*	Proposed Property on the North West Corner	430234	394196
P3*	Proposed Property in the middle of the Site	430198	394044
P4*	Proposed Property on the east of the Site	430583	393941

*These Proposed Receptors are assessed in the 2017 With-Development scenario only.
[1]modelled at a height of 3 metres.
[2]These committed receptors are for the future 2017 scenarios only.

3.1.4 Methodology for Determining Construction Dust Effects

Fugitive emissions of airborne particulate matter are readily produced through the action of abrasive forces on materials and therefore a wide range of site preparation and construction activities have the potential to generate this type of emissions, including;

- demolition work;
- earthworks, including the handling, working and storage of materials;
- construction activities and
- the transfer of dust making materials from the site onto the local road network.

Particulate matter in air is made up of particulates of a variety of sizes, and the concept of a 'size fraction' is used to describe particulates with sizes in a defined range. These definitions are based on the collection efficiency of specific sampling methods and each size fraction is especially associated with different types of impacts. In this assessment the term 'dust' is used to mean particulate matter in the size fraction 1µm - 75µm in diameter, as defined in BS 6069:1994 (BSI, 1994). Dust impacts are considered in terms of the change in airborne concentration and the change in the rate of deposition of dust onto surfaces.

The size fraction called ‘PM_{10}’ is composed of material with an aerodynamic diameter of less than 10 μm and overlaps with the size fraction for dust. Air quality objectives (H.M. Government, 2010) for PM_{10} has been set for the protection of human health and the term PM_{10} is only used in this assessment when referring to the potential impact of emissions of particulate matter from demolition and construction activities on human health receptors. The short term, 24 hour mean objective for airborne concentrations of PM_{10} is the appropriate air quality objective for assessing the potential impact on health of short term fugitive emissions from demolition and construction sites.

The Institute of Air Quality Management (IAQM) (IAQM, 2014) adopts a broad definition of dust that includes the potential for changes in airborne concentration, changes in deposition rates and the risk to human health and public amenity, when considering the significance of effects from emissions of fugitive particulate matter. In this assessment, specific reference is made to the impacts associated with specific size fractions (dust, PM_{10}) within the assessment narrative, before considering the overall effect on receptors using an approach that is consistent with the IAQM’s guidance.

The nature of the impact requiring assessment varies between different types of receptor. In general receptors associated with higher baseline dust deposition rates are less sensitive to impacts, such as farms, light and heavy industry or outdoor storage facilities. In comparison some hi-technology industries or food processing plants operate under clean air conditions and increased airborne particulate matter concentrations may have an increased economic cost associated with the extraction of more material by the plants air filtration units.

Table 3.3 provides some generic examples of the type of impacts that may result from fugitive emissions of particulate matter. The sensitivity of receptor types is listed for selected impacts, with sensitivity being described as ‘high’ for receptors that are especially sensitive to the specified impact. For example, industrial painting operations are consider to be more sensitive to the impact of material becoming soiled by depositing material, than are residential properties or schools.

Table 3.3: Types of Impacts from Emissions of Particulate Matter

NATURE OF IMPACT	RECEPTOR TYPES AFFECTED	RELATIVE SENSITIVITY
Change in 24 hour mean PM_{10} concentrations	Residential properties	Receptor sensitivity was considered when Air Quality Objective Value was set
	Schools	
	Hospitals and clinics	
Change in rate at which air filtration units require maintenance	Hospitals and clinics	High
	Hi-tech industries	High
	Food processing industries	High
Change in the rate at which material accumulates on glossy surfaces, such as glass or paint work	Painting and furnishing operations	High
	Residential properties	Medium
	Schools	Medium
	Food retailers	Medium
	Offices	Medium
	Museum and Galleries	Medium
	Glasshouses	Medium
Change in the rate at which property or products becomes soiled by deposited material	Food processing industries	High
	Painting and furnishing operations	High

NATURE OF IMPACT	RECEPTOR TYPES AFFECTED	RELATIVE SENSITIVITY
	Museums and Galleries	High
	Residential properties	High
	Food retailers	Medium
	Offices	Medium
Change in the rate at which mineral material is deposited onto vegetation	Ecological sites	Medium – Low
Change in chemical composition of mineral material deposited	Ecological sites	Medium – Low
	Outdoor Storage	Medium - Low

3.1.5 Methodology for Determining Operational Effects

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene (chemical formula C_6H_6) and 1,3-butadiene (chemical formula C_4H_6), and sulphur dioxide (chemical formula SO_2), carbon monoxide (chemical formula CO), particulate matter (size fractions PM_{10} and $PM_{2.5}$) in exhaust emissions. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form NOx, mainly in the form of nitric oxide (chemical formula NO), which is then converted to nitrogen dioxide in the atmosphere. Nitrogen dioxide is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

Although sulphur dioxide, carbon monoxide, benzene and 1,3-butadiene are also present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of this assessment. This is because road traffic emissions of these substances have been reviewed by SCC and BMBC (SC, 2012) (BMBC, 2015) and nowhere within the administrative area is at risk of exceeding these objectives. The development proposals would not be capable of compromising the achievement of the relevant air quality objectives for the protection of human health. Emissions of SO_2, CO, benzene and 1, 3-butadiene from road traffic are not considered further within this assessment.

Exhaust emissions from road vehicles may affect the concentrations of the principal pollutants of concern, nitrogen dioxide, PM_{10} and $PM_{2.5}$, at sensitive receptors in the vicinity of the proposed Scheme. These pollutants will be the focus of the assessment of the significance of road traffic impacts.

3.2 Prediction of Construction Phase Impacts

At present, there are no statutory UK or EU standards for use in the assessment or control of nuisance dust. The emphasis of the regulation and control of demolition and construction dust should therefore be the adoption of good working practices on site. Good design practice is a process that is informed by impact assessments and is able to avoid the potential for significant adverse environmental effects at the design stage. This approach assumes that measures, beyond those inherent in the proposed design, that are identified as being necessary in the impact assessment, will be applied during works to ensure potential significant adverse effects do not occur. These incorporated mitigation will be included as part of the environmental management measures for the Proposed Development.

Examples of accepted good site practice include guidelines published by the Building Research Establishment (BRE, 2003), the Greater London Authority (Greater London Authority, 2014), the IAQM (IAQM, 2014) and considerate contractor schemes.

A qualitative assessment has been undertaken to assess the significance of effects on sensitive receptors. The steps in the assessment process are to consider potential sources of fugitive dust emissions on the basis of the four main activity groupings of Demolition, Earthworks, Construction and Track-out. For each activity group the same steps are applied with respect to the potential impacts at identified receptors, before coming to an overall conclusion about the significance of the effects predicted.

The steps to assessing likely effects are:

For the Proposed Development with environmental management measures, consider for demolition, earthworks, construction and trackout:

- the potential dust emission magnitude;
- the sensitivity of the area;
- establish the risk of dust impacts;
- determine if additional mitigation is required; and
- summarise the overall effect of the works with respect to fugitive emissions of particulate matter and then report the significance of the effects.

3.2.1 Construction Phase Road Traffic Emissions

The construction phase of the Proposed Development is likely to lead to a relatively small increase in the number of vehicles on the local highway network, for the duration of the construction works only (EPUK, 2010) set out criteria to establish the need for an air quality assessment. For the construction phase the recommendation for when an air quality assessment is required is "*large, long-term construction sites that would generate large HGV flows (>200 per day) over a period of a year or more*". It is very unlikely that a development of the scale proposed would lead to this number of vehicle movements. Therefore, construction phase road traffic emissions are not considered further.

3.3 Prediction of Air Quality Impact

During operation, the Proposed Development has the potential to change vehicle movements on the surrounding road network. An increase in vehicle emissions can increase the exposure of sensitive receptors to concentrations of nitrogen dioxide and particulate matter (PM_{10} and $PM_{2.5}$). This assessment will quantify the concentrations of the pollutants most commonly associated with vehicle emissions at the worst affected receptor locations. Concentrations for a 2014 baseline scenario, 2017 Without-Development and 2017 With Development scenarios will be predicted using applicable modelling techniques. The magnitude of change as a result of the change in vehicle movements due to the development will be used to identify the potential for road traffic emissions to cause a significant effect at sensitive receptors. This assessment follows the guidance for the determination of baseline pollutant concentrations, and uses emissions factors for road traffic, from the current Defra emissions factor toolkit EFT 6.0.1, issued in November 2014 (Defra, 2016a).

