14. AIR QUALITY ASSESSMENT

14.1 Introduction

14.1.1 This chapter of the environmental Statement assesses the potential air quality issues and impacts associated with the proposed development North of Birstall.

14.1.2 The following assessment stages have been undertaken;

1. relevant legislation and policy
2. baseline evaluation
3. assessment of potential air quality impacts during the construction phase
4. assessment of potential air quality impacts during the operational phase
5. define mitigation measure if required

14.1.3 The construction phase assessment considers the potential effects of dust and PM_{10} (particulates) releases from site activities and materials movement. The qualitative risk assessment is based on the Institute of Air Quality Management (IAQM) document "Guidance on the assessment of dust from demolition and construction" (v1.1, June 2016). The assessment also consider the suitability of the site for residential development with regards to exposure of future occupants to elevated pollution concentrations.

14.1.4 For both the construction and operational phases of the development the type, source and significance of potential impacts are identified and the measures that should be employed to minimise any identified impacts and exposure to elevated pollution levels are described.

14.1.5 A glossary of common air quality terminology is provided in Appendix A.

14.2 Legislation and Policy

Air Quality Strategy for England, Scotland, Wales & Northern Ireland

14.2.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (AQS) published in July 2007[1] , pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed.

14.2.2 The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10}, PM_{25}), sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs).

14.2.3 The air quality standards are long-term benchmarks for ambient pollutant concentrations which represent negligible or zero risk to health, based on medical and scientific evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). These are general concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects.

14.2.4 The air quality objectives are medium-term policy based targets set by the Government which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

14.2.5 For some pollutants there is both a long-term (annual mean) standard and a short-term standard. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants (e.g. temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road).

14.2.6 The current statutory standards and objectives are set out in the table presented in Appendix B.

14.2.7 Of the pollutants included in the AQS, NO_2 and PM_{10} will be the most relevant to this project as these are the primary pollutants associated with road traffic.

14.2.8 Examples of where the Air Quality Standards and Objectives should/should not apply are included in the table below, taken from the Local Air Quality Management Technical Guidance (February 2018).

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – July 2007

Averaging Period	Objectives Should Apply At	Objectives Should Generally Not Apply At
Annual Mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens or residential properties. Kerbside sites, or any other location where public exposure is expected to be short term.
24 hour (daily mean) 8 hour mean	All locations where the annual mean objectives would apply together with hotels. Gardens of residential properties.	Kerbside sites, or any other location where public exposure is expected to be short term
1 hour mean	All locations where the annual mean and 24 and 8 hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and railway stations etc. which are not fully enclosed where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations to which the public might reasonably be expected to spend one hour or longer.	Kerbside sites where public would be expected to have regular access
15 min. mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

Figure 1: Application of Air Quality Standards and Objectives

Local Air Quality Management (LAQM)

14.2.9 Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

14.2.10 Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

14.2.11 For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

14.2.12 The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work[2]. This guidance, referred to in this chapter as LAQM.TG(16), has been used where appropriate in the assessment.

National Planning Policy Framework

14.2.13 The revised NPPF[3] was published in July 2018 and states that '*planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas*'. It outlines the principles upon which the planning process can take account of air quality impacts associated with new developments. It outlines the role of Local Plans in promoting sustainability and providing limitations on development in areas of poor air quality. An emphasis is placed on consultation with the planning authority to determine whether there are any local issues with the potential to affect the scope of an air quality assessment. Typical air quality mitigation measures are outlined highlighting the use of planning conditions and funding obligations to off-set any significant impacts.

Control of Dust and Particulates Associated with Construction

14.2.20 Section 79 of the environmental Protection Act (1990) states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Statutory nuisance is defined as;

- *"Any dust or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance"*

[2] Department for Environment, Food and Rural Affairs (DEFRA), (2018): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(16).

[3] Department for Communities and Local Government, National Planning Policy Framework, July 2018

- *"Any accumulation or deposit which is prejudicial to health or a nuisance"*

14.2.21 Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

14.2.22 In the context of the proposed development, the main potential for nuisance of this nature will arise during the construction phase - potential sources being the clearance, earthworks, construction and landscaping processes.

14.2.23 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist – 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred. However, research has been undertaken by a number of parties to determine community responses to such impacts and correlate these to dust deposition rates.

Odour Regulatory Standards and Guidelines

14.2.24 Currently, in the UK there are no statutory numerical standards for assessing the acceptability of predicted odour impacts from quantitative odour impact assessments. On this basis, odour impact criteria are typically based upon guideline documents (predominantly based on research from outside of the UK), case law and research which differ depending on the regime i.e. planning (to avoid significant detriment to amenity) or permitting (to avoid unacceptable pollution).

14.2.25 The numerical limits applied have largely been derived from the findings of a limited number of epidemiological assessments where modelled odour impacts have been compared to the findings of quality of life surveys; a dose-effect study. These dose-effect studies have only been undertaken for a limited number of odour types; however they have been used as the foundation for the setting of acceptable odour standards in many countries.

14.2.26 The actual acceptable level of impact will be dependent on the nature (offensiveness) of the odour and the broad sensitivity of the population. To account for this differing numerical limits are often set not only depending on the offensiveness of the odour but also the broad sensitivity of the environment.

UK Guidance

14.2.27 UK guidance identifies a range of odour impact criteria depending on the nature of the odour (i.e. its pleasantness/unpleasantness) and the likelihood of causing unacceptable impacts based on the 98th percentile of predicted hourly average concentrations over a year. It is therefore evident that such criteria apply only to locations where an individual's exposure is likely to occur for prolonged periods of time i.e. residential properties. Where exposure is more transient (i.e. roads, footpaths etc.) the direct application of such criteria should be treated with caution and further consideration should be given to how the duration and frequency of exposure of the individual will influence the acceptability of the predicted impact.

DEFRA Odour Guidance for Local Authorities

14.2.28 This DEFRA guidance[5] provides further general principles and factors that may be important in assessing when, or if, a specific odour source is likely to constitute a statutory nuisance.

14.2.29 The "FIDOL" factors within this guidance are defined as Frequency, Intensity (and therefore concentration), Duration, relative Offensiveness (hedonic tone/character) and Location, along with any aggravating characteristics. Figure 2 below outlines the "FIDOL" factors that are useful in determining potential odour impact or offensiveness.

Factors	Factors determining Statutory Nuisance	Comments
Frequency	How often an individual is exposed to odour	Even a pleasant odour can be perceived as a nuisance if exposure is frequent. At low concentrations a rapidly fluctuating odour is more noticeable than a steady background odour, i.e. this is an aggravating factor
Intensity	Level of Odour	Factors are equivalent
Duration	Duration of Exposure	Factors are equivalent
Offensiveness	Type of odour	Some odours are universally considered offensive, such as decaying animal matter. Other odours may be offensive only to those who suffer unwanted exposure, e.g. coffee roasting
Location (the type of land use and nature of human activities in the vicinity of the odour source	The characteristics of the neighbourhood where the odour occurs	Factors are essentially equivalent
Tolerance and expectation of the receptor	The sensitivity of the complainant	Statutory nuisance uses the concept of the response of the average reasonable person

Figure 2: Factors Relating Odour Impacts to Statutory Nuisance

Section 79 of the Environmental Protection Act

14.2.30 Under Section 79 of the Environmental Protection Act (EPA) 1990, (as amended), Councils have powers to deal with certain nuisances (these are deemed to be Statutory Nuisances). However, for the Council to be able to act, the nuisance must be coming from private land or property. These powers apply not only to control existing nuisance, but also where nuisance is expected to occur or recur. Statutory Nuisance cannot easily be defined but is often described as an unreasonable interference with the enjoyment of your property. It must occur regularly and must continue for a time that makes it unreasonable.

