URS

Proposed Development at Low Barugh, Barnsley

Air Quality Impact Assessment

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ABBREVIATIONS

AADT	Annual Average Daily Total flow
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
BMBC	Barnsley Metropolitan Borough Council
CAFE	Clean Air For Europe
CEMP	Construction Environmental Management Plan
CO	Carbon Monoxide
DEFRA	Department of Environment Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EC	European Commission
EU	European Union
HA	Highways Agency
HDV	Heavy Duty Vehicle
km	Kilometres
km/hr	Kilometres per hour
LDV	Light Duty Vehicle
LAQM	Local Air Quality Management
mg/m^3	Milligrammes (of pollutant) per cubic meter (of air)
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter of less than 2.5 µm
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 µm
SO_2	Sulphur Dioxide
TG	Technical Guidance
$\mu g/m^3$	Microgrammes (of pollutant) per cubic meter (of air)
UK	United Kingdom
UNECE	United Nations Economic Community for Europe

GLOSSARY

Term	Meaning Adopted in this Assessment
Air pollutants	Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation and/or materials
Air quality sensitive receptors	People, property or designated sites for nature conservation that may be at risk from exposure to air pollutants that could potentially arise as a result of the proposed development/project
Air quality study area	The area assessed for air quality impacts during this assessment
Ambient air quality	The concentrations of gases and particles in the atmosphere (tropospheric boundary layer) to which the general population would be exposed, as opposed to the concentration of pollutants emitted by a specific source
Annual average daily total flows	A daily traffic flow (24hrs), expressed as a mean daily flow across all 365 days of the year (AADT) in units of vehicles per hour
Annual mean concentration	The average (mean) of the hourly pollutant concentrations measured or predicted for a one year period
Baseline scenario	Scenarios with the proposed development/project not in operation
Construction Environmental Management Plan	A framework developed to address and manage the environmental aspects and impacts related to the construction of the proposed development/project
DMRB screening tool	An empirical computer modelling tool that predicts future air quality levels as a result of road traffic characteristics under different scenarios
Dust	A generic term that BS6069 (Part 2) used to describe particulate matter in the size range 1 – 75 µm (micrometres) in diameter
Dust deposition rates	The rate at which particulate matter is deposited on to surfaces typically expressed in units of mg/m^2/day
Emission factors	The average emission rate of a given pollutant for a given source, relative to units of activity. Used to model future pollution concentrations under different scenarios
EU limit values	Limits set by the European Union on air quality to be achieved by member states. In the UK this EU Directive is prescribed under the Air Quality Limit

	Values (England) Regulations (2003) and subsequent amendments. For nitrogen dioxide the annual mean limit value and the annual mean objective value are set at the same concentration.
Fumes	The Clean Air Act 1993 (s.64) defines fumes as any airborne solid matter smaller than dust. In this assessment fume is considered to be airborne solid matter with a diameter of less than 1 µm.
Gases	Substances presence in ambient air in a gaseous state. For example nitrogen dioxide, sulphur dioxide or carbon monoxide.
Heavy Duty Vehicle	A vehicle type classification, including rigid and articulated heavy goods vehicles, plus buses and coaches, that is used by air quality dispersion models
Imperceptible impact	A change in the annual mean concentration of a pollutant equivalent to 1 % of the relevant air quality limit value or less
Light Duty Vehicle	A vehicle type classification, including motorcycles, cars and light goods vehicles, that is used by air quality dispersion models
National air quality objectives	A series of objectives set by the Government's Expert Panel on Air Quality to be achieved either without exception or with a permitted number of exceedances within a specific timescale. For nitrogen dioxide the annual mean limit value and the annual mean objective value are set at the same concentration
Odour	A substance or combination of substances that has a smell that can be detected by the human nose if present in air at a high enough concentration
Particulate Matter	Solid particles or liquid droplets suspended or carried in the air
Road links	Individual sections of the road network, usually divided by junctions, used in the modelling of scenarios
Smoke	Emissions from combustion that are visible. Typically includes visible emissions from chimneys, stacks and exhaust pipes. See also Particulate Matter and Gases.
Steam	Airborne droplets of water, that might be visible under some atmospheric conditions
Trackout	The transport of mud and other dusty materials from a works area onto the public highway. Usually on the

	wheels and body work of vehicles.
24 hour mean concentration	The average (mean) of the hourly pollutant concentrations measured or predicted for 24 consecutive hours in one day

1 INTRODUCTION

1.1 Introduction

URS Infrastructure & Environment Limited (URS) have been instructed by Hallam Land Management (HLM) and Commercial Estates Projects (CEP) to assess the impact on local air quality of proposals to construct 180 dwellings and associated landscaping works on land at Low Barugh, Barnsley. Since the time of writing, the proposed development has been amended to approximately 150 dwellings, but as this assessment has considered the provision of a greater number of properties it is considered to represent a robust assessment of potential impacts.

The village of Low Barugh is located approximately 3 km northeast of Barnsley city centre. The plot of the proposed development is currently a patch of open land with existing residential properties to the north on Dearne Hall Road, Claycliffe Industrial Park, and a waste water treatment works located 1km east of the proposed site.

Barnsley Metropolitan Borough Council (BMBC) have three declared Air Quality Management Areas for nitrogen dioxide (NO_2) in the vicinity of Low Barugh. AQMA number 1 is located 1.1km west of the proposed site and comprises of an area of the M1 between Junction 35a and Junction 38. AQMA number 314 is located 2.7km south of the site and encompasses the A628 from Junction 37 off the M1 to Town End roundabout. The third AQMA is number 315 and is located 2.9km south west of the proposed site, the area encompasses the A628 from Junction 37 off the M1 to Dudworth Level Crossing.

The potential effects of the proposed development with mitigation, on local air quality sensitive receptors, are considered with respect to existing planning policies. Additional mitigation measures have been recommended where appropriate, to minimise the potential for adverse residual effects from being experienced by sensitive receptors during the construction and operational phases of the proposed development.

1.2 Scope of Works

A review of the published ambient air quality data forms the basis for the prediction of current and future baseline conditions against which the magnitude of predicted impacts due to the proposed scheme 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 100 m of the source of emissions (IAQM, 2012) unless appropriate mitigation measures are adopted. There are receptors located within 100 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 200 m from the site access.

There are no designated ecological sites located within 40 m of the site boundary or within 40 m of roads extending up to 200 m from the site access. Therefore, it is considered highly unlikely that the proposed works could emit dust emissions with the potential to significantly effect the nearest ecological receptor sites and the risk to such sites is not considered further in this assessment.

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:

- 2011 Baseline Scenario (for the purpose of calibrating the dispersion model);

- 2015 Baseline Scenario (indicative opening year without development); and
- 2015 With Development Scenario (indicative opening year with development).

The air quality assessment uses predicted traffic flows for the development derived from the Transport Assessment (TA), prepared by Bryan G Hall, which accompanies the planning application.