To undertake the assessment of road traffic emissions during the operational phase of the Proposed Development, the latest version of the dispersion model software 'ADMS-Roads' (V4.0.1.0) has been used to quantify pollution levels at selected receptors. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (CERC, 2015).

3.4 Dispersion Model Input Data and Model Conditions

Details of general model conditions are provided in **Table 3.4**.

Table 3.4: General ADMS Roads Model Conditions

VARIABLE	INPUT
Surface Roughness	0.5 m at source; 0.2 m at met site
Minimum Monin-Obukhov length for stable conditions	30 m
Receptors	Selected discrete receptors
Receptor location	X, Y co-ordinates determined by GIS, z = 1.5 m for residential receptors
Emissions	NO_X, PM_{10} and $PM_{2.5}$
Emission Factors	Emission Factor Toolkit V6.0.2

VARIABLE	INPUT
Meteorological Data	1 year of hourly sequential data Robin Hood Airport, Doncaster (2014)
Emission Profiles	None
Terrain Type	Flat terrain
Model output	Long-term annual mean NO_X concentration (µg/m^3) Long-term annual mean PM_{10} concentration (µg/m^3) Long-term annual mean $PM_{2.5}$ concentration (µg/m^3)

3.4.1 Traffic Data

The air quality assessment uses predicted traffic flows for the Proposed Development derived by Bryan G Hall (Bryan G Hall, 2016).

The data have been used for the dispersion modelling scenarios:

- 2014 Baseline (2015 traffic count factored back to 2014);
- 2017 Without-Development (2017 Without-Development); and
- 2017 With-Development (2017 With-Development, Cumulative Development traffic).

The traffic data used in the modelling of road traffic emissions are presented in Appendix B to this report.

3.4.2 Cumulative Schemes

The 2017 future scenarios include a development in Deepcar which is located south east of the B6088 Manchester Road/A6102 Manchester Road and A6102 Vaughton Hall junction. The development is for 460 dwellings.

3.4.3 Meteorological Data

Hourly sequential data from Robin Hood Airport, Doncaster meteorological station, 35 km to the east of the Site has been used in the assessment. Data for 2014 has been used to verify the performance of the model against measured nitrogen dioxide concentrations.

3.4.4 Emissions Data

The magnitude of road traffic emissions for the baseline and with development scenarios are calculated from traffic flow data and using the Defra's current emission factor database tool EFT 6.0.2. The assessment considers the operational phase impact of road traffic emissions at receptors adjacent to roads in the vicinity of the proposed development. All scenarios are modelled using the 2011 emission year and the England rural road option selected (Defra, 2016b).

3.4.5 Background Data

There are six council operated continuous monitors located at Tinsley Infant School, Lowfield School, King Ecgbert's Old School site, Wicker, Fir Vale School and Waingate. The concentrations at these sites range from 21µg/m^3 to 53 µg/m^3. These sites are greater than 1km from the Proposed Development and are therefore not appropriate to determine background concentrations of the site.

AECOM conducted site specific diffusion tube monitoring and one site was located in a background location. This was DT7. The annualised concentration for this tube has been used to determine background NO_2 concentrations for the model verification.

As there is no site specific monitoring for PM_{10} or $PM_{2.5}$ their concentrations have been sourced from Defra's background maps (Defra, 2016a), for 2011. The background data used in this assessment is set out in Table 3.5.

There was no removal of any road sources from the Defra background maps. Due to the current uncertainty in the rate at which background pollutant concentrations are improving, this assessment has taken a conservative approach by assuming the baseline background pollutant concentration year for both future year scenarios.

Table 3.5: Background Pollutant Concentrations for NO_2 from DT7 and PM_{10} and $PM_{2.5}$ from Defra maps

	BACKGROUND GRID SQUARE CENTRE COORDINATES		AECOM BACKGROUND DIFFUSION TUBE	ANNUAL MEAN 2011 CONCENTRATION (µg/m^3)	
RECEPTOR	**X**	**Y**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
R1	428827	397979	14.3	14.2	10.3
R2	429802	394735	14.3	14.2	10.3
R3	429925	394376	14.3	14.2	10.3
R4	430035	394119	14.3	14.1	10.2
R5	430641	393830	14.3	15.1	10.8
R6	430754	393720	14.3	15.1	10.8
R7	430690	393485	14.3	15.1	10.8
R8	430732	393423	14.3	15.1	10.8
R9	430677	393444	14.3	15.1	10.8
R10	430582	393305	14.3	15.1	10.8
R11	430719	393355	14.3	15.1	10.8
R12	430840	393370	14.3	15.1	10.8
R13	431079	393354	14.3	14.9	10.6
R14	430704	393316	14.3	15.1	10.8
R15	430988	393041	14.3	15.1	10.8
R16	430918	393035	14.3	15.1	10.8
R17	431756	391994	14.3	15.2	10.9
C1**	428976	397830	14.3	14.2	10.3
C2**	428915	397921	14.3	14.2	10.3
P1*	430002	394357	14.3	14.1	10.2
P2*	430234	394196	14.3	14.1	10.2
P3*	430198	394044	14.3	14.1	10.2
P4*	430583	393941	14.3	14.1	10.2

* These Proposed Receptors are assessed in the 2017 With-Development scenario only

**These Committed Receptors are assessed in the 2017 future scenarios only.

3.4.6 NO_X to NO_2 Conversion

To accompany the publication of the guidance document LAQM.TG(09) (Defra, 2009), a NO_X to NO_2 converter was made available as a tool to calculate the road NO_2 contribution from modelled road NO_X contributions (Defra, 2016c). The tool comes in the form of an MS Excel spreadsheet and uses borough specific data to calculate annual mean concentrations of NO_2 from dispersion model output values of annual mean concentrations of NO_X. Version 4.1 (June 2014) of this tool was used to calculate the total NO_2 concentrations at receptors from the modelled road NO_X contribution and associated background concentration. The 'All other rural UK traffic' option was used.

3.4.7 Bias Adjustment of Road Contribution NO_X, PM_{10} and $PM_{2.5}$

Model verification has been informed by monitoring undertaken by AECOM. These measurement data are for 7 locations within the study area collected between November 2015 and February 2016. The council diffusion tubes were modelled at a height of 2.5 metres. Details of the monitoring sites used in the verification process, and a summary of that process, are shown in **Table 3.6** and in Figure 1 (provided as Appendix A to this report).

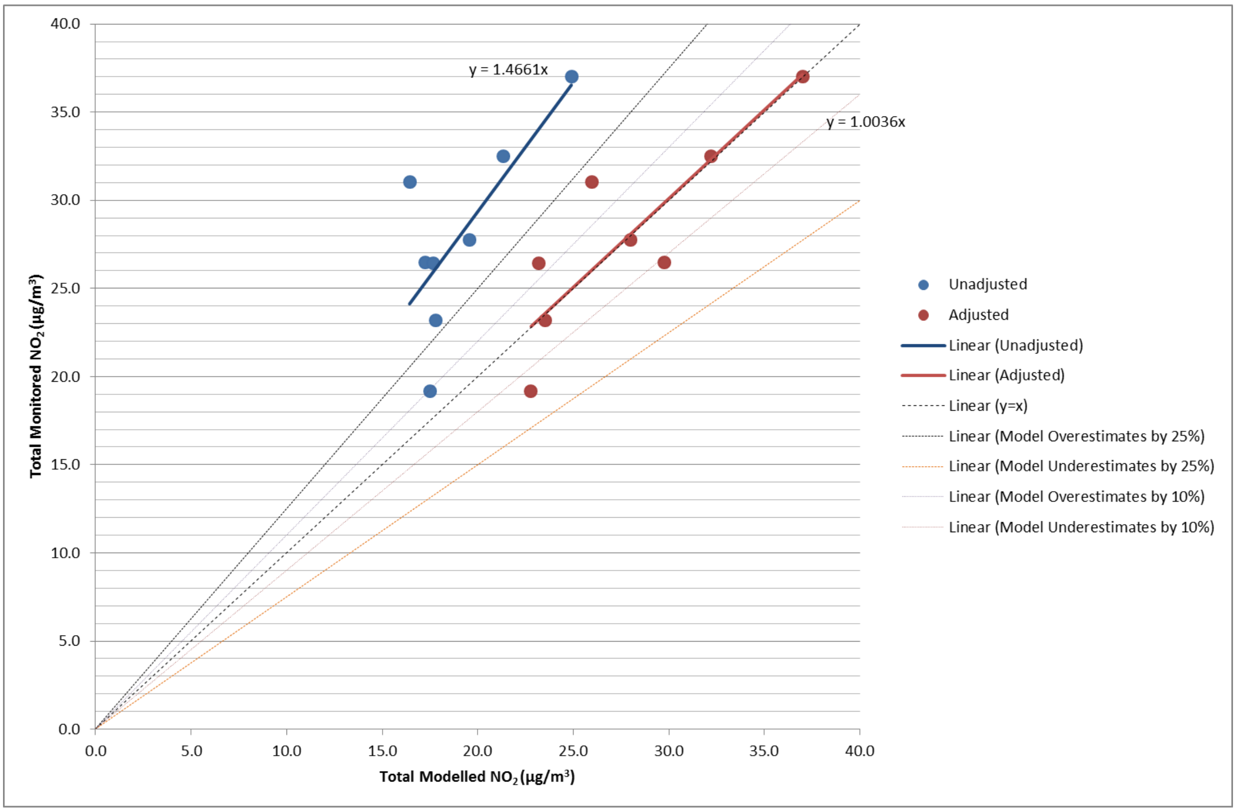
Table 3.6: Summary of Model Performance Prior to Bias Adjustment Process