13.2.31 The EPA sets out numerous definitions of what constitutes statutory nuisance, as identified below;

a) any premises in such a state as to be prejudicial to health or a nuisance;
b) smoke emitted from premises so as to be prejudicial to health of a nuisance;
c) fumes or gases emitted from premises so as to be prejudicial to health or a nuisance;
d) any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance;
e) any accumulation or deposit which is prejudicial to health or a nuisance;
f) any animal kept in such a place or manner as to be prejudicial to health or a nuisance;
fa) any insects emanating from relevant industrial, trade or business premises and being prejudicial to health or a nuisance;
fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance;
g) noise emitted from premises so as to be prejudicial to health or a nuisance;
ga) noise that is prejudicial or a nuisance and is emitted from or caused by a vehicle, machinery or equipment in a street;
h) any other matter declared by any enactment to be a statutory nuisance.

14.2.32 Section 79 also identifies that it is the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under Section 80 and where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

14.2.33 Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

14.2.34 The guidance is for assessing odour impacts for planning purposes. It provides background information such as that described in EPR H4 horizontal odour guidance.

IAQM Odour Guidance

14.2.35 On 20 May 2014 the Institute of Air Quality Management released guidance on the assessment of odour for planning.

14.2.36 The guidance is for assessing odour impacts for planning purposes. It provides background information relating to requirements for odour impact assessments and

suitable impact criteria and draws from other sources of information such as that described in EPOR H4 horizontal odour guidance.

Charnwood Local Plan Core Strategy 2011 – 2028

14.2.39 The Charnwood Local Plan Core Strategy 2011-2028 was adopted in November 2015. With regard to air quality, Policy CS16 "Sustainable Construction and Energy" states;

"we will adapt and mitigate against the effects of climate change by encouraging sustainable design and construction and the provision of renewable energy, where it does not make development unviable. We will do this by;

- *supporting new development that protects environmental resources including local air quality and our most versatile agricultural land"*

14.3 **Methodology**

Scope of Assessment

14.3.1 The scope of the assessment has been determined in the following way;

- *as part of a formal request for a Scoping Opinion from Charnwood Borough Council (CBC) in April 2014 in order to define the nature and extent of environmental impact assessment;*
-
- *consultation with CBC Air Quality Officer (AQO);*
-
- *review of air quality data for the area surrounding the site and background pollutant maps;*
-
- *review of the traffic flow data, which has been used as an input to the air* quality modelling assessment.

14.3.2 The development proposals will provide new residential, employment, commercial uses, primary school and associated infrastructure and green spaces; therefore there is the potential for impacts on local air quality during both the construction and operational phase of the proposed development.

14.3.3 The site is located to the west of a sewage treatment works. The potential impact of odour from the treatment works on the proposed development site has been considered within the assessment.

14.3.4 Details of the assessment methodology and the specific issues considered are provided below

Construction Phase Methodology

<u>Construction Traffic</u>

14.3.5 During construction of the Proposed Development, lorries will require access to the Site to deliver and remove materials; earthmoving plant and other mobile machinery

will work on site and generators and cranes will also be in operation. These machines produce exhaust emissions; of particular concern are emissions of NO_2 and PM_{10}.

14.3.6 The Environmental Protection UK (EPUK) / IAQM air quality guidance[47] sets out criteria to assist in establishing when an air quality assessment will be required. These criteria indicate that significant impacts on air quality are likely to occur where a development results in greater than 100 HGV movements per day during a construction period of a year or more.

14.3.7 No information has been provided on the number of vehicles that will be generated during the construction period, however, based on the size of the development proposals it is anticipated that there will be less than 100 additional HGV movements generated on the adjacent road network per day and therefore the construction traffic is unlikely to would significantly affect local air quality. Construction traffic impacts have therefore not been considered further within the assessment.

Construction Dust

14.3.8 To assess the potential impacts associated with dust and PM_{10} releases during the construction phase and to determine any necessary mitigation measures, an assessment based on the latest guidance from the Institute of Air Quality Management[8] has been undertaken.

14.3.9 This approach divides construction activities into the following four categories;

- *demolition;*
- *earthworks;*
- *construction; and*
- trackout

14.3.10 The assessment methodology requires consideration of dust effects arising from three potential impacts;

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in exposure to PM10

14.3.11 The three impacts are assessed taking into account the sensitivity of the area likely to experience these effects, with the results of the assessment being used to define appropriate mitigation measures to prevent any significant effects at nearby receptors.

14.3.12 The IAQM guidance sets out the assessment into a number of steps. The first is an initial screening assessment to determine if there are any sensitive receptors (both human and ecological) within 350m of the site boundary or within 100m of the proposed construction haulage routes, thus determining the requirement for a more detailed evaluation. The exact route of the construction vehicles is not known at this stage. There are however existing sensitive receptors located within 350m of the site boundary and it is necessary to proceed to the next step.

[4] EPUK/ IAQM (2017), Land-Use Planning & Development Control: Planning for Air Quality, January 2017 (v1.2)

14.3.13 Step 2 of the methodology assesses the risk of dust impacts for each construction activity and takes account of;

- the scale and nature of the works, which determines the potential dust emission magnitude (step 2); and
- the sensitivity of the area (step 2b)

14.3.14 Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities. This assessment is based on both IAQM criteria and professional judgement.

14.3.15 The outcome of the above two steps are then combined (step 2c) to identify the risk of dust impacts, which are described in terms of there being low, medium or high risk of dust effects for each of the four activity groups and assuming no mitigation measures are in place.

14.3.16 Based on the identified risk, appropriate mitigation measures are identified as set out in the IAQM guidance.

14.3.17 All construction sites are different and the potential for dust impacts are dependent on a number of local factors. The methodology set out in the IAQM guidance is therefore considered as a framework for assessing dust impacts and a certain level of professional judgement is required in determining the effects from each site. The sensitivity of the location is considered to be low in view of its rural setting. There are two dwellings on site at the eastern boundary. A Construction Environmental Management Plan (CEMP) will ensure that construction best practice will be undertaken in this area.

14.3.18 The significance of identified effects is evaluated post mitigation using professional judgement and assuming that the mitigation measures identified and set out within the assessment are implemented by way of a Dust Management Plan (DMP).

Operational Phase Methodology

<u>Impacts from Sewage Treatment Works</u>

14.3.19 A qualitative assessment of potential impacts from odour arising from the sewage treatment works has been undertaken. This has included a review of local meteorological data, details of complaints data held by CBC and consideration of separation distances between proposed sensitive receptors and the sewage treatment works.

<u>Operational Traffic Impact</u>

14.3.20 The prediction of local air quality has been undertaken using the ADMS Roads dispersion model (Version 4.1.1). This is a commercially available dispersion model and has been widely validated for this type of assessment and used extensively in the Air Quality Review and Assessment process. ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used world-

wide for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and Department for the Environment Food and Rural Affairs (DEFRA).

14.3.21 The model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user. Meteorological data from East Midlands Airport for 2016 has been used for the assessment.

14.3.22 The dispersion model uses input data that details the following parameters;

- assessment area;
- traffic flow data;
- vehicle emission factors;
- spatial co-ordinates of emissions;
- street width;
- meteorological data;
- roughness length; and
- Monin-Obukhor length.

14.3.23 Traffic data for use in the assessment has been provided by the application's Transport Consultant Lawrence Walker Ltd. Base traffic flows have been provided for 2016 for the road links in close proximity to the Site. In addition, traffic flows along the A6 Loughborough Road, south of the A46, have been taken for the Department of Transport (DfT) traffic count data available on their website (http://www.dft.gov.uk/traffic-counts/) to allow verification of the model results with local monitoring data.

14.3.24 A base year of 2016 has been used in the assessment. The baseline traffic has been factored forward to 2031 to provide the future year baseline scenario. The predicted traffic generated by the proposed development has then been added to the 2031 baseline scenario to provide the 'with development' scenario.