The potential effect of existing industrial activities located in Claycliffe Industrial Park, upon air quality and amenity at the proposed residential properties will also be considered.

2 LEGISLATION AND POLICY

2.1 Air Quality Legislation

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the European Union (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).

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 National Planning Policy Framework

The National Planning Policy Framework (NPPF) published in March 2012 (Department for Communities and Local Government, 2012a), paragraph 109 of the NPPF states that:

"*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 Barnsley Metropolitan Borough Council (BMBC) 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 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 different roles of a planning authority and a pollution control authority is addressed by the NPPF in paragraph 122:

"... local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.'

The NPPF is accompanied by Technical Guidance to the National Planning Policy Framework (NPPF-TG) (Department for Communities and Local Government, 2012b). The NPPF does

not include any specific guidance for the assessment of air quality impacts from residential developments, but does provide some broader guidance on assessments of dust impacts from mineral extraction sites.

2.3 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 subsequently 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 WMDC 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	Value	Maximum Permitted Exceedances	Target Data
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

2.4 Local Planning Policy

Barnsley Local Development Framework Core Strategy (BMBC, 2011) considers development in AQMA's in policy 41 noting that:

"development[s] 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."

BMBC also notes that they will only permit:

"development[s] in air quality management area 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."

There are no air quality specific policies within the Yorkshire and Humber Plan (Yorkshire and Humber Assembly, 2008) however, plans to improve congestion and the use of alternative means of transport have the potential for associated reductions in emissions of pollutants from road traffic, and therefore associated improvements in air quality.

2.5 Local Air Quality Management

Under the requirements of Part IV of the Environment Act (1995) (H.M. Government 1995), Barnsley Metropolitan Borough Council has carried out a phased review and assessment of local air quality within their district.

The first round of this review and assessment process, undertaken from 1999 to 2005, led to the declaration of six AQMA's in the District due to the exceedance of the annual mean objective for nitrogen dioxide. In comparing the Borough's air quality against the objectives the 2009 updating and screening assessment concluded that a detailed assessment would be required for additional congested road links and junctions within the Borough. All Barnsley's current AQMAs are summarised by the list below:

1) AQMA Number 1: M1 Motorway, 100 meters either side of the central reservation within the Barnsley Borough;

2) AQMA Number 2A: A628 Dodworth Road;

3) AQMA Number 2B: A628 Barnsley Road;

4) AQMA Number 3: Junction A61 Wakefield Road and Burton Road;

5) AQMA Number 4: A61 Harborough Hill Road;

6) AQMA Number 5: Junction of A633 Rotherham Road and Burton Road

At the time of writing the 2012 Air Quality Progress Report a further two AQMAs are in the process of being declared, the council approval is being requested for these new declarations. The two proposed AQMAs in the Barnsley Borough are: number 6; A616 passing through Langsett, number 7; Junction of A61 Sheffield and A6133 Cemetery Road. The Barnsley Metropolitan Borough Council published their Air Quality Progress Report in 2012 (BMBC, 2012). All of the AQMAs listed above are remote from the proposed development and there is no potential for local air quality to be adversely affected at any of the AQMAs as a result of the proposed development.

A revised action plan was published by BMBC in 2010 (BMBC, 2010) and is currently being consulted upon. For the purpose of this assessment, the air pollution issues raised by the above policies in the action plan are addressed through consideration of the air quality objectives set out within the National Air Quality Strategy.

3 METHODOLOGY

3.1 Overview

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, 2010) or to the assessment of the significance of air quality effects (IAQM, 2009).

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;
- The potential impact of emissions from existing industrial activities at Claycliffe Industrial Park on the proposed development.
- The potential cumulative impact of emissions from proposed back up electricity generators at land off Whaley Road, Barnsley.

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 in Section 3.6.

3.1.1 *Fugitive Emissions of Particulate Matter During the Construction Phase*

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.

'Dust' is defined in BS 6069:1994 (BSI, 1994) as particulate matter in the size range 1µm - 75µm in diameter, and is primarily composed of mineral materials and soil particles. This definition is also referred to in NPPF technical guidance (Department for Communities and Local Government, 2012b) in the context of dust impacts from mineral extraction operations and has been adopted in this assessment.

Respirable particulate matter (PM_{10}) is composed of material with an aerodynamic diameter of less than 10 micrometers (µm), and includes the size fractions of greatest concern to impacts on human health. The majority of construction dust is larger than 10 µm in diameter and, therefore, increased levels of dust in the air do not necessarily equate to an increase in levels of PM_{10}. In general construction dusts rarely represent an adverse risk to human health and are more typically associated with consequences of material depositing onto property.

Particulate matter may have an impact whilst airborne or as a result of its deposition onto a solid or liquid surface. Consequently 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 3.1 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 considered to be more sensitive to the impact of material becoming soiled by depositing material, than residential properties or schools are.

TABLE 3.1: 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 Schools Hospitals and clinics	Receptor sensitivity was considered when Air Quality Objective Value was set.
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
	Museums 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
	Museums and Galleries	High
	Residential properties	Medium
	Food retailers	Medium
	Offices	Medium
	Horticultural Land	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
	Horticultural Land	Low
	Agricultural Land	Low

This assessment is consistent with the overarching approach to the assessment of the impacts of construction and the determination of their significance set out in current guidance from the Institute of Air Quality Management (IAQM, 2012). The method adopted for this assessment differs from the IAQM's guidance in taking a more conservative, site specific approach to assigning the significance of potential effects. The assessment considers the significance of potential effects with standard mitigation in place and recommends mitigation measures appropriate to the identified risks to receptors.

3.1.2 *Road Traffic Emissions*

The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, and sulphur dioxide (SO_2), carbon monoxide (CO), 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 NO_X, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. NO_2 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.

Exhaust emissions from road vehicles affect the concentrations of principal pollutants of concern, NO_2, PM_{10} and $PM_{2.5}$, at sensitive receptors in the vicinity of the development. Therefore, these pollutants will be the focus of the assessment of the significance of road traffic impacts.

Although SO_2, CO, 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 proposal. Road traffic emissions of these substances have been reviewed by the local authority and nowhere within the BMBC 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 therefore not considered further within this assessment.

The magnitude of road traffic emissions for the baseline, including committed development such as the new ALDI on Barugh Green Road and with development scenarios are calculated from traffic flow data. The assessment considers the operational phase impact of road traffic emissions at receptors adjacent to roads in the vicinity of the proposed development.

This assessment follows current guidance for the determination of baseline pollutant concentrations, and uses emissions factors for road traffic from the Highways Agency's current emissions factors toolkit EFT 5.1.2.

3.1.3 *Construction Phase Road Traffic Emissions*

The construction phase of the proposed development is likely to lead to a small increase in the number of vehicles on the local highway network, for the duration of the construction works only. Environmental Protection UK (EPUK) (EPUK, 2010) set out criteria to establish the need for an air quality assessment for the construction phase of a development as being:

"Large, long-term construction sites that would generate large HGV flows (>200 per day) over a period of a year or more."