TUBE I.D	DIFFUSION TUBE DESCRIPTION	HEIGHT (m)	MONITORED TOTAL NO_2 ($\mu g/m^3$)	UNADJUSTED MODELLED TOTAL NO_2 ($\mu g/m^3$)	ADJUSTED MODELLED TOTAL NO_2 ($\mu g/m^3$)	TOTAL NO_2 FACTOR (Monitored/Modelled)
DT3	Roadside	2.4	26.5	26.5	29.8	4.86
DT4	Roadside	2.5	31.1	31.1	26.0	4.86
DT1	Roadside	2	23.2	17.8	23.3	2.75
DT2	Roadside	1.3	32.5	21.3	32.2	2.75
DT5	Roadside	2.3	27.7	19.6	28.0	2.75
DT6	Roadside	2.2	19.2	17.5	22.8	2.75
DT8	Roadside	2.5	26.4	17.7	23.2	2.75
SCC Carr Lane	Urban Background	2.5	37.0	24.9	37.0	2.28

A comparison of the unadjusted predictions and the measured concentrations at these diffusion tube locations is illustrated in Plot 1, by the blue dots and trend line (the dashed lines either side of the centre line indicate y=x +/- 10% and +/- 25%).

The blue dots on the chart (Plot 1) show the variation of unadjusted modelled concentration of total annual mean NO_2 at the measurement (and projected measurement) locations. The red dots show the adjusted modelled concentration of total annual mean at the measurement (and projected measurement) locations. The comparison of measured and modelled concentrations here suggests that the model performed within 25% of measured values across the study area.

Plot 1: Modelled NO_2 verses Monitored NO_2



The uncertainty in the model has been assessed by comparing the adjusted modelled predictions to the measured concentrations of NO_2 and calculating the Root Mean Square Error (RMSE). LAQM TG(09) (Defra, 2009) identifies a standard of model uncertainty, expressed as a RMSE value that is within 10% of the objective value as the ideal. For annual mean nitrogen dioxide 10% of the objective value is 4µg/m^3. The combined RMSE for all the tubes in the study area was 2.9µg/m^3 which can be considered robust.

DT3 is located along Station Lane and DT4 is located along Church Lane both of these roads were on slight gradients with parked cars on road sides where there may have been reduced vehicle speeds compared to the main Langsett Road. Therefore, receptors located near to DT3 and DT4 have been adjusted for bias following the method described in LAQM TG(09) (Defra, 2009). An average bias adjustment factor of 4.86 was calculated for receptors near these diffusion tubes, this bias adjustment factor has been used on R10 (property on Church Street), R12 (property on Waterside) and R13 (property on Station Lane).

DT1 was located near to the Proposed Development entrance, DT2 near to Orchard Street on Langsett Road, DT5 was located on the bend of the road adjacent to Bedford Road, DT6 was located north of the Proposed Development and DT8 was located in Middlewood. These diffusion tubes performed similarly therefore receptors near to these diffusion tubes have been grouped into another bias adjustment factor zone which was 2.75. This bias adjustment factor is applicable for R2, R3, R4 (properties on Langsett Road north of the Proposed Development), R5 (property on Myers Avenue), R6 (property on Bedford Road), R7 and R8 (properties on Orchard Street), R11 (property on Bridge Hill), R9, R14 and R16 (property on Langsett Road South), R15 (property on Forge Hill), R17 (property on Middlewood Road North) and the proposed receptors.

There was also one Sheffield City Council tube located in Deepcar which was used for assessing bias of the ADMS Roads model. The average bias adjustment factor for this site was 2.28 receptors in Deepcar such as R1 (property on Carr Road) and the committed receptors used this bias adjustment factor.

In the absence of suitably located sampled PM_{10} or $PM_{2.5}$ data, the same factor has been applied to the modelled road PM_{10} and $PM_{2.5}$ contributions, as recommended in LAQM.TG(09) (Defra, 2009).

3.4.8 Predicting the Number of Days in which the PM_{10} 24-hour Mean Objective is Exceeded

The guidance document LAQM.TG(03) (Defra, 2003) set out the method by which the number of days in which the PM_{10} 24-hour objective is exceeded can be obtained based on a relationship with the predicted PM_{10} annual mean concentration. The most recent guidance suggests no change to this method. As such, the formula used within this assessment is:

$$\text{No. of } Exceedances = 0.0014 * C^3 + \frac{206}{C} - 18.5$$

Where C is the annual mean concentration of PM_{10}.

3.4.9 Predicting the Number of Days in which the NO_2 hourly Mean Objective is Exceeded

Research projects completed on behalf of Defra (Defra, 2003) have concluded that the hourly mean NO_2 objective is unlikely to be exceeded if annual mean concentrations are predicted to be less than 60 µg/m^3.

In 2003, Laxen and Marner concluded:

"…local authorities could reliably base decisions on likely exceedances of the 1-hour objective for nitrogen dioxide alongside busy streets using an annual mean of 60 µg/m^3 and above."

The findings are further supported by research that revisited the investigation to complete an updated analysis including new monitoring results and additional monitoring sites (AEAT, 2008). The recommendations of this report are:

"Local authorities should continue to use the threshold of 60 µg/m^3 NO_2 as the trigger for considering a likely exceedance of the hourly mean nitrogen dioxide objective."

Therefore this assessment will evaluate the likelihood of exceeding the hourly mean NO_2 objective by comparing predicted annual mean NO_2 concentrations at all receptors to an annual mean equivalent threshold of 60 µg/m^3 NO_2. Where predicted concentrations are below this value, it can be concluded with confidence that the hourly mean NO_2 objective (200 µg/m^3 NO_2 not more than 18 times per year) will be achieved.

3.5 Significance Criteria

3.5.1 Construction Phase Emissions Assessment of Significance

For amenity effects (including that of dust), the aim is to bring forward a scheme, including mitigation measures if necessary, that does not introduce the potential for additional complaints to be generated as a result of the Proposed Development.

Table 3.7: Descriptors Applied to the Predicted Adverse Effects of Fugitive Emissions of Particulate Matter

SIGNIFICANCE OF EFFECT AT SINGLE RECEPTOR	DESCRIPTION
Major	A significant effect that is likely to be a material consideration in its own right.
Moderate	A significant effect that may be a material consideration in combination with other significant effects, but is unlikely to be a material consideration in its own right
Minor	An effect that is not significant but may be of local concern
Negligible	An effect that is not significant change

The scale of the risk of adverse effects occurring due to each group of activities, with mitigation in place is described using the terms high, medium and low risk. The basis for the choice of descriptor is set out for each section. Experience in the UK (IAQM, 2014) is that good site practice is capable of mitigating the impact of fugitive emissions of particulate matter effectively so that in all but the most exceptional circumstances, effects at receptors **Table 3.7** can be controlled to ensure effects are of negligible or slight adverse significance at worse.