14.3.25 Based on the traffic data provided the following scenarios have been assessed;

- 2016 Baseline – for verification of the model only;
- 2031 Baseline;
- 2031 Baseline + proposed development

14.3.26 A summary of the traffic data used in the assessment can be found in Appendix C. The data includes details of annual average daily traffic flows (AADT), vehicle speeds and percentage HGV for the assessment years considered.

Emission factors and background data used in the prediction of future air quality concentrations predict a gradual decline in pollution levels over time due to improved emissions from new vehicles and the gradual renewal of the vehicle fleet. However, recent monitoring carried out in urban areas throughout the UK have found that NO_2 concentrations are not declining as rapidly as previously thought and in some

locations concentrations have increased. Monitoring carried out by CBC shows no significant upward or downward trend in NO_2 concentrations in recent years.

14.3.27 The ADMS model has been used to predict concentrations of oxides of nitrogen (NOx) and PM_{10} in 2031 using 2030 emission factors from version 8.0.1 of the Emission Factor Toolkit. Vehicle emissions factors for years beyond 2030 are not currently available. A worst-case sensitivity analysis has also been undertaken for NO_2 using 2016 emissions factors, which assumes no improvement in vehicle emissions between 2016 and 2030. The predicted concentrations of NOx have been converted to NO_2 using version 6.1 of the LAQM calculator on the DEFRA air quality website[5].

14.3.28 To predict local air quality, traffic emissions predicted by the model must be added to local background concentrations. Background NO_2 and PM_{10} concentrations have been taken from the 2015 DEFRA background maps. The maps provide an estimate of background concentrations between 2015 and 2030. Data for 2016, which is provided in Figure 9, has been used for the 2031 assessment year, assuming no improvement in background air quality between 2016 and 2031.

14.3.29 It is recommended, following guidance set out in LAQM.TG(16) that the model results are compared with measured data to determine whether the model results need adjusting to more accurately reflect local air quality. This process is known as verification.

14.3.30 LAQM.TG(16) recommends that model predictions should be within 25% (preferably 10%) of monitored concentrations for the model to be predicting with any degree of accuracy. The two monitoring sites located adjacent to the A6 in Birstall have been used to verify the model results. The results of the comparison are presented below in Figure 3.

Monitoring Locations	Measured Concentrations	Modelled Concentrations	% Difference
Loughborough Road (Birstall)	32.3	23.4	-27.7
A6 (Birstall)	31.8	23.4	-26.4

Figure 3: Comparison of Modelled and Monitored NO_2 Concentrations ($\mu g/m^3$)

14.3.31 The comparison of monitored and modelled concentrations indicates that the model is under-predicting annual mean NO_2 concentrations by an average of 27%. It is therefore considered necessary to adjust the model results to better represent local concentrations. The results of the modelling assessment have been adjusted using the methodology given in LAQM.TG(16). Full details of the verification and calculation of adjustment factors are provided in Appendix D.

14.3.32 Following application of the calculated adjustment factors the model results are showing no overall tendency to under or over predict at the monitoring locations and the predicted annual mean NO_2 at each site is within the preferred 10% of monitored concentrations.

[5] http://uk air.defra.gov.uk

14.3.33 There is no suitable monitoring of PM_{10} data to allow verification of the PM_{10} model results. However, LAQM.TG(16) suggests applying the NO_2 adjustment factor to modelled road-PM_{10} where no appropriate verification against PM_{10} data can be carried out. Therefore, the adjustment applied to predicated NO_2 concentrations has also been applied to the modelled PM_{10} concentrations.

14.3.34 LAQM.TG(16) does not provide a method for the conversion of annual mean NO_2 concentrations to 1-hour mean NO_2 concentrations. However, research[10] has concluded that exceedances of the 1-hour mean objective are generally unlikely to occur where annul mean concentrations do not exceed 60 µg/m^3. Care has been taken to ensure that locations where the 1-hour mean objective is relevant are included in the assessment.

14.3.35 Quantitative assessment of the impacts on local air quality from road traffic emissions associated with the operation of the development have been completed against the current statutory standards and objectives set out in Appendix B for NO_2 and PM_{10}.

Significance Criteria

14.3.36 The guidance issued by Environmental protection UK (EPUK) & the IAQM[6] relates to air quality considerations within the planning process and sets criterion which identify the need for an Air Quality Assessment, the type of Air Quality assessment required, and the significance of any predicted impact.

14.3.37 The guidance suggests expressing the magnitude of incremental change in concentrations as a proportion of an Air Quality Assessment Level (AQAL) such as the air quality objectives set out in Appendix B. The significance of impact is then identified based on the incremental change in the context of the new total concentrations and its relationship with the assessment criteria, noting whether the impact is adverse or beneficial based on a positive or negative change in concentrations. The criteria suggested for assigning significance is set out in Figure 4 below.

Long term average concentration at receptor in assessment year	% Change in Concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% or more of AQAL	Moderate	Major	Major	Major

[6] EPUK/ IAQM (2017), Land-Use Planning & Development Control: Planning for Air Quality, January 2017 (v1.2)

AQAL – Air Quality Assessment Level which in this assessment refers to the Air Quality Objectives set out in Appendix B The percentage change in concentration should be rounded to a whole number The table should only be used with annual mean concentrations The descriptors are for individual receptors only: overall significance should be based on professional judgement When defining the concentrations as a percentage of the AQAL use the 'without scheme' concentration where there is a decrease in pollutant concentrations and the 'with scheme' concentrations for an increase The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value i.e. well below, the degree of harm is likely to be small. As exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year, it is impossible to define the new total concentrations without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Figure 4: Impact Descriptors for Individual Receptors

Sensitive Receptors

14.3.38 For the completion of this assessment, consideration of the potential impacts of the proposed development on local air quality has been undertaken by predicting pollutant concentrations at nine existing sensitive receptors. The receptors selected represent worst-case exposure to local traffic emissions.

14.3.39 In addition, concentrations of NO_2 and PM_{10} have been predicted at receptors representing the development site including at locations of proposed residential properties within the Site to assess the suitability of the site for residential development.

14.3.40 Details of the receptors are provided below in Figure 5 and their locations presented in Figure 6.

Receptor Number	Receptor Name / Location	OS Grid Reference
1	Tip Hill – residential property on A6	459148, 311078
2	Woodcock Farm	459022, 312512
3	Residential on Loughborough Road	458991, 312666
4	Residential on Loughborough Road	458987, 312698
5	Cossington Lane	459143, 312725
6	Hallfields Lane	458896, 312626
7	Hogarth Road	457499, 310273
8	Rectory Road	459951, 311017
9	Rectory Road	459911, 310745
10	Proposed Residential	459037, 310979
11	Proposed Residential	458515, 310730
12	Site Boundary	458662, 310725
13	Site Boundary – two residential properties	459131, 311311

Figure 5: Receptors used in Modelling Assessment

Figure 6: Location of Receptors used in Modelling Assessment

14.4 Baseline Conditions

Charnwood Borough Council Local Air Quality Management Review and Assessment of Air Quality

14.4.1 CBC has carried out detailed assessments of air quality throughout the Borough and as a result has declared four Air Quality Management Areas (AQMA) due to exceedances of the NO_2, PM_{10} and sulphur dioxide (SO_2) objectives at sensitive receptors. The four locations are:

AQMA 1: Incorporating the major roads in the centre of Loughborough and declared for likely exceedances of the annual mean NO_2 objective;

AQMA 2: Great Central Railway (GCR) in Loughborough, declared for likely exceedances of the fifteen minute mean SO_2 objective;

AQMA 3: Syston, declared for likely exceedances of the annual mean NO_2 objective; and

AQMA 4: Mountsorrel Quarry declared for likely exceedance of the 24-hour PM_{10} objective.