It is unlikely that a development of this size would lead to this number of vehicle movements. The additional number of vehicle movements is not considered to be high enough to have the potential to cause a significant adverse effect at any local air quality sensitive receptor. Construction phase road traffic emissions are not considered further as it can be concluded with confidence that the effect on local air quality sensitive receptors will not be significant

3.1.4 *Potential Impact of Emissions from Industrial Activities*

The potential for releases to atmosphere from Claycliffe Industrial Park to cause air quality impacts on proposed future residential properties is assessed using a qualitative simple screening assessment methodology. The likely significance of the effect of such impacts on amenity is discussed, taking into account the proximity of the source of the emissions and the effectiveness of commonly applied best practice techniques to control emissions.

3.1.5 *Use of Measurement Data*

Barnsley Metropolitan Borough Council undertakes extensive monitoring and measurement of concentrations of NO_2 and PM_{10} within the area, in support of its local air quality management review and assessment process. This is achieved with both continuous monitoring sites, for NO_2 and PM_{10}, and diffusion tubes for NO_2.

Although Barnsley Metropolitan Borough Council has 5 continuous monitoring sites located in their geographical area there are none in close proximity to the proposed development. There are, however 2 roadside diffusion tubes located in Low Barugh, one of which has been used to verify the output of the model.

As the diffusion tubes in Low Barugh are in roadside locations and are therefore able to be used to adjust the bias in the modelled road contribution they cannot be used as a source of background data. In the absence of locally sampled background NO_2 and PM_{10} concentrations, the air quality background maps hosted by Defra (Defra, 2012) have been used to source background concentrations, following the procedure described in Local Air Quality Management Technical Guidance (2009) (LAQM TG(09)) (Defra, 2009).

3.2 Air Quality Sensitive Receptors

3.2.1 *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 boundary of the site in each direction. These receptors have the potential to experience impacts of greater magnitude due to emissions of particulate matter generated by the works, when compared with other more distant receptors, or less sensitive receptors.

There are a number of receptors that are sensitive to dust in the immediate vicinity of the proposed development site. These receptors include medium sensitivity residential properties surrounding the site off Dearne Hall Road (B6428), Claycliffe Road (A637) and Barugh Lane (B6428). The location of these receptors relative to the application site boundary is illustrated on Figure 1 in Appendix A.

3.2.2 *Receptors Potentially Affected by Emissions from Road Traffic*

The concentration of road traffic emitted pollutants 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.

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 road traffic emissions are quantified at 9 existing representative receptors in the vicinity of the scheme and local highway network, where there is the potential for a significant change in road traffic flows. With development concentrations have also been predicted at 2 proposed residential receptors, located on the development site itself. Each of the receptors chosen represents the maximum level of exposure that would be experienced at other receptors in their vicinity. The receptors are listed in Table 3.2 and their location displayed in Figure 1 in Appendix A.

The design of the proposed development has not yet progressed to the detailed stage and the precise layout of the site has not been determined, although it has been decided where development will be located. For this reason, the two receptors chosen have been selected as being representative of the closest locations to the proposed spine road within the

development where dwellings may be constructed, rather than actual planned locations of properties.

TABLE 3.2: AIR QUALITY SENSITIVE RECEPTORS

Receptor	Description	Grid Reference
R1	A637/ B6428 Junction	431474 408581
R2	Barugh Lane	431431408527
R3	Deepdale Close, adjacent to Claycliffe Road	431529 408497
R4	A637/ Dearne Hall Road Junction	431454 408707
R5	A637 between Barugh Lane and Dearne Hall Road	431463 408652
R6	Dearne Hall Road	431495 408749
R7	Dearne Hall Road	431694 408916
R8	Dearne Hall Road	431813 408995
R9	Claycliffe Lane	431520 408554
R10	Royal Hotel, Barnsley Road	431438 408654
R11	Future residential, proposed development site	431511 408610
R12	Future residential, proposed development site	431686 408646

3.2.3 ***Receptors Potentially Affected by Emissions from Industrial Activities***

The proposed residential properties in the southern part of the application site would be closer to the BRC manufacturing site than existing dwellings on Dearne Hall Road and along Claycliffe Road.

Prevailing winds at the application site are typical of UK conditions and blow from the south western quarter. Areas to the north and north east of the industrial estate would therefore be exposed to industrial emissions more frequently than receptors located in other areas. This would place some parts of the application site, particularly the south eastern corner, generally downwind of the BRC manufacturing site. The site would be less likely to be downwind of the Charcon Precast Solutions Aggregates facility to the south east on Whaley Road for much of the time.

3.3 Prediction of Construction Phase Impacts

At present, there are no statutory UK or EU standards relating to 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 mitigation measures, beyond those inherent in the proposed design, that are identified as being necessary in the impact assessment, will be applied during works (possibly secured by planning conditions, legal requirements or required by regulations) to ensure potential significant adverse effects do not occur.

Examples of accepted good site practice include guidelines published by the Building Research Establishment (Building Research Establishment, 2003), the Greater London Authority (Greater London Authority, 2006) and considerate contractor schemes.

A qualitative assessment has been undertaken to assess the significance of any effects on sensitive receptors. The steps in the assessment process are to consider potential sources of emissions on the basis of the four main activity groupings of Demolition, Earthworks, Construction and Trackout. 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 significant of the effects predicted.

The steps are:

- identify the nature, duration and the location of activities being carried out;
- establish the risk of significant effects occurring as a result of these activities;
- review the proposed or embedded mitigation against good site practice;
- identify additional mitigation measures, if necessary, to reduce the risk of a significant adverse effect occurring at receptors; and
- summarise the overall effect of the works with respect to fugitive emissions of particulate matter and then report the significance of the effects.

3.4 Prediction of Air Quality Impacts from Road Traffic

This assessment has used the latest version of dispersion model software 'ADMS-Roads' 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, 2010).

3.4.1 *Dispersion Model Input Data and Model Conditions*

Details of general model conditions are provided in Table 3.3.

TABLE 3.3: GENERAL ADMS-ROADS MODEL CONDITIONS

Variables	Model Input
Surface roughness at source	0.5 m
Minimum Monin-Obukhov length for stable conditions	30 m
Terrain types	Flat
Receptor location	x,y coordinates determined by GIS z =1.5m
Road traffic emissions	NO_X, PM_{10}, $PM_{2.5}$
Road traffic emission factors	UK EFT v5.1.3
Road traffic emission profiles	Profile from traffic counts on A637
Meteorological data	1 year (2011) hourly sequential data from Church Fenton meteorological station
Receptors	Selected receptors only
Model output	Long-term annual mean NO_X concentrations Long-term annual mean PM_{10} concentrations Long-term annual mean $PM_{2.5}$ concentrations

3.4.2 *Traffic Data*

The traffic data used within this assessment has been provided by Bryan G Hall, who carried out traffic counts and predictions to inform this assessment. A summary of the traffic data used is provided in Appendix B.