3.5.2 Operational Emissions Assessment of Significance

With regard to road traffic emissions, the change in pollutant concentrations with respect to baseline concentrations has been described at receptors that are representative of exposure to impacts on local air quality within the study area. The absolute magnitude of pollutant concentrations in the baseline and with development scenario is also described and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

For a change in annual mean concentration, or hourly mean NO_2 concentration, of a given magnitude, the EPUK and IAQM have published recommendations for describing the effects of such impacts at individual receptors (EPUK and IAQM, 2015).

Table 3.8: Effects Descriptors at Individual Receptors - Annual Mean NO_2 and PM_{10}

ANNUAL MEAN POLLUTANT CONCENTRATION AT RECEPTOR IN ASSESSMENT YEAR	*CHANGE IN ANNUAL MEAN CONCENTRATION OF NO_2/PM_{10} (µg/m^3 AS PROPORTION OF OBJECTIVE VALUE)*				
	< 1% Imperceptible	*1% - 2% Very Low*	*2%-5% Low*	*5% - 10% Medium*	*10% Large*
≤30.2	Negligible	Negligible	Negligible	Slight	Moderate
30.2 – 37.8	Negligible	Negligible	Slight	Moderate	Moderate
37.8 – 41.0	Negligible	Slight	Moderate	Moderate	Substantial
41.0 – 43.8	Negligible	Moderate	Moderate	Substantial	Substantial
≥43.8	Negligible	Moderate	Substantial	Substantial	Substantial

Table 3.9: Effects Descriptors at Individual Receptors - Hourly Mean NO_2

PROPOSED CRITERIA	***PREDICTED 99.8th PERCENTILE HOURLY MEAN NO_2 PROCESS CONTRIBUTION***	***EFFECT DESCRIPTOR***
<10%	< 20μg/m^3	Negligible
10 – 20%	20 - 40 μg/m^3	Slight
20 – 50%	40 - 100 μg/m^3	Moderate
>50%	> 100 μg/m^3	Substantial

A change in predicted annual mean concentrations of NO_2 or PM_{10} of less than 0.1 μg/m^3 is considered to be so small as to be imperceptible. A change (impact) that is imperceptible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

The criteria in **Table 3.8** relate to air quality statistics that are elevated about the objective values in many urban locations, this is not the case with $PM_{2.5}$. A change in the annual mean concentration of $PM_{2.5}$ equivalent to 1% of the objective value is 0.25 μg/m^3. It is unusual for schemes of this type to give rise to a change of more than 0.1 μg/m^3.

All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts on human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered in the definition of the air quality objective values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

3.5.3 Assessment of Significance

The significance of all of the reported impacts is then considered for the development in overall terms. The potential for the scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principle focus is any change to the likelihood of future achievement of the air quality objective values set out in **Table 2.1** for the following pollutants:

- Annual mean nitrogen dioxide (NO_2) concentration of 40 μg/m^3;
- Annual mean particulate matter (PM_{10}) concentration of 40 μg/m^3;
- Annual mean fine particulate matter ($PM_{2.5}$) concentrations of 25 μg/m^3;
- 24-hour mean PM_{10} concentration of 50 μg/m^3 not to be exceeded on more than 35 days per year; and
- 1-hour mean NO_2 concentration of 200 μg/m^3 not to be exceeded on more than 18 times per year

The achievement of local authority goals for local air quality management are directly linked to the achievement of the air quality objective values described above and as such this assessment focuses on the likelihood of future achievement of the air quality objective values.

In terms of the significance of the consequences of any adverse impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'substantial' this is deemed to be 'significant'. Effects found to be 'minor' are considered to be 'not significant', although they may be a matter of local concern. 'Negligible' effects are considered to be 'not significant'.

4 Potential Air Quality Impacts

4.1 Baseline Conditions

4.1.1 Local Authority Ambient Monitoring Data

Sheffield City Council

SCC undertake continuous monitoring of NO_X and PM_{10} at six locations in their administrative area. Defra also undertake continuous monitoring at two locations within Sheffield City Council's administrative area. The six monitors are located at: Firvale School, Tinsley Infant School, Lowfield School, Wicker, King Ecgbert School and Waingate. Annual mean NO_2 concentrations are recorded using diffusion tubes at 274 locations across the district. Only one diffusion tube is located in close proximity to the Proposed Development on Glossop Road in Oughtibridge. Annual mean concentrations at these two locations are well below the annual mean NO_2 objective. AECOM also commissioned a diffusion tube survey (November 2015), the results of which will be used to review the conclusions of this assessment (March 2016).

Concentrations and exceedances of the air quality objectives recorded at five of the continuous monitors and the one NO_2 diffusion tube locations are presented in **Table 4.1** for 2011 to 2014. There have been no exceedances of the annual mean objectives for NO_2 during this period. During this period the number of exceedances of the NO_2 hourly mean objective of 200 $\mu g/m^3$ have remained well below the air quality objectives of no more than 18 times per year.

Table 4.1: Summary of Monitored Annual Mean Concentrations of NO_2 and PM_{10} within Sheffield

SITE NAME	NATIONAL GRID COORDINATES	MONITORING TYPE	SITE TYPE	POLLUTANTS MONITORED	ANNUAL MEAN CONCENTRATION (µg/m^3)			
					2011	2012	2013	2014
PO, Deepcar	428189, 398209	Diffusion Tube	Urban Background	NO_2	32	33	34	33
Carr Road, Deepcar	428818, 397977	Diffusion Tube	Urban Background	NO_2	38	38	**40**	37
Oughtibridge	430725, 393264	Diffusion Tube	Not known	NO_2	No result	No result	No result	20
GH1 Firvale School	436990, 390218	Continuous Monitor	Urban Background	NO_2	21	Not known	Not known	Not known
GH2 Tinsley Infant School	440077, 390794	Continuous Monitor	Urban Industrial	NO_2	36	Not known	Not known	Not known
GH3 Lowfield School	435181, 385366	Continuous Monitor	Urban Centre	NO_2	**41**	Not known	Not known	Not known
GH4 Wicker	435959, 388021	Continuous Monitor	Urban Background	NO_2	36	Not known	Not known	Not known
RM1	RM1 Waingate	Continuous Monitor	Roadside	NO_2	**53**	Not known	Not known	Not known
Sheffield Centre Defra	435158, 386885	Continuous Monitor	Urban Background	NO_2	34	34.7[2]	32.5[2]	Not known
Sheffield Tinsley Defra	440215, 390598	Continuous Monitor	Urban Industrial	NO_2	34	22.0[2]	32.1[2]	34.1[2]

Data from SCC (2012) and (SCC, 2015b) Exceedances are denoted in **bold**.
[2]sourced from the Defra AURN website (Defra, 2015c)

Overall, there is no existing source of measurement data to suggest that the air quality objectives for the pollutants measured are at risk of exceedance in close proximity to the application site. As the continuous monitoring stations are located are greater than 1km from the Proposed Development site.

4.1.2 Site Specific Monitoring

AECOM have carried out a diffusion tube monitoring survey, the details of which are in Section 4.1.2. The locations of the diffusion tubes are presented in **Table 3.1** and in Figure 1 of Appendix A of this report.

4.2 Predicted Baseline Pollutant Concentrations

4.2.1 2015 Baseline Scenario

Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, and the number of exceedances of the 24-hour 50 µg/m^3 PM_{10} air quality objective, at the selected existing receptors during the baseline scenario, are listed in **Table 4.2**.

Table 4.2: Air Quality Statistics Predicted for Baseline Scenario in 2014

RECEPTOR	ANNUAL MEAN CONCENTRATION (µg/m^3) [1]			NO. DAYS PM_{10} >50 µg/m^3
	NO_2	PM_{10}	$PM_{2.5}$	
R1	35.9	16.5	12.0	1
R2	24.9	15.7	11.3	1
R3	23.5	15.5	11.2	1
R4	16.1	14.3	10.4	1
R5	17.9	15.6	11.1	1
R6	23.6	16.3	11.7	1
R7	26.5	16.6	11.9	1
R8	29.2	17.1	12.2	1
R9	24.1	16.3	11.7	1
R10	32.5	17.3	12.4	1
R11	29.3	17.1	12.2	1
R12	29.1	17.1	12.2	1
R13	28.5	16.7	11.9	1
R14	28.4	17.0	12.1	1
R15	26.9	16.9	12.0	1
R16	23.0	16.3	11.6	1
R17	20.1	16.0	11.4	1

[1] **Bold** denotes an exceedance of the air quality objective.