14.4.2 The AQMA in Loughborough is located over 8km to the north-west of the Site therefore the proposals are unlikely to have a significant impact on air quality within this AQMA.

14.4.3 The Mountsorrel AQMA has been declared due to emissions of PM_{10} from the large quarry to the north-west of the village whilst the GCR AQMA has been declared in relation to SO_2 emissions from the diesel trains. The development proposals are also considered unlikely to impact on air quality within these two AQMAs.

14.4.4 The Syston AQMA is located approximately 2.5km to the east, through the centre of the town. Traffic generated by the development has the potential to impact air quality within the Syston AQMA.

14.4.5 The Borough Council's review and assessment has not identified any exceedance of the air quality objectives in the immediate vicinity of the development site.

Automatic Local Monitoring

14.4.6 CBC currently operates four automatic monitors; one within each of the designated AQMA's. The site in Mountsorrel monitors PM_{10} concentrations in close proximity to the Quarry. Data recorded at this site is not considered relevant to this assessment and therefore has not been included in the baseline assessment. Monitoring undertaken at the GCR AQNA is for SO_2 and is therefore also not considered relevant. The Loughborough site measures kerbside NO_2 concentrations, but at over 8km from the site is not considered representative.

14.4.7 The final monitoring site is located in Syston and measures roadside concentrations of NO_2. Details of this site and data recorded from 2010 to 2013 and in 2017 is set out below in Figures 7 and 8 (monitoring was not undertaken between 2014 and 2016).

Site ID	Location	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to nearest road	Location representative of worst-case exposure?
CM4	Syston AQMA	Roadside	462540, 311428	NO_2	Y	3m	N

Figure 7: Details of Automatic Monitoring Site

Site ID	Location	2010	2011	2012	2013	2017
CM4	Syston AQMA	34.4	30.6	34.4	36.3	34.9

Figure 8: Annual Mean NO_2 Concentrations Measured Automatically in Syston ($\mu g/m^3$)

14.4.9 The Syston automatic monitoring site recorded annual mean NO_2 concentrations below the 40 µg/m³ objective in all five years. There is no clear trend in the data to suggest that air quality is improving or worsening within the AQMA.

Non-automatic Local Monitoring

14.4.9 NO_2 is measured extensively across the borough using diffusion tubes (there are 45 in a variety of roadside, kerbside and background locations). There are no monitoring sites adjacent to the development site however, there are a number located to the south and south-east in Birstall, Thurmaston and Syston. Details of the sites and concentrations recorded between 2013 and 2017 are presented below in Figure 9.

14.4.10 Diffusion tubes are known to be less accurate than automatic monitoring sites. For this reason, all diffusion tube data is bias corrected using correction factors derived from two triplicate co-locations studies (in Loughborough and Syton).

14.4.11 The monitoring data shows annual mean NO_2 concentrations to be below the objective at all the monitoring locations presented, with the exception of one site in Thurmaston which recorded an exceedance of the objective during 2013.

14.4.12 Overall the monitoring data show no significant trend in concentrations over the five year monitoring period.

14.4.13 The closest and most representative monitoring sites to the development site are the two located adjacent to the A6 in Birstall (22 and 23) NO_2 concentrations along the eastern and western boundaries of the site which lie adjacent to the A6 Loughborough Road are expected to be similar to those recorded at the two Birstall monitoring sites. It is expected that concentrations will decline rapidly away from the road falling to background levels within 100-200m of the roadside. On the basis of the monitoring data, it is anticipated that NO_2 concentrations across the Site would meet the air quality objectives.

Site ID	Location	Site Type	OS Grid Ref	2013	2014	2015	2016	2017
19	Melton Rd Town Centre (Syston)	Roadside	462777, 311692	36.8	27.7	27.2	31.7	33.2
20	1123 Melton Road (Syston)	Roadside	462351, 311213	31.7	24.5	22.9	27.3	29.8
21	1116 Melton Rd (Syston)	Roadside	462373, 311254	36.1	28.4	26.4	35.8	37.2
22	Loughborough Rd (Birstall)	Roadside	459233, 309590	39.5	30.5	28.5	32.3	33.7
23	A6 (Birstall)	Roadside	459178, 309890	37.9	30.9	28.4	31.8	32.4
24	21 Humberstone Lane (Thurmaston)	Roadside	460821, 308757	41.4	32.5	30.9	33.9	35.3
25	43 Humberstone Lane (Thurmaston)	Roadside	460861, 308824	38.1	30.4	26	32.6	34.2
26	22 Humberstone Lane Thurmaston)	Roadside	460835, 308784	32.4	26.3	24.1	27.3	23.7

32	High St (Syston)	Roadside	462369, 311809	33.1	25.7	24.7	28.5	32.2
33	Syston AQMS 1	Roadside	462540, 311428	36.5	30.8	27.6	30.5	35.4
34	Syston AQMS 2	Roadside	462540, 311428	36.7	29.4	27.1	29.8	34.6
35	Syston AQMS 3	Roadside	462540, 311428	35.5	28.8	25.7	29.8	34.1
44	3 Simpson Close (Syston)	Roadside	461499, 310459	-	-	21.8	26.5	28.0

Figure 9: NO_2 Diffusion Tube Monitoring (bias corrected, µg/m^3)

DEFRA Background Maps

14.4.14 In the absence of local monitoring PM_{10} data for the area and for comparison with the data measured at the AURN sites, background pollutant concentrations have been obtained from the Defra UK Background Air Pollution maps[7]. These 1 km grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites.

14.4.15 The latest background maps for NO_2 and PM_{105} were issued in November 2017 and are based on 2015 monitoring data.

14.4.16 A summary of the maximum 2016 mapped annual mean background concentrations at the proposed development site and the identified sensitive receptors is presented in Figure 10. The background concentrations for the area are less than 50% of the the long-term air quality objectives for NO_2 and PM_{10}.

Pollutant	2016 Annual Mean Concentration
NO_2	18.5
PM_{10}	17.4

Figure 10: Estimated Annual Mean Background Concentrations from DEFRA Maps (µg/m^3)

14.5 Assessment of Impacts, Mitigation and Residual Effects

Construction Phase Impact

<u>Site and Surroundings</u>

14.5.1 The Site is mainly agricultural fields located predominantly to the west of the A6. There are a small number of industrial/commercial buildings located adjacent to the A6 that would require demolition prior to the commencement of any earthwork or construction activities. In addition there are three properties. In this area other residential uses are located over 0.8km away. Impacts associated with dust emissions during the demolition phase are therefore considered to be related to these three properties and are considered further below.

[7] http://uk-air.defra.gov.uk/data/laqm-background-home

14.5.2 The development site is located to the north of Birstall in a semi-rural location. There are two residential properties immediately within the site and another adjacent to it at the eastern boundary with the A6. The next nearest properties are located to the south along Rectory Road, Wanlip, approximately 190m from the site boundary. There are also a number of existing and proposed properties to the west along Leicester Road, Rothley, approximately 300m from the site boundary. As there are a number of properties located within 350m of the site boundary an assessment of impacts on human receptors has been undertaken.

14.5.3 Dust emissions from construction activities are unlikely to result insignificant impacts on ecologically sensitive receptors beyond 50m from the site boundary. There are no dust sensitive ecological receptors within 50m of the development site. The sensitivity of the surrounding area in relation to ecological impacts is therefore considered to be low and impacts as a result of dust emissions from the site, negligible. Impacts on ecologically sensitive receptors have therefore not been considered any further within the assessment.