The baseline and operational traffic data includes a consideration of the increased traffic associated with the new ALDI development on Barugh Green Road and the nearby North Gawber Colliery scheme.

3.4.3 *Meteorological Data*

One year (2011) of hourly sequential observation data from Church Fenton meteorological station has been used in this assessment. The station is located approximately 35 km northeast of the site and experiences meteorological conditions that are representative of the conditions experienced in the Barnsley area.

3.4.4 *Background Data*

As discussed in section 3.2 background data has been sourced from Defras background maps (Defra, 2012). Contributions to annual mean NO_x, PM_{10} and $PM_{2.5}$ from primary road sources were removed from the background as they are specifically modelled in this assessment. The background data for the grid square containing the proposed development have been used in this assessment, and are set out in Table 3.4. Due to the uncertainty in the assumption that year on year background NO_2 concentrations will decrease, 2011 background data has been used for both the baseline and future year assessment.

TABLE 3.4: ANNUAL MEAN BACKGROUND POLLUTANT CONCENTRATION DATA				
Grid square	**NO_X ($\mu g/m^3$)**	**NO_2 ($\mu g/m^3$)**	**PM_{10} ($\mu g/m^3$)**	**$PM_{2.5}$ ($\mu g/m^3$)**
431500, 408500	26.27	18.14	15.57	10.74

3.4.5 ***Bias Adjustment of Road Contribution Pollutant Concentrations***

As described in Section 3.1.5, a diffusion tube operated by Barnsley Metropolitan Borough Council has been used in the model verification process for this assessment. The verification process has followed the methodology described in LAQM TG(09) (Defra, 2009)

The tube is situated in a kerbside location to the northeast of the Claycliffe Road/Barugh Lane roundabout. Due to its kerbside location adjacent to the roundabout, the diffusion tube was not representative of any of the receptor locations considered in this assessment. As such, Air Quality Consultants' "NO_2 with Distance from Roads Calculator (Issue 3)" (Defra, 2009) was used to adjust the concentration measured at the tube location to a concentration that is representative of that experienced at the nearest building façade. This location was now representative of receptors situated adjacent to Claycliffe Road. A summary of the verification process is shown in Table 3.6 below.

TABLE 3.6: SUMMARY OF BIAS ADJUSTMENT PROCESS			
Diffusion Tube	**Monitored Road NO_x ($\mu g/m^3$)**	**Modelled Road NO_x ($\mu g/m^3$)[a]**	**Adjusted Modelled Road NO_x ($\mu g/m^3$)[b]**
Junc A637/B6428 Roundabout	28.1	21.4	1.3

A comparison was made of the measured annual mean NO_2 concentration obtained at this tube location (adjusted back to the façade of the properties on Claycliffe Road) in 2011, with predicted annual mean NO_2 concentrations in 2011 for the same location. It was found that the model under predicted annual mean NO_2 concentrations by a little more than 10 %. As such, the factor obtained from a comparison of the measured and modelled road NO_X contributions from the same location was applied to model predictions.

This approach has been adopted for other primary pollutants and the road source contributions to annual mean concentrations of PM_{10} and $PM_{2.5}$ have been factored similarly.

3.4.6 ***NO_X to NO_2 Conversion***

To accompany the publication of the guidance document LAQM TG(09), 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. 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. This tool was used to calculate the total NO_2 concentrations at receptors from the modelled road NO_X contribution. Due to the location of the proposed development, the 'All Other Urban Traffic' setting has been selected.

3.4.7 ***Predicting the Number of Days in which the PM_{10} 24-hr Mean Objective is Exceeded***

The guidance document LAQM TG(03) set out the method by which the number of days in which the PM_{10} 24-hr objective is exceeded can be obtained based on a relationship with the predicted PM_{10} annual mean concentration. The most recent guidance (Defra, 2009) 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}.

3.5 Prediction of Impacts from Existing Industrial Activities

The potential for emissions from industrial sites to affect future sensitive receptors within the proposed development site is considered using a qualitative simple screening assessment methodology. The assessment takes into account:

- the position of receptors in relation to emission sources;
- the type, frequency and probable intensity of emissions;
- prevailing meteorological conditions;
- the effectiveness of standard best practice methods to control odour emissions;

to predict the overall likelihood that proposed properties will be exposed to air quality impacts of a frequency and magnitude that would make complaints from future residents likely to occur.

3.6 Method for Assessment of Significance

3.6.1 ***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 3.5: DESCRIPTORS APPLIED TO THE PREDICTED ADVERSE EFFECTS OF FUGITIVE EMISSIONS OF PARTICULATE MATTER

Significance of Effect at Single Receptor	Description
Substantial	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 that 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, 2012) 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 3.5) can be controlled to ensure effects are of negligible or minor adverse significance at worse.

3.6.2 *Road Traffic Emissions Assessment of Significance*

With regard to road traffic emission, the change in pollutant concentrations with respect to baseline concentrations has been quantified 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 quantified and this is used to consider the risk of the air quality limit values being exceeded in each scenario.

For a change of a given magnitude, the Institute of Air Quality Management have published recommendations for describing the magnitude of impacts at individual receptors (Table 3.6) and describing the significance (Table 3.7) of such impacts (IAQM, 2009).

TABLE 3.6: MAGNITUDE OF CHANGES IN AMBIENT POLLUTANT CONCENTRATIONS OF NO_2 AND PM_{10}

Magnitude of Change	Annual Mean Concentrations of NO_2 ($\mu g/m^3$)	Annual Mean Concentrations of PM_{10} ($\mu g/m^3$)	Exceedances of the 24-hr mean objective for PM_{10} (days)
Large	Increase/decrease > 4	Increase/decrease > 4	Increase/decrease > 4
Medium	Increase/decrease 2 – 4	Increase/decrease 2 – 4	Increase/decrease 2 to 4
Small	Increase/decrease 0.4 – 2	Increase/decrease 0.4 – 2	Increase/decrease 1 to 2
Imperceptible	Increase/decrease < 0.4	Increase/decrease < 0.4	Increase/decrease < 1

A change in predicted annual mean concentrations of NO_2 or PM_{10} of less than 0.4 $\mu g/m^3$ is considered (IAQM, 2009) 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 magnitude of the change in the predicted number of exceedences of the 24-hour objective is directly derived from the predicted annual mean value using the relationship defined in the DMRB Screening Tool. The magnitude descriptors in the table above are as proposed by Environmental Protection UK (EPUK, 2010).

The criteria in Table 3.7 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 $\mu g/m^3$. It is unusual for schemes of this type to give rise to a change of more than 0.1 $\mu g/m^3$.

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.