In the 2014 baseline scenario, annual mean concentrations of PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24 hour PM_{10} objective are well below their relative air quality objectives at all receptors located in Deepcar, Oughtibridge and Middlewood.

In the 2017 scenario without the development, **Table 4.3**, concentrations for all pollutants remain the same or are higher than the 2014 concentrations at all receptors, due to the increase in traffic flow. Annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24 hour PM_{10} objective are well below their relative air quality objectives at all receptors in Oughtibridge and Middlewood. However, the receptor located on Carr Lane in Deepcar (R1) is just below the NO_2 air quality objective.

Table 4.3: Air Quality Statistics Predicted for Future Without-Development Scenario in 2017

RECEPTOR	ANNUAL MEAN CONCENTRATION (μg/m^3) [2]			NO. DAYS PM_{10} >50 μg/m^3
	NO_2	PM_{10}	$PM_{2.5}$	
R1	37.4	16.8	12.2	1
R2	26.3	15.9	11.5	1
R3	24.8	15.7	11.3	1
R4	16.3	14.3	10.4	1
R5	18.3	15.6	11.2	1
R6	24.8	16.5	11.8	1
R7	30.1	17.1	12.2	1
R8	30.5	17.3	12.4	1
R9	25.2	16.5	11.8	1
R10	33.6	17.5	12.5	2
R11	30.4	17.3	12.4	1
R12	30.7	17.3	12.4	1
R13	30.1	16.9	12.1	1
R14	29.6	17.2	12.3	1
R15	27.8	17.0	12.2	1
R16	23.8	16.4	11.7	1
R17	20.5	16.0	11.4	1
C1	26.5	15.6	11.3	1
C2	30.6	15.9	11.5	1

[2] **Bold** denotes an exceedance of the air quality objective.

5 Predicted Air Quality Impacts

5.1 Construction Dust Emissions

The nature of specific aspects of the construction works is, as yet, unknown. In the absence of detailed construction information, the assessment of construction dust effects has made several assumptions on the likely activities and phasing to be undertaken during the construction works.

As with the majority of construction projects of this type the early phases of the works are likely to involve excavations and earthworks, temporary stockpiling of potentially dusty materials and the use of unsurfaced haul roads. These activities are likely to be the principal sources of dust during these early phases. During the middle phases, when the buildings are erected the principal sources of dust are likely to be from the cutting and grinding of materials and the movement of construction related road vehicles. The latter phases, when the majority of the buildings and infrastructure are complete, will involve the landscaping and finishing works. During these phases, the principal sources of dust will include the storage, handling and movement of materials generated during the associated earthworks.

There are several receptors in the vicinity of the site which have the potential to be adversely affected by construction phase works. These receptors are located on Langsett Road North, Crag View Crescent and Green Lane. There are also some industrial units located on the site itself which may be sensitive to dust.

The potential impacts considered at the residential properties are:

- Effects on Amenity and Property including changes to the rate of deposition of particulate matter onto glossy surface and other property;
- Changes in 24 hour mean concentrations that might increase the risk of exposure to PM_{10} at levels that could exceed the 24 hour air quality objective.

5.1.1 Demolition

The proposals involve the demolition of the existing commercial buildings off Langsett Road North. Given the size of the buildings and the materials in these structures the demolition works are expected to be medium scale over a short demolition time period. With good site practice demolition would represent a low risk to the nearest receptors.

Mitigation measures considered good practice for demolition include:

- Ensure effective water suppression is used during demolition operations;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives;
- Bag and remove any biological debris or damp down such material before demolition

With good site practice the demolition works would have a minor adverse effect on amenity and a negligible effect on short term PM_{10} concentrations at all receptors.

5.1.2 Earthworks

Site clearance works, the digging of trenches for foundations and utilities and temporary stockpiling of material represent the principal activities that may generate emissions of particulate material.

The potential for stockpiles of materials to generate dust depends on the nature of the material. Earth is soft and friable compared to hardcore. However, hardcore generally has a lower moisture content than soil, and consequently they can both be a potential source of dust.

Standard mitigation measures would be implemented onsite to control emissions of dust and PM_{10} during the earthworks. Such measures are in common use on all well managed construction sites across the UK and, if implemented correctly, have a proven track record of controlling emissions so that a significant effect does not occur. Such mitigation measures considered good practice include:

- Construction of a paved road as early as possible in the earthworks programme;
- 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; and
- Only remove the cover in small areas during work and not all at once.

The risk of amenity effects and the amount of mitigation effort required is strongly influenced by weather conditions at the time of the works. There are several receptors within 350 metres from the Proposed Development site, and there is the potential for earthworks for the Proposed Development to generate dust at these receptors. Given the likely methods of work, scale of materials involved in the earthworks, it is considered that with good site practice, they would have a negligible effect on amenity and a negligible effect on short term PM_{10} concentrations at all receptors.

5.1.3 Construction

Dust emissions during construction can give rise to elevated dust deposition and PM_{10} concentrations. These are generally short-lived changes over a few hours or days, which occur over a limited time period of several weeks or months.

Placing activities which are a potential source of PM_{10} such as cutting and grinding of materials and cement mixing away from boundaries would minimise the possibility of exposure to PM_{10} at receptors within 100 m of the site boundary. If this measure is implemented, then impacts on PM_{10} concentrations at local receptors are capable of being reduced to a negligible level. Good site practice measures during this phase of the project are similar to those described above.

Standard mitigation measures would be implemented onsite to control emissions of dust and PM_{10} during the earthworks. Such measures are in common use on all well managed construction site across the UK and, if implemented correctly, have a proven track record of controlling emissions so that a significant effect does not occur. Such mitigation measures considered good practice include (IAQM, 2014), but are not limited to:

- Avoid scabbling (roughening of concrete surfaces);
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored to prevent dust.

There are several receptors within 350 metres of the Proposed Development site. Given the likely methods of work, scale and materials involved in the construction works, it is considered that with good site practice, the construction works would have a negligible effect on amenity and a negligible effect on short term PM_{10} concentrations at all receptors.

5.1.4 Track-out of Material

The construction vehicles that access the site are likely to do so from Langsett Road North, Manchester Road the A616 leading towards the M1, which are fully paved public roads. Over the course of the works, there may be periods when construction vehicles have to drive over unsurfaced haul ground.

Facilities for the washing of vehicles and vehicle wheels might provide an appropriate means of minimising the potential for material to be transferred onto the local road network. However, the use of washing also leads to wetting of local roads near the access and can, if not carefully managed, spread material further along the local road network. It is not expected that wheel washing will be in operation, as the plant that will be used on any unpaved haul roads are expected to be in operation for a limited amount of time, and are unlikely to have access to the road network offsite. Unpaved onsite haul roads are also likely to be replaced with surfaced roads early on in the construction period. Regular inspection of the local roads within 200 metres of the site access point(s) should be undertaken and street cleaning applied as necessary.

The impact of track-out of material can be minimised by limiting the amount of material transferred onto local roads and by removal of any transferred material from the roads. The impacts associated with the trackout of material can be controlled such that it would have a negligible effect on amenity and on short term PM_{10} concentrations at all receptors.

5.1.5 Summary

The conclusions of the construction dust assessment are summarised in **Table 5.1.** Overall the effects of the construction phase activities are considered to be negligible, which is not considered to represent a significant effect.

Table 5.1: Summary of Construction Phase Emissions Significance, with Mitigation

SOURCE	EFFECTS ON AMENITY AND PROPERTY	ECOLOGICAL EFFECTS	EXPOSURE TO PM_{10} AT LEVELS THAT COULD EXCEED THE 24-HOUR AIR QUALITY OBJECTIVE
Demolition	Minor Adverse	None	Negligible
Earthworks	Negligible	None	Negligible
Construction	Negligible	None	Negligible
Trackout	Negligible	None	Negligible
Overall Significance	Not Significant		

5.2 Operational Road Traffic Emissions

Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour 50 µg/m^3 air quality objective, at the selected air quality sensitive receptors in the opening year (2017), are listed in **Table 5.2**

With the proposed development in operation, annual mean concentrations of PM_{10}, $PM_{2.5}$ and the number of exceedances of the PM_{10} 24 hour objective remain well below their respective national air quality objective values at all existing and proposed receptors considered. Annual mean concentrations of NO_2 are still well below or below the national air quality objective at all the existing and proposed receptor locations considered.