14.5.4 There is no monitoring of PM_{10} carried out by the Borough Council in the vicinity of the development site. However, based on the DEFRA background maps, background PM_{10} concentrations in the vicinity of the site are expected to be less than 50% of the annual mean air quality objective. Concentrations are expected to be slightly higher closest to the A6 and A46, but it is considered unlikely that concentrations in these locations would exceed 24 $\mu g/m^3$.

14.5.5 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel being deposited would depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

14.5.6 A wind rose from East Midlands Meteorological Station (2016) is provided below in Figure 11, which shows that the prevailing wind is from the west and south-west. Property located to the east and north-east would therefore be most likely to experience significant impacts as a result of dust generated during the construction process. However, the closest receptors to the north-east are over 350m from the site boundary and therefore significant impacts are unlikely to be experienced in this direction.

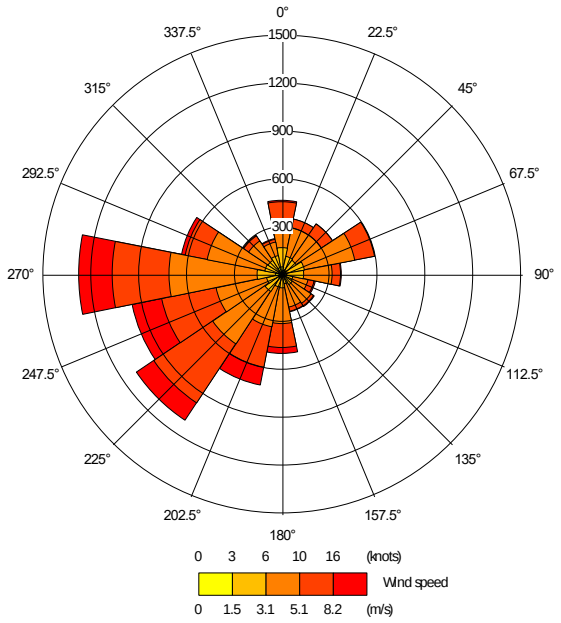

Figure 11: Windrose from East Midlands Airport (2016)

<u>Potential Dust Emission Magnitude</u>

14.5.7 The dust emission magnitude is based on the scale of anticipated works at the Site and has been defined as small, medium or large for each of the three activities; earthworks, construction and trackout. A summary of the dust emission magnitude for each activity is set out in Figure 12.

Earthworks

14.5.8 Earthworks are those activities involved in preparing the Site for construction such as excavation of material, haulage, tipping, stockpiling and levelling.

14.5.9 The Site covers an area of approximately 179ha and the proposals are to provide new housing, employment, commercial and community uses. During the earthwork activities it is anticipated that there would be more than 10 earth moving vehicles on the site at any given time. Given the scale of the proposed development, the Site is considered to have a dust emission class of 'large' with regards to earthworks activities.

Construction

14.5.10 There are a number of issues that can impact the dust emission class during construction activities including the size of the building, materials used for construction, the method of construction and the duration of the build.

14.5.11 The proposed development is at outline planning stage therefore detailed information is not available on the construction process. Based on the current design layout the total building volume proposed for the Site would be more than 100,000m^3, and a significant proportion of the construction materials would be brick and concrete,

which can be significant sources of dust emissions. The site is therefore considered to have a dust emission class of 'large' with regards to construction activities.

Trackout

14.5.12 The risk of impacts occurring during trackout is predominantly dependent on the number of vehicles accessing the Site on a daily basis. However, vehicle size and speed, the duration of activities and local geology are also factors which are used to determine the emission class of the site as a result of trackout.

14.5.13 Given the size of the proposed development it is expected that there would be more than 50 Heavy Duty Vehicles (HDV) accessing the Site each day during construction, with the vehicles travelling on site over unpaved roads of more than 100m in length. The Site is therefore classed as 'large' with regards to trackout activities.

Source	Magnitude
Earthwork	Large
Construction	Large
Trackout	Large

Figure 12: Summary of Dust Emissions Magnitude for each Activity

Sensitivity of Surrounding Area

14.5.14 The sensitivity of the surrounding area takes account of the following factors;

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10} the local background concentration; and
- site-specific factors i.e. whether there are natural shelter such as trees, to reduce the risk of wind-blown dust.

14.5.15 The main receptors adjacent to the Site are residential dwellings, including some allotments to the north. Based on the IAQM guidance residential dwellings are considered as high sensitivity receptors in relationship to both dust soiling and health effects of PM_{10}, There are two receptors within the development area and another at its boundary. The rest are over 100m from the site boundary. The overall sensitivity of the area to dust soiling impacts is considered to be 'medium' for the two properties and 'low' for the wider area.

14.5.16 As detailed above, PM_{10} concentrations in the vicinity of the site are expected to be less than 24 $\mu g/m^3$. Based on the proximity of the residential receptors to the site boundary and the local concentrations of PM_{10} the sensitivity of the surrounding area is considered to be 'low' with regards to human health impacts.

14.5.17 In relation to trackout, it is anticipated that vehicles accessing the Site would travel along A6 and/or Loughborough Road either from the north or south. As a general guidance, significant impacts from trackout may occur up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. Two residential properties are located within 500m of the site access point therefore

the sensitivity of receptors in relation to dust soiling and human health is considered to be generally 'low' in relation to trackout and 'medium' for the two properties.

Source	Sensitivity of Surrounding Area	
	Dust Soiling	Human Health
Earthworks	Low (localised medium)	Low (localised medium)
Construction	Low (localised medium)	Low (localised medium)
Trackout	Low (localised medium)	Low (localised medium)

Figure 13: Summary of Sensitivity of Surrounding Receptors

Defining the Risk of Impacts

14.5.18 The dust emission magnitude as set out in Figure 12, is combined with the sensitivity of the area (Figure 13) to determine the risk of both dust soiling and human health impacts, assuming no mitigation measures have been applied at site. The risk of impacts associated with each activity is provided in Figure 14 below and has been used to identify specific mitigation measures, which are set out later in this chapter.

Source	Sensitivity of Surrounding Area	
	Dust Soiling	Human Health
Earthworks	Low Risk (localised medium)	Low Risk (localised medium)
Construction	Low Risk (localised medium)	Low Risk (localised medium)
Trackout	Low Risk (localised medium)	Low Risk (localised medium)

Figure 14: Summary of Dust Risk Effects to Define Site specific Mitigation

Impacts from Sewage Treatment Works

14.5.19 Three site visits were undertaken to assess the potential for odour at the development site as a result of the proposed sewage treatment works. The site visits were undertaken on 12 July 2014, 18 august 2014 and 11 September 2014 and included a full site walk over. Weather conditions were warm, with low wind speed on all occasions.

14.5.20 At no time during the site visits could any odour be detected across the site, including within the area to the east of the A6 which lies closest to the sewage treatment works.

14.5.21 The closest existing receptors are properties approximately 200-250m to the south and south-east and properties approximately 750-800m to the north-west. Based on the existing masterplan for the Site the closest residential receptor would be over 500m to the west of the sewage treatment work. It is therefore expected that any odour arising from the sewage treatment works is unlikely to result in significant odour impacts at the proposed residential receptors.

14.5.22 As shown in Figure 11 the prevailing winds are from the west and south-west, therefore any odour emissions from the sewage treatment works would impact receptors to the north-west for the majority of the year. The wind rose shows that winds from the east are very infrequent therefore it is considered that odour emissions from the sewage treatment works would have a negligible impact on properties proposed within the development site.

14.5.23 An Odour Assessment undertaken by Redmore Environmental was submitted to the Council in August 2017. This assessment provided consideration of the potential for loss of amenity for future users of the development as a result of odour emissions from the nearby Wanlip Wastewater Treatment Works (WwTWs) and Anaerobic Digestion (AD) plant, operated by Severn Trent Water (STW), and an AD plant operated by Biffa Leicester Limited (BLL).