TABLE 3.6: AIR QUALITY IMPACT DESCRIPTORS FOR CHANGES IN AMBIENT POLLUTANT CONCENTRATIONS OF NO_2 AND PM_{10}			
Absolute Concentration in Relation to Objective/Limit Value	**Change in Concentration**		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value *With* Scheme (>40 µg/m^3)	Minor Adverse	Moderate Adverse	High Adverse
Just Below Objective/Limit Value *With* Scheme (36-40 µg/m^3)	Minor Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value *With* Scheme (30-36 µg/m^3)	Negligible	Minor Adverse	Minor Adverse
Well Below Objective/Limit Value *With* Scheme (<30 µg/m^3)	Negligible	Negligible	Minor Adverse
Decrease with Scheme			
Above Objective/Limit Value *Without* Scheme (>40 µg/m^3)	Minor Beneficial	Moderate Beneficial	High Beneficial
Just Below Objective/Limit Value *Without* Scheme (36-40 µg/m^3)	Minor Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value *Without* Scheme (30-36 µg/m^3)	Negligible	Minor Beneficial	Minor Beneficial
Well Below Objective/Limit Value *Without* Scheme (<30 µg/m^3)	Negligible	Negligible	Minor Beneficial

For receptors that are predicted to experience a perceptible change, the effect of the change on local air quality and the risk of exceeding the air quality objective value is summarised in Table 3.6. A small increase in annual mean concentrations, at receptors exposed to baseline concentrations that are just below the objective value (36 µg/m^3 to 40 µg/m^3) is considered to have a minor adverse effect as the small increase in the risk of exceeding the objective value is significant. However, a small increase in annual mean concentration at receptors exposed to baseline concentrations that are below or well below (< 36 µg/m^3) is not likely to affect the achievement of the objective value and is therefore not a significant effect (negligible).

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; and

- 24-hour mean PM_{10} concentration of 50 µg/m^3 not to be exceeded on more than 35 days 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'.

3.6.3 *Assessment of Significance of Emissions from Existing Industrial Activities*

As for other amenity effects such as construction dust, it is intended that the scheme (including mitigation measures where necessary) would be designed such that impacts would give rise to negligible or minor effects at the closest receptors off site.

The magnitude of the impact on amenity of receptors exposed to industrial emission sources will be considered with respect to the potential for the receptor to be aware of the impact relative to baseline conditions. The magnitude of impact descriptors are set out in Table 3.7.

TABLE 3.7: DEFINITION OF INDUSTRIAL EMISSIONS EFFECTS

Significance of Effect at Single Receptor	Description
Substantial	An impact that is likely to be intolerable for any more than a very brief period of time and is very likely to cause complaints
Moderate	Impact is likely to cause annoyance and might cause complaints, but can be tolerated if prior warning and explanation has been given.
Minor	Impact may be perceptible, but of a magnitude or frequency that is unlikely to cause annoyance to a reasonable person or to cause complaints.
Negligible	Impact is unlikely to be noticed by sensitive receptors.

4 BASELINE CONDITIONS

Local air quality is influenced by a combination of background air quality, which is representative of the general levels of pollution in the area away from busy roads and industrial activity (in parks and quiet residential areas, for example), and added emissions from local emission sources (such as roads and industry).

There are a number of automatic stations and passive monitors located within a reasonable distance of the site Barnsley Metropolitan Borough Council on which to base an assumption of existing and past baseline air quality conditions. The Defra Local Air Quality Management Background Maps (Defra, 2012) also provide an indication of conditions in the area (see Section 3.4.4).

4.1 Baseline Dust and Local Industrial Emissions

A background level of dust exists in all urban and rural locations in the UK. Dust can be generated on a local scale from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity. The concentrations of dust can vary depending on various parameters such as meteorological conditions and time of year.

Residents currently experience dust deposition at a rate that is determined by the contributions of local and distant sources. This baseline rate of soiling is considered normal and varies dependent on prevailing climatic conditions. The tolerance of individuals to deposited dust is therefore shaped by their experience of baseline conditions.

Existing local sources of particulate matter include windblown dust from agricultural land, local industrial sources, exhaust emissions from energy plant and road vehicles, break and tyre wear from road vehicles and the long range transport of material from outside the study area.

Barnsley Metropolitan Borough Council have been consulted on the past complaint history from existing residents in the vicinity of local industry. There is no recorded history of complaints from BRC manufacturing, the closest facility to the application site. There have been complaints regarding dust emissions from the Charcon Aggregates site (approximately 380 m to the south east), but these have originated from locations closer to the aggregates facility rather than receptors near to the proposed development.

4.2 Monitoring and Measurement Data

Barnsley Metropolitan Borough Council undertakes monitoring and measurement of concentrations of NO_2 and PM_{10} within the area, in support of its local air quality management review and assessment process (BMBC, 2012).

Table 4.1 shows annual mean NO_2 and PM_{10} concentrations measured by BMBC at nearby monitoring locations within the district. The NO_2 concentrations were obtained using diffusion tubes.

The annual mean NO_2 concentrations measured at the A637 / B6428 roundabout show that concentrations at the roadside are at risk of exceeding the annual mean air quality objective value. Despite not being situated in a background location, the PM_{10} concentrations measured in Royston are well below the annual mean objective.

TABLE 4.1: MONITORING DATA WITHIN BMBC AREA (µg/m^3)							
Address	**Site Type**	**NO_2 (µ/m^3)**			**PM_{10} (µ/m^3)**		
		2009	**2010**	**2011**	**2009**	**2010**	**2011**
Junction A637/ B6428 (roundabout)	Roadside	n/a	39.5	38.1	-	-	-
Barugh Green Rd/ Higham Com'n Road	Roadside	n/a	35.7	34.7	-	-	-
Royston	Urban Industrial	-	-	-	21	20	22

4.2.1 ***Predicted Baseline Pollutant Concentrations***

Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hr 50 µg/m^3 air quality objective, at the selected existing receptors during the baseline scenarios, are listed in Table 4.3.

Annual mean concentrations of NO_2 are not at risk of being exceeded in the baseline year of 2011. The highest predicted concentration is in the vicinity of receptor R1 near to the A637 / B6428 junction, which is 33.9 µg/m^3. Lower concentrations are predicted at the other receptor locations, although concentrations in the area around R4 (the junction of the A637 and Dearne Hall Road) are elevated in comparison to other parts of the air quality study area.

By 2015 projected improvements in emissions from road vehicles are predicted to reduce annual mean concentrations of NO_2 across the study area. At R1 the annual mean concentration is predicted to fall from 33.9 µg/m^3 in 2011 to 31.7 µg/m^3 in 2015, despite growth in baseline traffic flows due to committed development (including the Aldi supermarket).

In 2011 and 2015, baseline annual mean concentrations of PM_{10} and $PM_{2.5}$ are predicted to be well within the air quality objective for that pollutant at all locations within the air quality study area. The number of exceedances of the 24-hr PM_{10} objective is also well below the relevant air quality objective.