The changes that are predicted to occur as a result of the Proposed Development, in relation to the baseline conditions for each of the sensitive receptors are listed in **Table 5.3**.

The operation of the Proposed Development would lead to a low change in annual mean NO_2 concentrations in the vicinity of residential properties located near Bedford Road (R6), Orchard Street (R7 and R8), Langsett Road South (R9, R14 and R16), Bridge Hill (R11), Station Lane (R12) and Forge Hill (R15). A very low change in annual mean NO_2 concentration is predicted at residential properties located on Langsett Road north of the Proposed Development (R2, R3, R4), Langsett Road south of the Proposed Development (R5), Church Street (R10), and Station Lane , R13), Middlewood (R17), and the committed development in Deepcar (C1 and C2). Imperceptible changes in annual mean NO_2 are predicted at residential properties on Carr Road in Deepcar (R1).

Receptor R7, R8, R9, R11, R12 and R14 are predicted to all have a slight adverse impact in terms of annual mean NO_2 concentration. All other receptors in Deepcar, Oughtibridge and Middlewood are predicted to have a negligible impact in terms of annual mean NO_2 concentration.

The operation of the Proposed Development would lead to a very low change in annual mean PM_{10} at residential properties located near Bedford Road (R6), Orchard Street (R7 and R8) and Langsett Road South (R14). An imperceptible change at residential properties located on Langsett Road north of the Proposed Development (R2, R3, R4), Langsett Road south of the Proposed Development (R5), Church Street (R10), Middlewood (R17) and residential and committed properties on Carr Road in Deepcar (R1, C1 and C2). The annual mean PM_{10} concentrations are well below the objective therefore, a very low change would results in a negligible effect on local air quality.

The operation of the Proposed Development would lead to an imperceptible change for all receptors (except for Orchard Street R8 and Bridge Hill R11 which had a very low change) in terms of exceedance of the PM_{10} 24 hour objective resulting in a negligible effect on local air quality.

The operation of the Proposed Development would lead to a very low change at residential properties located on Orchard Street (R8), and Bridge Hill (R11), and an imperceptible change in annual mean $PM_{2.5}$ at all other receptors. A low change in annual mean $PM_{2.5}$ would result in a negligible effect on local air quality.

Table 5.2: Air Quality Statistics Predicted for the With-Development Scenario in 2017

RECEPTOR	ANNUAL MEAN CONCENTRATION (µg/m³) [3]			NO. DAYS PM_{10} >50 µg/m³
	NO_2	PM_{10}	$PM_{2.5}$	
R1	37.5	16.8	12.2	1
R2	26.5	15.9	11.5	1
R3	25.1	15.7	11.3	1
R4	16.6	14.4	10.4	1
R5	18.7	15.7	11.2	1
R6	25.7	16.7	11.9	1
R7	31.3	17.3	12.4	1
R8	31.5	17.5	12.5	2
R9	26.0	16.6	11.9	1
R10	33.8	17.5	12.5	2
R11	31.2	17.5	12.5	2
R12	31.3	17.4	12.4	1
R13	30.6	17.0	12.1	1
R14	30.4	17.3	12.4	1
R15	28.6	17.2	12.2	1
R16	24.4	16.5	11.8	1
R17	21.0	16.1	11.5	1
C1	26.7	15.6	11.3	1
C2	30.8	16.0	11.6	1
P1	17.5	14.5	10.5	1
P2	16.2	14.3	10.4	1
P3	20.0	14.8	10.7	1
P4	17.8	14.5	10.5	1

[3] **Bold** denotes an exceedance of the air quality objective.

Table 5.3: Predicted Impact of Development at Existing Receptors in 2017

RECEPTOR	ANNUAL MEAN CONCENTRATION (µg/m^3)			NO. DAYS PM_{10} >50 µg/m^3
	NO_2	PM_{10}	$PM_{2.5}$	
R1	+0.1 (Im)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R2	+0.2 (VL)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R3	+0.4 (Lo)	+0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R4	+0.3 (VL)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R5	+0.4 (Lo)	+0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R6	+0.9 (Lo)	+0.2 (VL)	+0.1 (VL)	+<1 (Im)
R7	+1.2 (Lo)	+0.2 (VL)	+0.1 (VL)	+<1 (Im)
R8	+1.1 (Lo)	+0.2 (VL)	+0.1 (VL)	+1 (VL)
R9	+0.8 (Lo)	+0.1 (Im)	+0.1 (VL)	+<1 (Im)
R10	+0.2 (VL)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)
R11	+0.7 (Lo)	+0.1 (Im)	+0.1 (VL)	+1 (VL)
R12	+0.6 (Lo)	+0.1 (Im)	+0.1 (VL)	+<1 (Im)
R13	+0.5 (VL)	+0.1 (Im)	+0.1 (VL)	+<1 (Im)
R14	+0.9 (Lo)	+0.2 (VL)	+0.1 (VL)	+<1 (Im)
R15	+0.8 (Lo)	+0.1 (Im)	+0.1 (VL)	+<1 (Im)
R16	+0.6 (Lo)	+0.1 (Im)	+0.1 (VL)	+<1 (Im)
R17	+0.4 (VL)	+0.1 (Im)	+<0.1 (Im)	+<1 (Im)
C1	+0.2 (VL)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)
C2	+0.2 (VL)	+<0.1 (Im)	+<0.1 (Im)	+<1 (Im)

Magnitude of change displayed in Parenthesis (Im)= imperceptible (VL) = Very Low (Lo)= Low, (M) = Medium, (La) = Large

6 Conclusions

In general, construction activities have the potential to generate fugitive dust emissions as a result of demolition, construction, earth works or track-out of material. For the Proposed Development, the concentrations of any airborne particulate matter generated by these activities would be controlled using on site management practices to the extent that the Proposed Development should give rise to effects of slight/negligible significance on dust deposition rates at the nearest sensitive receptors. The impact of fugitive emissions of PM_{10} at these receptors, with proposed mitigation applied would be negligible. Overall the effect of fugitive emissions of particulate matter (dust and PM_{10}) from the proposed works is considered to be not significant with respect to potential effects on health and amenity.

The advanced dispersion model ADMS-Roads has been used to quantify baseline pollutant concentrations at representative air quality sensitive receptors in the vicinity of the Proposed Development site. In the 2014 baseline and the 2017 Without-Development scenario, all existing receptors experience pollutant concentrations that are well below or below their respective national air quality standards.

With the Proposed Development in operation, the selected receptors would experience an imperceptible, very low or, at worst, low magnitude change in pollutant concentrations, including those receptors located adjacent to the Proposed Development entrance on Langsett Road and near to the junctions of Langsett Road, Orchard Street and Bridge Hill. Since the annual mean concentrations of nitrogen dioxide are well below the national air quality objective at all locations, this is described as a negligible effect. The annual mean concentrations of PM_{10} and $PM_{2.5}$ are all well below their respective air quality objectives at all locations, the maximum change in both pollutants is very low; therefore this is a negligible effect on air quality. In terms of exceedance of the 24 hour PM_{10} objective the maximum change is imperceptible; therefore this is a negligible effect on air quality.

On balance, overall the Proposed Development would have a negligible effect and as such is considered to be not significant with regards to local air quality.