14.5.24 Following consultation with the Council's Environmental Health Officer it was agreed that an extended programme of Field Odour Surveys should be undertaken in order to provide further consideration of potential impacts at the development. The surveys were undertaken between January and March 2018 and the findings were submitted to the Council in the form of an Odour Assessment Addendum dated 31 May 2018. The Assessment demonstrates that odour exposure ranging between negligible and slight at locations across the development site. In conclusion, the Assessment predicts that although odour form the identified sources may be experienced at certain locations on the application site boundary during specific conditions, this is not likely to cause significant effects. It is therefore considered that the overall predicted impact is negligible.

14.5.25 The Environmental Health Officer and the Environment Agency have confirmed that there are no objections to the Odour Assessment.

Operational Phase Impact

NO_2 Concentrations

14.5.23 Annual mean NO_2 concentrations predicted at the selected existing receptor locations are presented below in Figure 15. Concentrations predicted at the Development Site are provided in Figure 16.

14.5.24 The modelling assessment shows that predicted annual mean NO_2 concentrations are below the annual mean objective of 40 µg/m^3 at all nine of the existing receptors under the base and 'with development' scenarios. The highest concentrations are predicted at receptor 1, Hill Top, which is located directly adjacent to the A6.

14.5.25 Traffic generated by the proposed development is predicted to result in a maximum increase in NO_2 concentrations of 0.7 µg/m^3, predicted at receptor 1. This equates to a 2% change in the AQAL (see Figure 4). Annual mean NO_2 concentrations are predicted to be less than 75% of the AQAL at all existing receptor locations and therefore the development impact is of negligible significance. At a number of locations, traffic flows are predicted to decline as a result of the proposed development and a small improvement in air quality is predicted at receptor 2 and receptor 5. The reduction at receptor 2 is less than 0.5% of the AQAL (rounded down to 0%).

14.5.26 Annual mean NO_2 concentrations at the Development Site are predicted to be well below the annual mean objective.

14.5.27 Exceedances of the 1-hour objective for NO_2 at any receptor location are unlikely based on the predicted annual mean concentrations. Guidance referred to earlier in the

report indicates that exceedance of the 1-hour objective is unlikely where the annual mean concentration is below 60 µg/m³.

Receptor Number	2031 Baseline	2031 Base + Development	Change with Development (as a % of the AQAL)	Significance
1	26.4	27.1	2%	Negligible
2	20.6	20.6	0%	Negligible beneficial
3	21.2	21.2	0%	Negligible
4	22.3	22.4	0%	Negligible
5	23.3	23.1	-1%	Negligible beneficial
6	21.8	22.0	1%	Negligible
7	23.4	23.4	0%	Negligible
8	23.4	23.7	1%	Negligible
9	22.5	22.8	1%	Negligible

Figure 15: Predicted Annual Mean NO_2 Concentrations at Existing Receptors – 2030 Emission Factors (µg/m³)

Receptor Number	2031 Base + Development	Significance
10	22.0	Negligible
11	22.0	Negligible
12	26.8	Negligible
13	23.6	Negligible

Figure 16: Predicted Annual Mean NO_2 Concentrations at Proposed Development – 2030 Emission Factors (µg/m³)

14.5.28 Worst-case predictions of future air quality, using 2016 emission factors, are presented in Figures 17 and 18. The predicted concentrations are considerably higher, resulting in a major adverse impact at receptor 1 and a minor adverse impact at receptor 9. It should be noted that this scenario is highly conservative and there are very few receptors that would be significantly affected.

14.5.29 Annual mean NO_2 concentrations at the Development Site are predicted to be below the annual mean objective, except at the site boundary with the A46 (receptor 12). However, this receptor does not represent the locations of the proposed new residential properties which would be set back significantly from the road.

Receptor Number	2031 Baseline	2031 Base + Development	Change with Development (as a % of the AQAL)	Significance
1	44.1	45.8	4%	Major adverse
2	25.4	25.1	-1%	Negligible beneficial
3	26.9	27.0	0%	Negligible
4	30.1	30.5	1%	Negligible
5	32.5	31.7	-2%	Minor beneficial
6	28.7	29.2	1%	Negligible
7	36.1	36.0	0%	Negligible
8	34.2	34.7	1%	Negligible
9	30.6	31.5	2%	Minor adverse

Figure 16: Predicted Annual Mean NO_2 Concentrations at Existing Receptors – 2016 Emission Factors (µg/m³)

Receptor Number	2031 Base + Development	Significance
10	30.9	Negligible
11	31.0	Negligible
12	46.8	Negligible
13	35.2	Negligible

Figure 18: Predicted Annual Mean NO_2 Concentrations at Proposed Development – 2016 Emission Factors (µg/m³)

PM_{10} Concentrations

14.5.30 Annual mean PM_{10} concentrations predicted at the selected existing receptor locations are presented below in Figure 19 and concentrations predicted at the Development Site are provided in Figure 20.

14.5.31 The modelling assessment shows that predicted annual mean PM_{10} concentrations are less than 75% of the AQAL at all the selected receptor locations.

14.5.32 The proposed development is predicted to result in maximum change in PM_{10} concentrations of 0.3 µg/m³ as a result of additional traffic movements on the adjacent road network. This equates a 1% change in the AQAL and is therefore of negligible significance.

14.5.33 Concentrations at the development site are also predicted to be less than 75% of the AQAL therefore the impact on future occupants would be negligible.

14.4.34 The number of exceedances of 50 µg/m³, as a 24-hour mean PM_{10} concentration, has been calculated from the annual mean following the approach set out by DEFRA:

A= -18.5 + 0.00145 x annual mean³ + (206/annual mean) where A is the number of exceedances of 50 µg/m³ as a 24-hour mean PM_{10} concentration

14.4.35 Based on the above approach, the maximum number of days >50 µg/m³ PM_{10} is predicted to be between 2 and 4 at all existing receptors and at the development site with no change as a result of traffic generated by the proposals. The objective for this pollutant permits up to 35 days per annum and therefore exceedance of this objective is highly unlikely.

Receptor Number	2031 Baseline	2031 Base + Development	Increase with Development (as a % of the AQAL)	Significance
1	20.5	20.8	1%	Negligible
2	18.2	18.2	0%	Negligible
3	18.3	18.4	0%	Negligible
4	18.7	18.8	0%	Negligible
5	19.2	19.1	0%	Negligible
6	18.6	18.7	0%	Negligible
7	19.4	19.5	0%	Negligible
8	19.3	19.4	0%	Negligible

9	18.9	19.0	0%	Negligible

Figure 19: Predicted Annual Mean PM_{10} Concentrations at Existing Receptors - 2030 Emission Factors (µg/m^3)

Receptor Number	2031 Base + Development	Significance
10	18.6	Negligible
11	18.8	Negligible
12	20.9	Negligible
13	19.5	Negligible

Figure 20: Predicted Annual Mean PM_{10} concentration at Proposed Development (µg/m^3)

Mitigation and Enhancement

<u>Construction Phase</u>

14.5.36 The control of dust emissions from construction site activities relies upon management provision and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without impact to nearby properties.

14.5.37 Appropriate mitigation measures for the site have been identified following the IAQM guidance and based on the risk effects DMP and approved by CBC prior to commencement of any work on site.

14.5.38 In addition to the 'recommended' measures, the IAQM guidance also sets out a number of 'desirable' measures which should also be considered for inclusion within the DMP. These are also set out in Appendix E.

14.5.39 The primary concern with respect to dust emissions is related to construction activities in the vicinity of the two existing residential properties at the eastern edge of the site adjacent to A6 and subsequently as phase of new housing are brought forward in relation to earlier completed phases.

14.5.40 During the construction phase the implementation of effective mitigation measures will be necessary to significantly reduce the potential for nuisance dust and particulate matter to be generated. A best practice dust management plan will be in place for the duration of the construction phase works and this will set out the practical measures to be implemented in the relevant phase.