TABLE 4.3: AIR QUALITY STATISTICS PREDICTED FOR BASELINE SCENARIOS IN 2011 AND 2015

Receptor	Year	Annual Mean Concentration (µg/m^3)			No. Days PM_{10} >50 µg/m^3
		Annual Mean NO_2 (µg/m^3)	Annual Mean PM_{10} (µg/m^3)	Annual Mean $PM_{2.5}$ (µg/m^3)	
R1	2011B	33.9	17.8	12.3	2
	2015B	31.7	17.5	12.0	2
R2	2011B	23.7	16.4	11.2	1
	2015B	22.1	16.5	11.2	1
R3	2011B	20.9	16.0	11.0	1
	2015B	20.0	16.0	11.0	1
R4	2011B	29.6	17.5	12.0	2
	2015B	27.4	17.5	12.0	2
R5	2011B	27.5	17.1	11.7	1
	2015B	25.8	17.1	11.7	1
R6	2011B	23.6	16.7	11.3	1
	2015B	22.9	16.5	11.3	1
R7	2011B	22.4	16.6	11.2	1
	2015B	22.1	16.4	11.2	1
R8	2011B	22.1	16.4	11.1	1
	2015B	21.8	16.4	11.1	1
R9	2011B	28.9	17.4	12.0	2
	2015B	26.9	17.5	11.7	1
R10	2011B	26.9	17.0	11.7	1
	2015B	23.6	16.4	11.2	1
Objective Value		**40**	**40**	**25**	**35**

5 PREDICTED IMPACTS

5.1 Construction Dust Emissions

The nature and duration of specific aspects of the construction works are, 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, leading to a conservative assessment of effects.

In this instance, the proposed development site is currently open agricultural land, which will need to be cleared and prepared prior to the construction of the proposed residential development. During the early phases of the majority of construction projects, works usually involve excavations and earthworks, temporary stockpiling of potentially dusty materials and the use of unsurfaced haul roads, which are often the principle sources of dust during these early phases.

During the middle phases, when the buildings are erected, the principle 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.

The receptors located close enough to the application site to potentially be adversely effected by the works, are residential properties on Pontefract Road, Mews Court, Victoria Street and Vicarage Lane. The land to the majority of the east and west of the site is considered to be of low sensitivity to impacts resulting from the fugitive emission of particulate matter.

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-hr mean concentrations that might increase the risk of exposure to PM_{10} at levels that could exceed the 24-hr air quality objective.

5.1.1 *Demolition*

The proposals involve the demolition of No. 1 and No. 3 Claycliffe Road to allow the construction of the new compact roundabout. Given the size and materials in these structures the demolition works are considered to be small in scale over a short time period, and with good site practice represent a low risk to the nearest receptors.

Mitigation measures considered good practice include:

- demolition of building to be undertaken in a phased and controlled manner, especially in this instance as the activity would be undertaken at locations within 100 m of the nearest receptors;
- regular inspections of works for visible signs of emissions of dust and early application of measures to minimise emissions at source;
- considerate location of temporary storage of dusty materials and material transfer operations on land that is not between site access and nearest receptors; and
- operation of mobile crushing plant to requirements of permit.

With good site practice the demolition works would have a minor adverse effect at worse on amenity and 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.

Mitigation measures considered good practice include:

- agree lines of communication between local authority pollution control officer and contractor(s) prior to commencement of works and procedure for reporting dust events or complaints from local residents;
- minimise drop heights and chutes where practicable;
- during extended periods of dry weather (especially over holiday periods) plan for additional mitigation measures to avoid windblown dust issues both within and outside normal working hours;
- avoid long term stockpiles of material on site without application of measures to stabilise the material surface, such as application of suppressants or seeding;

The risk of amenity effects and the amount of mitigation effort required is strongly influenced by weather conditions at the time of the works. With good site practice the earthworks of the extent required would have a minor adverse effect at worse 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 (if there is any) away from boundaries would minimise the possibility of exposure to PM_{10} at receptors within 30 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. The additional measures should also be considered:

- treat occupied properties that where constructed in the earlier phases of the construction programme as sensitive receptors in the same way as off site receptors;
- construction of site roads early enough to avoid the use of haul routes on site; and
- adoption of mobile booths for cutting and grinding operations if work cannot be undertaken away from sensitive receptors.

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

5.1.4 *Trackout of Material*

Much of the proposed development site at the time of construction would not be hard-surfaced, meaning that there is more potential for mud and loose earth material to be tracked out by construction related vehicle movements. As such, it is recommended that wheel

washing facilities should be installed to reduce related impacts. Regular inspection of the local roads within 200 m of the site access point(s) should also be undertaken and street cleaning applied as necessary.

The effect 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 trackout of material can be controlled such that it would have a minor adverse effect at worst on amenity and a negligible effect on short term PM_{10} concentrations at all receptors.

The conclusions of the construction dust assessment are summarised in Table 5.1. Overall the effect of the demolition and construction phase activities are considered to be minor adverse and this 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-hr air quality objective
Demolition	Minor adverse	None	Minor adverse
Earthworks	Minor adverse	None	Negligible
Construction	Minor adverse	None	Negligible
Trackout	Minor adverse	None	Negligible
Overall Significance			Minor adverse

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-hr 50 µg/m^3 air quality objective, at the selected air quality sensitive receptors in the year of operation (2015) with the proposed development in place, are listed in Table 5.2.

TABLE 5.2: AIR QUALITY STATISTICS PREDICTED FOR THE OPERATIONAL SCENARIO IN 2015

Receptor	Annual Mean Concentration (µg/m^3)			No. Days PM_{10} >50 µg/m^3
	Annual Mean NO_2 (µg/m^3)	Annual Mean PM_{10} (µg/m^3)	Annual Mean $PM_{2.5}$ (µg/m^3)	
R1	35.0	18.0	12.2	2
R2	21.8	16.2	11.2	1
R3	19.9	16.0	11.0	1
R4	24.3	17.2	11.5	1
R5	24.1	17.1	11.4	1
R6	19.8	15.9	10.9	1
R7	18.6	15.7	10.8	1
R8	20.5	16.1	11.1	1
R9	26.5	17.1	11.7	1
R10	23.4	16.6	11.3	1
R11	27.5	17.1	11.7	1
R12	24.1	16.6	11.4	1
Objective Value	**40**	**40**	**25**	**35**

In the 2015 with development scenario, annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted to be below their respective air quality objective at all locations within the air quality study area. As in the baseline scenario, the highest concentrations are predicted to occur in closest proximity to the A637 / B6428 junction (R1), which in the operational scenario has been replaced by a new compact roundabout.

The change in pollutant concentrations 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. No change is reported for receptors R11 and R12, as they represent proposed residential receptors within the development site and are not present in the baseline scenario.