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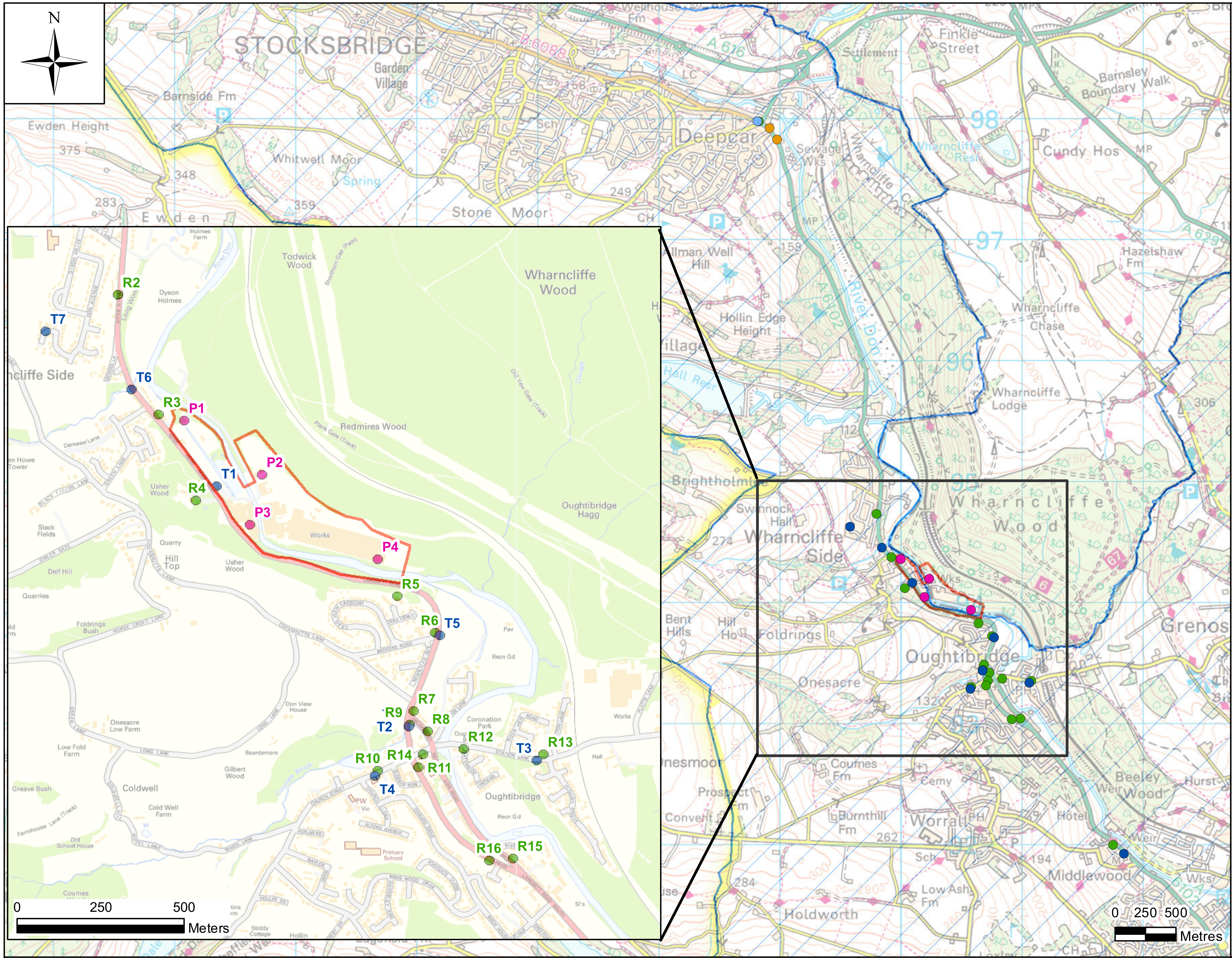
Appendices

Appendix A:

Figure 1 Oughtibridge Air Quality Study Area



LEGEND

- Site Boundary
- Sheffield City Council AQMA
- Sheffield City Council Diffusion Tubes
- AECOM Diffusion Tubes
- Existing Receptors
- Committed Receptors

Client:	CEG
Project:	OUGHTIBRIDGE MILLS, AIR QUALITY ASSESSMENT
Title:	OUGHTIBRIDGE AIR QUALITY STUDY AREA

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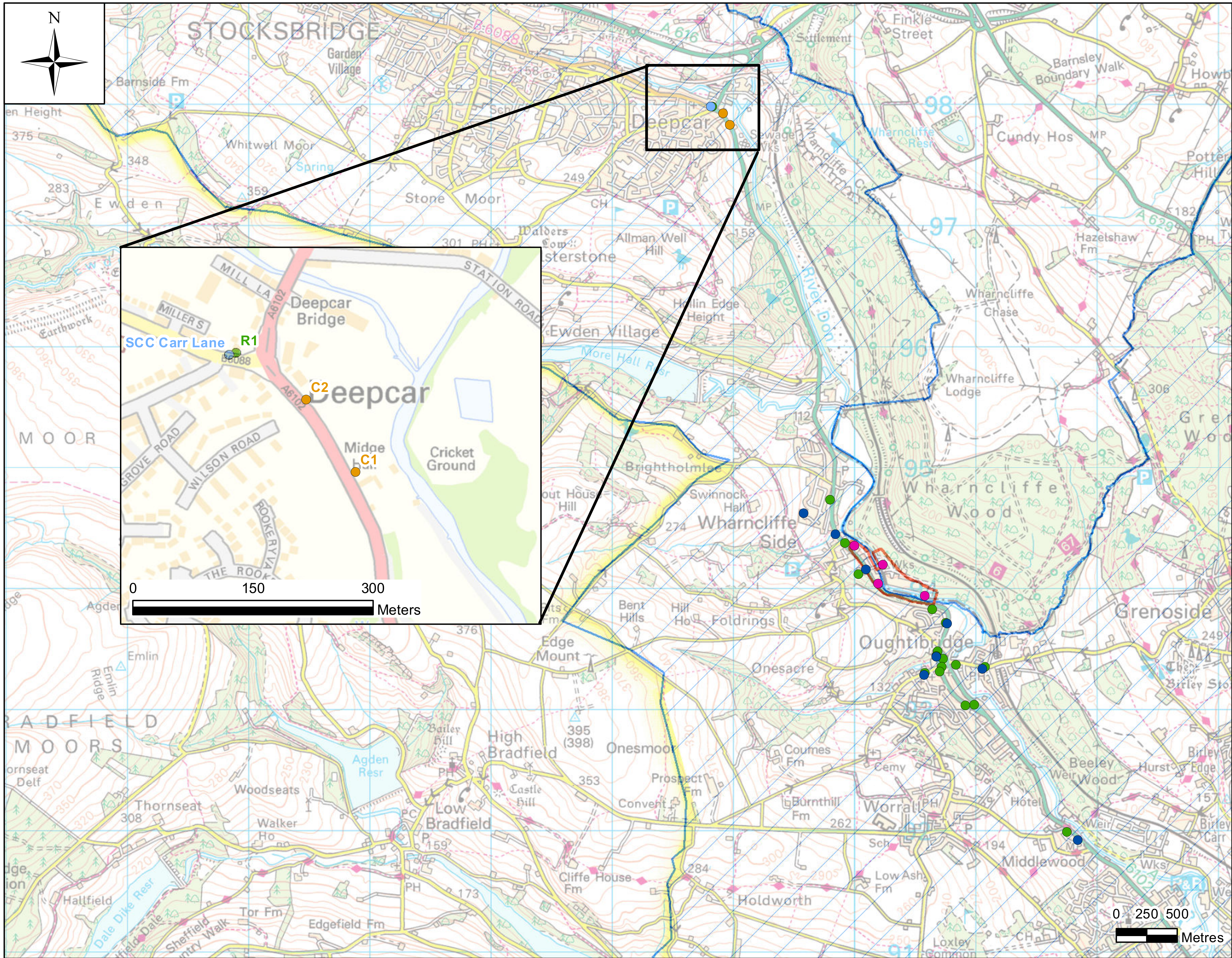
Design:	N/A	Drawn:	JW
Chk'd:	DD	App'd:	GG
Date:	18/03/2016	Scale at A3:	1:33,000
Drawing Number:	FIGURE 1		A3

Figure 2 Deepcar Air Quality Study Area



LEGEND

- Site Boundary
- Sheffield City Council AQMA
- Sheffield City Council Diffusion Tubes
- AECOM Diffusion Tubes
- Existing Receptors
- Proposed Receptors
- Committed Receptors

Client:	CEG
Project:	OUGHTIBRIDGE MILLS, AIR QUALITY ASSESSMENT
Title:	DEEPCAR AIR QUALITY STUDY AREA
Design:	N/A
Drawn:	JW
Chk'd:	DD
App'd:	GG
Date:	18/03/2016
Scale at A3:	1:33,000
Drawing Number:	FIGURE 2
	A3

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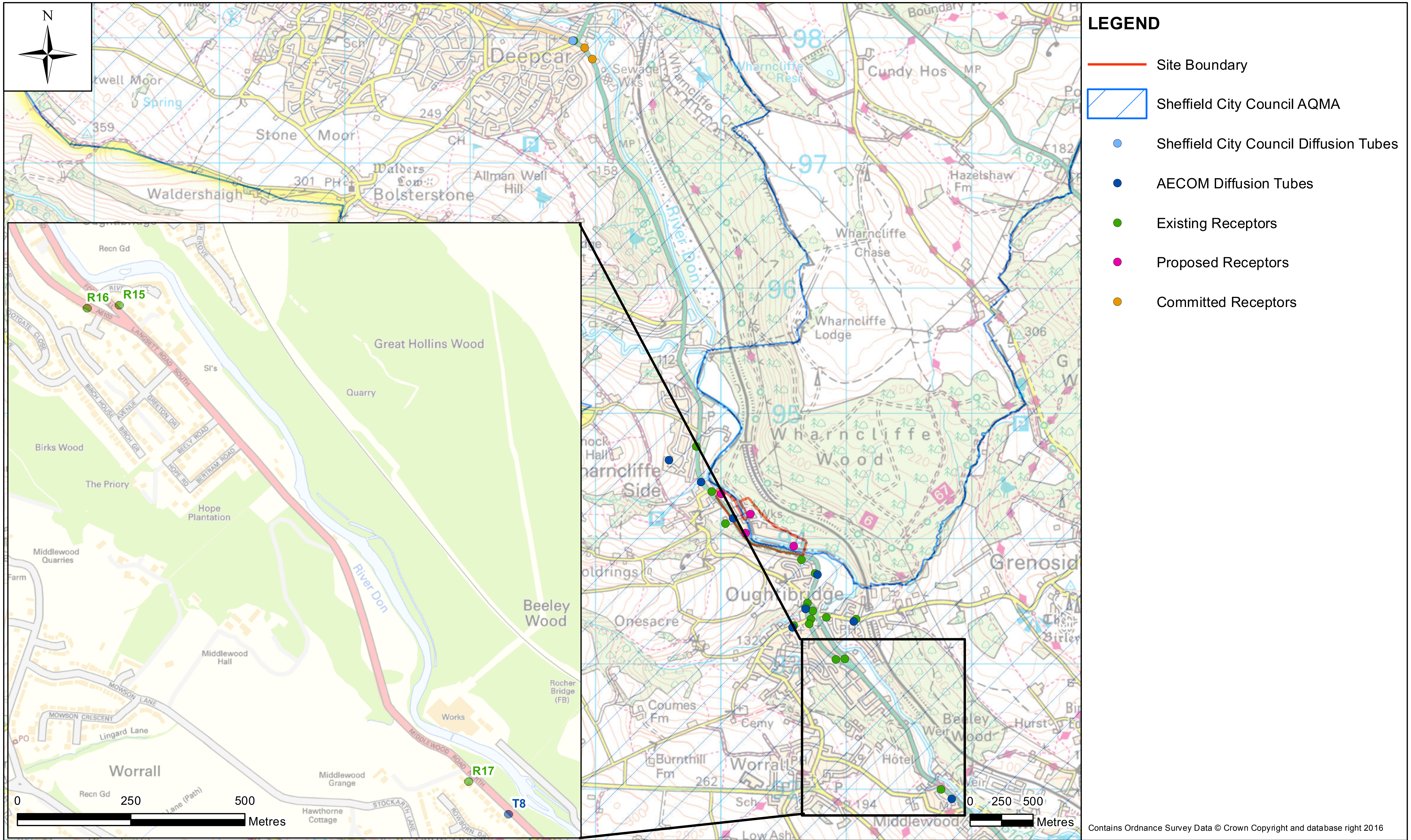
Figure 3 Middlewood Air Quality Study Area



Client: CEG	Title: MIDDLEWOOD AIR QUALITY STUDY AREA	AECOM	Design: N/A	Drawn: JW
Project: OUGHTIBRIDGE MILLS, AIR QUALITY ASSESSMENT		12 Regan Way, Chilwell, Nottingham, NG9 6RZ	Chk'd: DD	App'd: GG
		Tel: +44 (0) 115 907 7000 Fax: +44 (0) 115 907 7001 www.aecom.com	Date: 18/03/2016	Scale at A3: 1:28,000
			Drawing Number: FIGURE 3	A3

Appendix B: Traffic Data

Table 6.1: 2014 Baseline Traffic Data

LINK	AADT	% HDV	SPEED (KPH)
1: Combined flow Langsett Road North (north of site)	8,566	4.0	64.4
2: Combined flow Langsett Road North (south of site)	8,645	3.9	48.3
3: Combined flow Langsett Road North*	4,915	3.0	32.2
4: Orchard Street One Way	5,790	4.0	48.3
5: Combined flow Church Street*	4,517	2.2	20
6: Combined flow Bridge Hill*	2,582	1.2	48.3
7: Combined Flow Station Lane*	7,700	0.8	20
8: Langsett Road South One Way*	5,934	2.8	48.3
9: Forge Hill One Way*	8,710	3.0	48.3
10: Combined Flow Langsett Road South	10,247	2.8	48.3
11: Brighholmlee Lane	1,940	2.8	48.3
12: Dyson Holmes Lane	20	0	48.3
13: A6102 Main Road (north of Brighholmlee Lane)	8,009	4.1	64.4
14: A6102 Manchester Road*	7,566	3.0	96.5
15: B6088 Manchester Road*	10,561	2.9	48.3
16: A6102 Vaughton Hill*	7,611	3.2	48.3

*A Queue has been applied to this link at a speed of 16.1 kph.

Table 6.2: 2017 Without-Development Traffic Data

LINK	AADT	% HDV	SPEED (KPH)
1: Combined flow Langsett Road North (north of site)	10,011	3.6	64.4
2: Combined flow Langsett Road North (south of site)	10,098	3.5	48.3
3: Combined flow Langsett Road North*	5,625	2.8	32.2
4: Orchard Street One Way*	6,589	3.6	48.3
5: Combined flow Church Street*	4,875	2.1	20
6: Combined flow Bridge Hill*	2,680	1.2	48.3
7: Combined Flow Station Lane*	8,361	0.7	20
8: Langsett Road South One Way*	6,715	2.6	48.3
9: Forge Hill One Way*	9,706	2.8	48.3
10: Combined Flow Langsett Road South	11,186	2.7	48.3
11: Brighholmlee Lane	2,117	2.7	48.3
12: Dyson Holmes Lane	21	0	48.3
13: A6102 Main Road (north of Brighholmlee Lane)	9,535	3.6	64.4
14: A6102 Manchester Road*	9,175	2.5	96.5
15: B6088 Manchester Road*	11,785	2.7	48.3
16: A6102 Vaughton Hill*	8,402	3.0	48.3

*A Queue has been applied to this link at a speed of 16.1 kph.

Table 6.3: 2017 With-Development Traffic Data

LINK	***AADT***	***% HDV***	***SPEED (KPH)***
1: Combined flow Langsett Road North (north of site)	10,223	3.5	64.4
2: Combined flow Langsett Road North (south of site)	11,481	3.1	48.3
3: Combined flow Langsett Road North*	6,246	2.5	32.2
4: Orchard Street One Way*	7,352	3.2	48.3
5: Combined flow Church Street*	4,906	2.1	20
6: Combined flow Bridge Hill*	2,680	1.2	48.3
7: Combined Flow Station Lane*	8,669	0.7	20
8: Langsett Road South One Way*	7,335	2.4	48.3
9: Forge Hill One Way*	10,437	2.6	48.3
10: Combined Flow Langsett Road South	12,236	2.5	48.3
11: Brighholmlee Lane	2,139	2.7	48.3
12: Dyson Holmes Lane	21	0	48.3
13: A6102 Main Road (north of Brighholmlee Lane)	9,725	3.5	64.4
14: A6102 Manchester Road*	9,368	2.5	96.5
15: B6088 Manchester Road*	11,828	2.7	48.3
16: A6102 Vaughton Hill*	8,551	3.0	48.3
Site Access Main	*1,258*	*0*	*48.3*
Site Access West 20% of the flow to go this direction	*252*	*0*	*48.3*
Site Access East 80%of the flow to go this direction	*1,006*	*0*	*48.3*

These links have been inferred from the traffic data given.

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