14.5.41 Any dust and air quality complaints will be recorded and appropriate measure taken to identify causes and reduce emissions in a timely fashion. Any exceptional incidents which cause dust and/or emissions and action taken to remedy the position will be logged and information made available to the Borough Council on request.

14.5.42 During the earthworks and construction phases measures implemented to limit dust generation will include;

- material handling methods which minimise generation of airborne dust

- minimise the duration and extent of such material handling

- ensure vehicles involved in the operation are sheeted when loaded

- dampening down of exposed stored materials and storage takes place a far a possible from sensitive receptors

- avoidance of activities that generate large amounts of dust during windy conditions

- protection of surfaces and exposed material from winds until disturbed areas are sealed and stable

14.5.43 Mitigation measures will also be implemented to reduce the prospect of dust being generated through the trackout of mud and dirt on to the public highway and these will include;

- confining vehicles to areas of the site where appropriate dust control measure can be introduced

- limiting vehicle speeds and minimising vehicle movement

- providing easily cleaned hard standing area for vehicles accessing and leaving the construction phase and also for parking and turning

- providing a wheel wash at the site exist and utilising a road sweeper at appropriate times

14.5.44 These control and practices are also referred to in mitigating prospective pollution of the water environment (see Chapter X) and there are common objectives which will be defined in the Construction Environmental Management Plan (CEMP) which, following approval by Charnwood Borough Council, will control the construction phases throughout. Final design solutions will be developed with the input of the contractor(s) involved in order to use modern construction techniques and efficiencies, skill and experience and sustainable materials.

14.5.45 Following implementation of the measures recommended for inclusion within the DMP/CEMP the impact of emissions during earthworks, construction and trackout associated with proposed development is classed as negligible.

Operational Phase

14.5.46 Traffic generated by the proposed development is predicted to result in a negligible impact at existing receptors. Impacts of emissions from the adjacent sewage treatment works are also anticipated to be negligible, therefore no mitigation is considered necessary.

(i) **Existing sensitive receptor locations**

14.5.47 A detailed air quality assessment has been undertaken to consider the potential impact of the proposed development on air quality at nine existing sensitive receptor locations. The assessment predicts that there will be a negligible impact on

concentrations of NO_2 and PM_{10} at all receptors with the development in place. The predicted NO_2 and PM_{10} concentrations at all existing receptor locations are below the Air Quality mean objective of 40 µg/m^3. Furthermore, a worst-case sensitivity study using 2016 emissions factors also predicts a negligible impact at the majority of the sensitive receptor locations, with adverse impacts only predicted at two receptors, which are in very close proximity to the A46/A6.

(ii) **Proposed sensitive receptor locations**

14.4.48 The air quality assessment has also predicted pollutant concentrations at two proposed receptor locations within the proposed development site that are representative of the residential area closest to the roads.

14.4.49 The Predicted NO_2 and PM_{10} concentrations are well below the annual mean air quality objectives of 40 µg/m^3.

Residual Effects

Construction Phase

14.5.54 The greatest potential for dust nuisance problems to occur will generally be within 200m of the construction site perimeter. There may be limited incidences of increase dust deposited on property beyond this distance. However, any potential effects during construction will be temporary and short-term and insignificant in air quality terms.

14.5.55 By following the mitigation measures outlined within this application and ensuring their application throughout the full construction period via a Construction Environmental Management Plan the impact will be substantially minimised. Residual impacts are therefore considered to be negligible.

Operational Phase

14.5.56 The impact of the proposed development would be slight adverse in one location and slight beneficial at a number of properties. There would be no significant impacts from odour emissions associated with the sewage treatment works. Residual impacts are therefore considered to be slight beneficial.

14.6 **Conclusions**

14.6.1 An air quality impact assessment has been carried out to assess both construction and operational impacts of the proposed development of the Broadnook Garden Suburb, North of Birstall.

14.6.2 An assessment of the potential impacts during the construction phase has been completed. This has shown that during this phase of the proposed development

releases of dust and PM_{10} are likely to occur as a consequence of site activities. Through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases may be effectively mitigated and the resultant impacts are considered to be negligible.

14.6.3 A qualitative review of the potential for odour impacts to occur at proposed residential receptor within the development site as a result of the sewage treatment work has been undertaken. Following consideration of separation distances, a review of meteorological data and detail of complaints received from CBC, it is considered unlikely that emissions from the treatment works would have significant impacts on future occupants of the site.

14.6.4 The ADMS dispersion model has been used to determine the impact of traffic generated by the proposed development on NO_2 and PM_{10} concentrations at existing receptors and to predict concentrations across the development site. The assessment has predicted that the impact of operational traffic will be negligible at existing receptor locations. A small beneficial impact is predicted at two receptors, due to a reduction in traffic flows on Cossington Lane and Loughborough Road. Predicted concentrations at the Development Site are well below the relevant air quality objectives.

14.6.5 Based on the above information, it is considered that air quality does not pose a constraint to development of the site as proposed in accordance with established planning policy.

Appendix 14.1 – Air Quality Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard)
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub-groups (see also air quality objective)
Ambient air	Outdoor air in the troposphere, excluding workplace air
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollution that have higher concentrations during the winter months.
AQMA	Air Quality Management Area
DEFRA	Department for Environment, Food and Rural Affairs
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system
LAQM	Local Air Quality Management
NO	Nitrogen monoxide, a.k.a. nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
O_2	Ozone
Percentile	The percentage of results below a given value
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every million (10^9) units of air, there is one unit of pollutant present
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation)
$\mu g/m^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant
UKAS	United Kingdom Accreditation Service
Uncertainty	A measure, associated with the result of a measurement, which characterises the range of values within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more

	clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation
USA	Updating and Screening Assessment
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification)
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations

Appendix 14.2 – Air Quality Standards and Objectives

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local air quality Management (LAQM)						
Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	Measured as	Annual exceedances allowed	Target date	
Nitrogen dioxide (NO_2)	All UK	200 µg/m^3	1 hour mean	18	31.12.2005	As objective. Target: 01.01.2010
	All UK	40 µg/m^3	Annual mean		31.12.2005	As standard. Target: 01.01.2010
	All UK	40 µg/m^3	Annual mean		31.12.2004	As standard. Target: 01.01.2005
Particulate Matter (PM_{10}) (gravimetric)	All UK	50 µg/m^3	24 hour mean	35	31.12.2004	As objective. Target: 01.01.2005
	Scotland	50 µg/m^3	24 hour mean	7	31.12.2010	As objective. Target: 01.01.2010
	Scotland	18 µg/m^3	Annual mean		31.12.2010	

Appendix 14.3 – Summary of Traffic Data

Traffic data utilised for the air quality assessment (AADT)

Road Link	Description	2016 Base		2031 Base		2031 Base + Development		Speed (km/h)
		AADT	HGV	AADT	HGV	AADT	HGV	
Link 14	A46 west of A6	66538	8.1%	83886	7.4%	84614	7.1%	48 (32 at junction)
Link 22	A46 east of A6	65960	8.0%	73972	6.6%	75435	6.0%	32 (16 at junction)
Link 7	A6 north of A46	49844	4.8%	52616	4.2%	58971	4.0%	32 (16 at junction)
Link 10	Loughborough Road	5927	3.0%	6526	2.7%	6122	2.9%	32 (16 at junction)
Link 33	Cossington Lane	13203	2.0%	14707	0.8%	13673	0.9%	48 (32 at junction)
Link 34	Hallfields Lane	11056	3.3%	11747	2.0%	12713	1.8%	48 (32 at junction)
Link 23	Rectory Road N	7265	1.1%	7204	0.7%	8040	0.6%	32
Link 24	Rectory Road S	7265	1.1%	7204	0.7%	8040	0.6%	32

Appendix 14.4 – Verification of Model Results

Most nitrogen dioxide (NO_2) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions.