TABLE 5.3: CHANGE IN AIR QUALITY STATISTICS PREDICTED FOR 2015 WITH DEVELOPMENT				
Receptor	**Change in Annual Mean Concentration (µg/m^3)**			**No. Days PM_{10} >50 µg/m^3**
	Annual Mean NO_2 (µg/m^3)	**Annual Mean PM_{10} (µg/m^3)**	**Annual Mean $PM_{2.5}$ (µg/m^3)**	
R1	+3.3 (m)	+0.5 (s)	+0.3	0
R2	-0.3 (i)	-0.3 (i)	-<0.1	0
R3	-0.1 (i)	-<0.1 (i)	-<0.1	0
R4	-3.1(m)	-0.3 (i)	-0.5	-1
R5	-1.7 (s)	+0.1 (i)	-0.3	0
R6	-3.1(m)	-0.6 (s)	-0.4	0
R7	-3.5(m)	-0.7 (s)	-0.4	0
R8	-1.3(s)	-0.3 (i)	-0.1	0
R9	-0.4 (i)	-0.1 (i)	-<0.1	0
R10	-0.2(i)	+0.2 (i)	+0.1	0

Magnitude of change displayed in Parentheses: (i) = Imperceptible (s) = Small (m) = Medium (l) =Large.

The proposed changes to the road layout and the associated effect on road traffic flows would lead to a predicted change in annual mean NO_2 concentrations of a medium magnitude at a number of locations within the study area. An increase of +3.3 µg/m^3 is predicted in the vicinity of R1 (A637 / B6428 junction), which is likely to be due to the proximity of the proposed spine road with the development in place. A change in annual mean NO_2 of medium magnitude, where the with development concentration is less than 36 µg/m^3, would be described using the criteria set out in Table 3.6 as an effect of minor adverse significance.

In the area around receptors R4 (A637 / Dearne Hall Road junction), R6 and R7 (Dearne Hall Road), a medium magnitude reduction in annual mean NO_2 concentrations is predicted to occur. This would result in a minor beneficial effect in the area around the A637 / Dearne Hall Road junction. On Dearne Hall Road and all other locations within the study area, the change in annual mean concentrations would have an effect of negligible significance.

The proposed development is predicted to lead to an increase in annual mean PM_{10} in the area around R1, R5 and R10, but a decrease in concentrations at other receptors within the study area. At all receptors, the predicted changes would result in an effect of negligible significance.

Most receptors are predicted to experience an imperceptible change in the number of days in which the PM_{10} 24-hr objective is achieved (<1 day), with one receptor at the junction of the A637 and Dearne Hall Road (R4) predicted to experience a small decrease of 1 day.

The proposed development would lead to an imperceptible magnitude of change in annual mean concentrations of $PM_{2.5}$ (<0.4 µg/m^3) at all sensitive receptors in the study area, with the exception of R4 where it would fall by 0.5 µg/m^3.

In summary, the effect of changes to road traffic flows in the vicinity of the proposed development would be minor adverse in a small area close to the proposed compact roundabout and spine road and negligible elsewhere within the study area. Overall, the effect of the proposal on local air quality is considered to be not significant.

5.3 Impact of Industrial Emissions

Industrial facilities in close proximity to the proposed development site with the potential to emit pollutants to atmosphere include the Charcon Precast Solutions Aggregates facility, 400 m to the south east on Whaley Road, BRC manufacturing, which is adjacent to the south east boundary of the proposed development and other light industry.

The BRC manufacturing facility makes steel grids for use in reinforced concrete. The area of the manufacturing site closest to the boundary of the proposed development is occupied by a product stocking yard, with the production building itself located some 60 m from the site boundary and 90 m from the edge of the area to be developed for housing. The process of fabricating the steel grids consists mainly of cutting and spot welding activities, there are no large sources of combustion emissions, particulate matter or fume within the facility. Emissions to air from the manufacturing process are therefore likely to be small scale and largely undetectable at locations outside of the site boundary. The stocking area is hard surfaced and unlikely to represent a significant source of dust during normal operation. Overall, emissions from the site are unlikely to perceptible on a frequent enough basis to cause annoyance to a reasonable person, or to cause complaints.

The Charcon Aggregates site is approximately 400 m to the south east of the areas that would be occupied by the proposed residential properties. The main production building is 600 m from the proposed development. BMBC have confirmed that this site has generated complaints in the past. For much of the time, however, the proposed development would not be generally downwind of the Charcon site, and the distances involved mean that the proposed development would be no more at risk of experiencing dust impacts than existing residential locations in the surrounding area. It is therefore concluded that the risk of impacts occurring at the development site of sufficient severity to generate complaints from future residents is very low.

There are a number of other small scale industrial activities undertaken within the Claycliffe Road industrial estate. The main potential source of emissions from these facilities would be dust emissions from vehicles moving across dirty or unsurfaced ground. Although dust emissions may cross the proposed development boundary from time to time during periods of dry and windy weather, this is unlikely to occur on a frequent enough basis to cause annoyance or generate complaints.

Overall, it is concluded that emissions to air from industrial sites in the area are unlikely to be perceptible within the proposed development for the majority of the time. Occasional perceptible impacts during periods of adverse meteorological conditions are not likely to be of a magnitude or frequency that would cause annoyance to a reasonable person or generate complaints.

5.4 Impact of Emissions from Backup Generators

This section considers the impact of emissions from the backup electricity generators on air quality within the proposed residential development. Phlorum Limited was commissioned to produce an air quality assessment to support a planning application for the development of an emergency backup electricity generators at a site off Whaley Road (Phlorum, 2012). The back up electricity generators will be required for approximately 75 hours per year.

The air quality assessment modelled the emissions from the proposed backup generators for 1 hour a day at 18:00 hours. This time period was considered due to its representation of the worst case scenario for the winter and autumn months when the electricity generator would be working.

The modelling results predicted that the highest increases in concentrations would occur to the north and east of the application site. The maximum contribution to local short-term NO_2 concentrations from the operation of the generators would be 9.02µg/m^3 of the 99.8th %ile of hourly NO_2 concentrations. The impact on the proposed residential development site and local road network would be lower, in the vicinity of the location most affected by changes to road traffic (R1) the predicted impact on 99.8th percentile 1-hour NO_2 concentrations is less than 1 µg/m^3.

Given the baseline and operational annual mean NO_2 concentrations predicted within this assessment, it is very unlikely that the short-term NO_2 air quality objective of 200 µg/m^3 would be at risk of being exceeded at any point within the air quality study area, with both the proposed residential development and the backup generators in place. The effect of emissions from the backup generators and the proposed development on short-term NO_2 concentrations would therefore not be significant.

6 CONCLUSIONS

This report has assessed the impact on local air quality of proposals to construct 180 dwellings on land at Low Barugh, Barnsley. The proposed development has since been revised and now proposes to construct approximately 150 dwellings. As the former scheme was of a greater scale, it is considered that this report provides a robust assessment of the potential impact that 150 dwellings could have on local air quality.

In general, construction activities have the potential to generate fugitive dust emissions as a result of demolition, construction, earth works and trackout 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 minor adverse to 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 also be minor adverse to 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 the change in pollutant concentrations at representative existing air quality sensitive receptors in the vicinity of the proposed development site. It has also been used to predict pollutant concentrations at proposed residential receptors on the development site itself. This has been based on predicted emissions data from the change in traffic flow. The predictions of annual mean nitrogen dioxide, particulate matter and fine particulate matter concentrations have been made for baseline and operational scenarios in 2015.

There are no predicted exceedences of the annual mean objective values for nitrogen dioxide, particulate matter and fine particulate matter, nor does the predicted number of days where the 24 hour PM_{10} concentration is above 50 $\mu g/m^3$, exceed the objective at any receptor.

Changes to road traffic flows in the vicinity of the proposed development would result in an effect of minor adverse significance in a small area close to the proposed compact roundabout and spine road. Elsewhere within the study area there would be a negligible effect on local air quality.

Emissions to air from industrial sites in the area are unlikely to be perceptible within the proposed development for the majority of the time. Occasional perceptible impacts during periods of adverse meteorological conditions are not likely to be of a magnitude or frequency that would cause annoyance to a reasonable person or generate complaints.

The operation of back up electricity generators at the substation off Whaley Road would result in very small impacts on short-term NO_2 concentrations across the proposed development site and local road network. The effect of emissions from the backup generators and the proposed development on short-term NO_2 concentrations would therefore not be significant.

In conclusion, the overall impact of the proposed development on local air quality is considered to be not significant.

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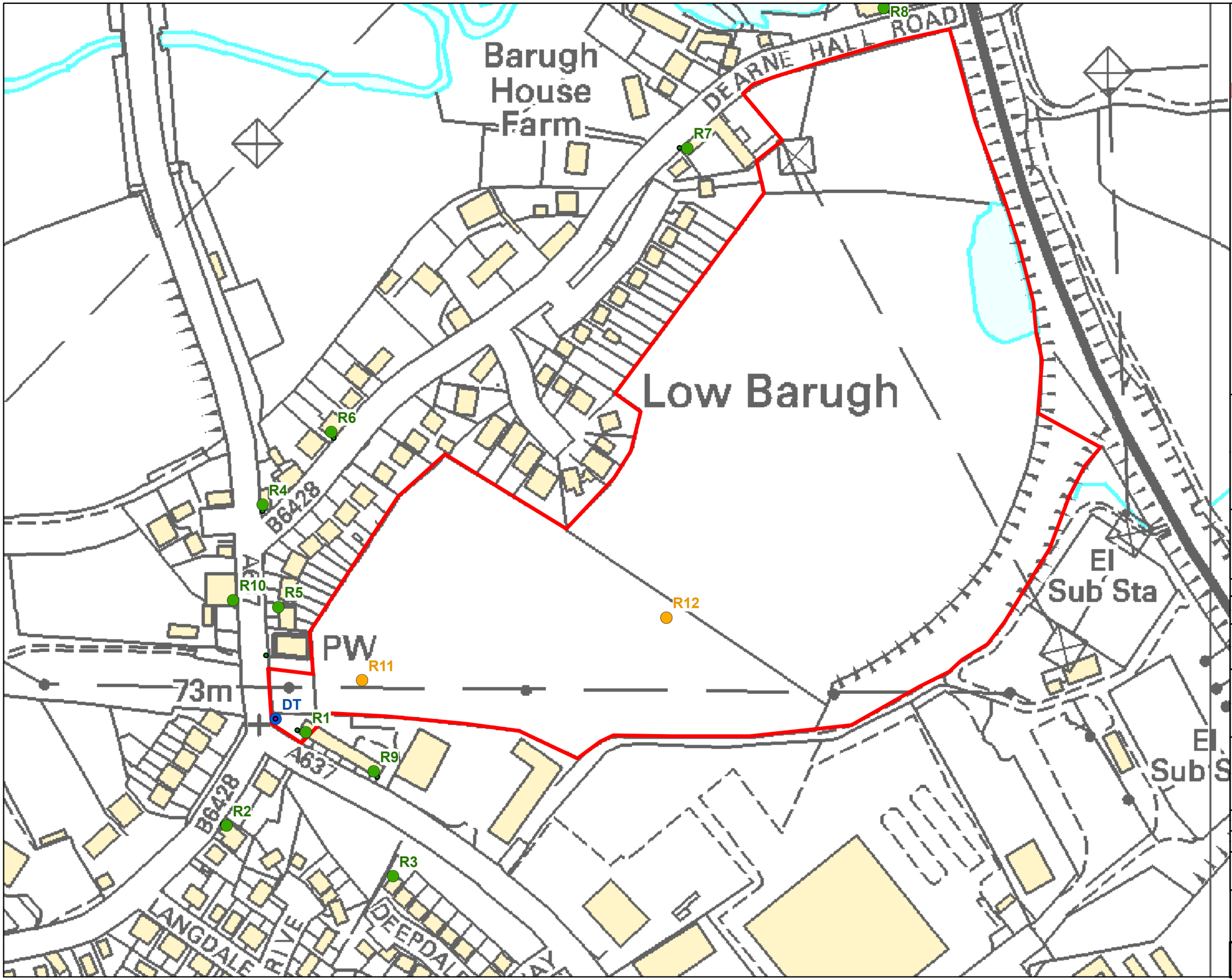
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APPENDICES

Appendix A – Figure 1



NOTES

- Existing Receptor Locations
- Proposed Receptors Locations
- Diffusion Tube Location
- Indicative Site Boundary

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Appendix B

6.1.1 ***Traffic Data Summary***

TABLE B1: 2011 BASELINE TRAFFIC DATA			
Link	**AADT**	**% HDV**	**Speed (kph)***
A637 Claycliffe Road	14645	3.6	64
B6428 Barugh Lane	6330	7.3	48
B6428 Dearne Hall Road (to west of site)	7637	2.4	48
B6428 Dearne Hall Road (to east of site)	7637	2.4	48
A637 Barnsley Road (to south of junction)	19257	3.5	64
A637 Barnsley Road (to north of junction)	12418	4.4	64

*Speeds estimated

TABLE B2: 2015 BASELINE TRAFFIC DATA			
Link	**AADT**	**% HDV**	**Speed (kph)**
A637 Claycliffe Road	15723	3.4	64
B6428 Barugh Lane	6983	6.6	48
B6428 Dearne Hall Road (to west of site)	8449	2.2	48
B6428 Dearne Hall Road (to east of site)	8449	2.2	48
A637 Barnsley Road (to south of junction)	20952	3.4	64
A637 Barnsley Road (to north of junction)	13435	4.1	64
Link Road through site	0	0	0

*Speeds estimated

TABLE B3: 2015 WITH DEVELOPMENT TRAFFIC DATA			
Link	**AADT**	**% HDV**	**Speed (kph)**
A637 Claycliffe Road	14118	3.3	64
B6428 Barugh Lane	6257	6.6	48
B6428 Dearne Hall Road (to west of site)	751	2.9	48
B6428 Dearne Hall Road (to east of site)	7563	2.1	48
A637 Barnsley Road (to south of junction)	11998	3.9	64
A637 Barnsley Road (to north of junction)	12061	4.0	64
Link Road through site	7496	1.8	32

*Speeds estimated