The model has been run to predict annual mean road-NO_x concentrations at the two roadside monitoring sites adjacent to the A6 in Birstall.

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared with the 'measured' road-NO_x (Figure D1. The 'measure' road NO_x has been calculated from the measured NO_2 concentrations, by first converting the measured NO_2 into an equivalent measured NO_x using the NO_x from NO_2 DEFRA calculator, then subtracting the background value.

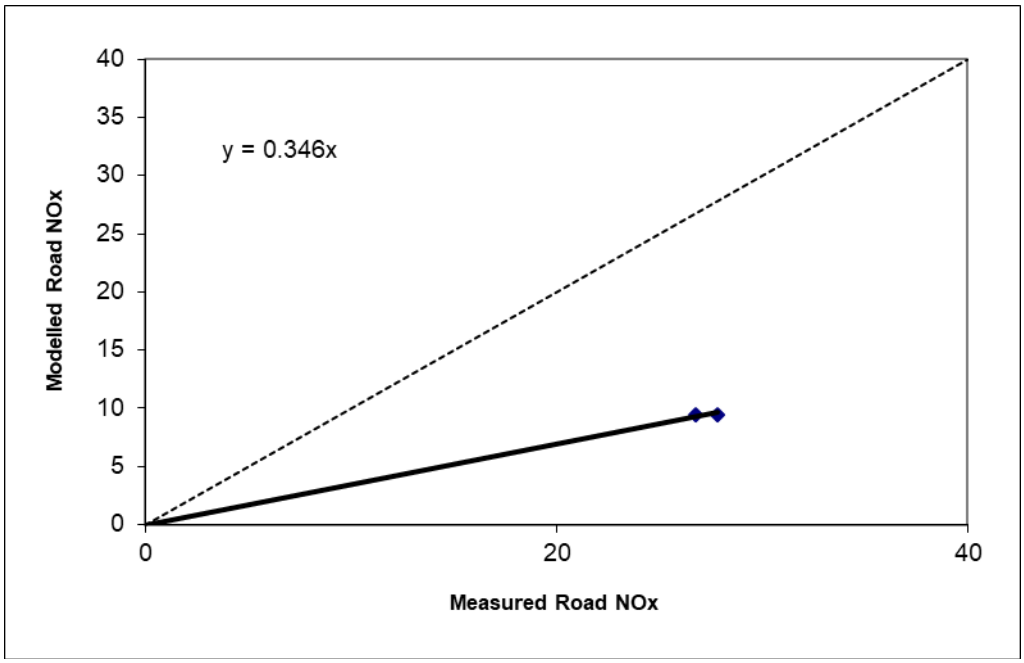

Figure D1: Comparison of Modelled Road NO_x to measured Road NO_x

A primary adjustment factor was then determined as the ratio between the measured road-NO_x contribution and the model derived road-NO_x contribution, forced through zero (1/0.346 = 2.89). This factor was then applied to the modelled road-NO_x concentration for each monitoring location to provide an adjusted modelled road-NO_x concentration. The background concentration was then added to these concentrations to determine the adjusted total modelled NO_x concentration. The road contribution to the total annual mean NO_2 concentration was then calculated using the DEFRA NO_x:NO_2 calculator tool.

The total nitrogen dioxide concentration was then predicted by adding the background NO_2 concentration to this calculated road contribution. Figure D2 shows the adjusted modelled total NO_2 vs monitored NO_2. There is good agreement with the best fit line forced through zero therefore no secondary adjustment factor has been calculated.

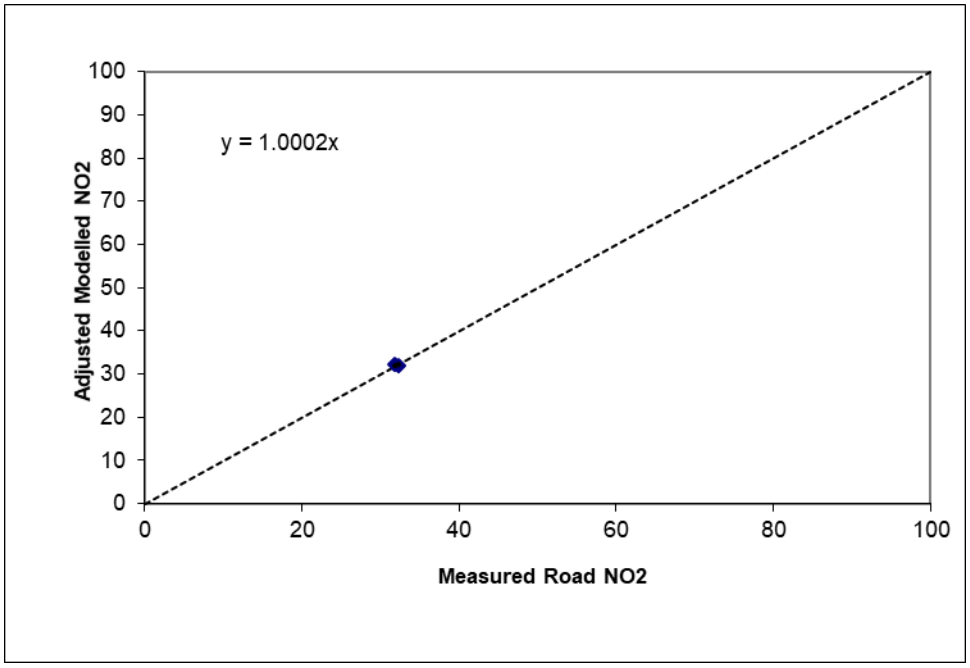

Figure D2: Comparison of Modelled NO_2 with measured NO_2 before Secondary Adjustment

Following application of the calculated adjustment factors the model results are showing no overall tendency to under or over predict at the monitoring locations and the predicted annual mean NO_2 at each site is within the preferred 10% of monitored concentrations (<1% different from monitored concentrations at both monitoring sites).

The adjustment factor of 2.89 has been applied to the modelled NO_x-road concentrations predicted at the selected proposed and existing receptors. The predicted NO_2-road concentrations, calculated using the NO_x-NO_2 converter tool, have subsequently been added to background NO_2 concentrations to provide the final predicted annual mean NO_2 concentrations at each receptor.

This method was also applied to the predicted PM_{10} concentrations.

Appendix 14.5 – Construction Mitigation Measures

It is recommended that the 'highly recommended' measures set out below are incorporated into a DMP and approved by CEC prior to commencement of any work on site:

- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the log book;
- carry out regular site inspections to monitor compliance with DMP, record inspection results and make inspection log available to CBC when asked;
- increase frequency of site inspection by the person accountable for air quality an dust issues onsite when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- avoid site run-off of water or mud;
- ensure all vehicles switch off engines when stationery – no idling vehicles;
- avoid the use of diesel or petrol powered generators and use main electricity or battery powered equipment where practicable.
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- avoid bonfires and burning of waste materials.

The following 'desirable' measures should also be considered for inclusion within the DMP:

- avoid scabbing (roughening of concrete surfaces) if possible;
- undertake daily on-site and off-site inspection, where receptors are nearby, to monitor, record inspection results and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning provided if necessary;
- fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period;
- keep site fencing, barriers and scaffolding clean using wet methods;

- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover a detailed below;
- cover, seed or fence stockpiles to prevent wind whipping;
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- impose and signpost a maximum speed limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas;
- 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;
- use water-assisted dust sweepers on the access and local roads, to remove, as necessary, any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving the site are covered to prevent the escape of materials during transport;
- record all inspections of haul routes and any subsequent action in a site log book;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud).