# 5 AIR QUALITY

## 5.1 Introduction

5.1.1 This chapter sets out the air quality assessment for the proposed Renewable Energy Centre (REC) on a plot at the Hams Hall Industrial Park in Coleshill, North Warwickshire. The REC will accept approximately 150,000 tonnes of waste per year, using gasification to provide electricity.

5.1.2 This air quality assessment primarily focusses on the potential air quality impacts associated with emissions from the stack at the Proposed Development. The assessment also considers the potential for air quality impacts as a result of dust emissions during construction, as well as additional road traffic emissions and odour and bioaerosol emissions during operation.

5.1.3 The gasification and combustion of waste can give rise to emissions of a number of pollutants with the potential to lead to air quality impacts. The pollutants covered in this assessment in terms of human health impacts, which form the primary focus of the assessment, are primarily those for which the Industrial Emissions Directive (IED) (Directive 2010/75/EU of the European Parliament and the Council on industrial emissions) specifies a maximum emission rate. These are:

- nitrogen dioxide ($NO_2$);
- sulphur dioxide ($SO_2$);
- total dust, which includes fine airborne particulate matter ($PM_{10}$ and $PM_{2.5}$);
- carbon monoxide (CO);
- hydrogen chloride (HCl);
- hydrogen fluoride (HF);
- Volatile Organic Compounds (VOCs);
- ammonia ($NH_3$);
- dioxins and furans; and
- the following trace metals:
    - cadmium (Cd);
    - thallium (Tl);
    - mercury (Hg);
    - antimony (Sb);
    - arsenic (As);
    - lead (Pb);
    - chromium (Cr);
    - copper (Cu);
    - manganese (Mn);
    - nickel (Ni); and

- vanadium (V).

5.1.4 In addition, there are two nature conservation sites close to the site such that the air quality impacts upon them warrant assessment; the Whitacre Heath SSSI and River Blythe SSSI. The relevant pollutants with the potential to affect sensitive ecosystems are:

- nitrogen oxides (NOx);
- ammonia ($NH_3$);
- sulphur dioxide ($SO_2$); and
- hydrogen fluoride (HF).

5.1.5 In terms of road traffic emissions, the primary pollutants of concern are nitrogen dioxide and fine particulate matter ($PM_{10}$ and $PM_{2.5}$). During construction, the focus is on dust and particulate matter ($PM_{10}$) emissions. Waste handling during operation could also potentially lead to emissions of bioaerosols and odorous compounds.

5.1.6 **Appendix 5.1** provides references and **Appendix 5.2** a glossary.

## 5.2 Assessment Approach

Methodology

*Assessment Criteria*

*Criteria to Protect Human Health*

5.2.1 Table A5.3.1 in **Appendix 5.3** defines the assessment criteria for human health used in this study. The UK Government's Air Quality Objectives for nitrogen dioxide and $PM_{10}$ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. The UK objectives for nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ are the same as the EU limit values. The EU limit value for $PM_{2.5}$ is the same as the UK objective, but was to have been met by 2015.

5.2.2 The objectives apply at locations where members of the public are likely to be regularly present and are exposed over the averaging period of the objective. Where there is no air quality objective, the Environment Agency's Environmental Assessment Levels (EALs) have been applied. Defra explains where the objectives apply in its Local Air Quality Management Technical Guidance (Defra, 2016a). Annual mean objectives and EALs are considered to apply anywhere with residential exposure. The 24-hour mean objective for $PM_{10}$ is taken to apply at residential properties as well as the gardens of residential properties. The 1-hour mean objective for nitrogen dioxide, and those EALs for shorter time periods than the annual mean, are taken to apply anywhere where people may spend one hour or more (or fifteen minutes in the case of the 15-minute sulphur dioxide objective).

5.2.3 Where there is no EAL quoted in Environment Agency guidance, one has been derived from the Health and Safety Executive's workplace exposure limits (HSE, 2005). This applies to the short term EAL for chromium VI, and the short- and long-term EALs for thallium and cobalt.

5.2.4 The Industrial Emissions Directive (IED) (Directive 2010/75/EU of the European Parliament and the Council on industrial emissions) specifies a maximum emission of Total Organic Carbon (TOC). In order to assess the potential emissions of TOCs, a worst-case approach has been taken, assuming that all TOCs are Volatile Organic Compounds (VOCs); that all VOCs are both benzene and 1,3 butadiene with respect to annual mean concentrations; and that all VOCs are dimethyl sulphate with respect to short-term EALs.

This situation would not happen in practice and provides an extremely conservative assessment.

5.2.5 There are no assessment criteria for dioxins and furans. The World Health Organisation (WHO, 2000) provides an indicator of the air concentrations above which it considers it necessary to identify and control local emission sources; this value is 0.3 pg/m$^3$ (300 fg/m$^3$). In the absence of suitable criteria, the process contributions have been compared against the relevant background concentration, as well as the WHO indicator concentration for which it is considered necessary to identify and control emission sources.

5.2.6 Table A5.3.1 in **Appendix 5.3** shows that 18 exceedences of 200 µg/m$^3$ as a 1-hour mean nitrogen dioxide concentration are allowed before the objective is exceeded. For a typical year with complete data capture, the 19$^{th}$ highest hour is represented by the 99.79$^{th}$ percentile of 1-hour mean concentrations. Thus, comparing the 99.79$^{th}$ percentile of 1-hour mean concentrations with the 200 µg/m$^3$ standard identifies whether the 1-hour mean nitrogen dioxide objective is exceeded. A similar approach is applied to assessing other short-term objectives with a permitted number of exceedences, as outlined in Table 5.1.

**Table 5.1: Equivalent Percentiles to the Air Quality Objectives**

| **Pollutant** | **Averaging Period** | **Permitted Exceedences** | **Equivalent Percentile** |
|---|---|---|---|
| $NO_2$ | 1 hour | 18 per year | 99.79$^{th}$ |
| $PM_{10}$ | 24 hour | 35 per year | 90.4$^{th}$ |
| $SO_2$ | 24 hour | 3 per year | 99.18$^{th}$ |
| | 1 hour | 24 per year | 99.7$^{th}$ |
| | 15 minute | 35 per year | 99.9$^{th}$ |

*Criteria to Protect Ecological Sites*

5.2.7 Objectives for the protection of vegetation and ecosystems have been set by the UK Government. These are based on the European Union limit values. The limit values and objectives only apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built up areas of more than 5,000 people. These objectives and limit values do not, therefore, strictly apply within the study area, although it is common practice for them to be considered.

5.2.8 Critical levels and critical loads are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive ecosystems are unlikely to occur. The critical levels are set at the same concentrations as the objectives. Typically, the potential for exceedences of the critical levels and critical loads is considered in the context of the level of protection afforded to the ecological site as a whole. For example, the level of protection afforded to an internationally-designated site (such as a SAC) is significantly greater than that afforded to a Local Nature Reserve, reflecting the relative sensitivity of the sites as well as their perceived ecological value.

5.2.9 The Air Pollution Information System (APIS) database (APIS, 2016) has been searched to obtain relevant critical levels and critical loads. Where APIS does not provide critical levels for a given pollutant, they have been taken from the Environment Agency's "Air Emissions Risk Assessment" guidance (Environment Agency, 2016). Different critical loads are available for different habitats; and in the case of acidity, different locations.

However, the APIS database indicates that the habitats at the River Blythe and Whitacre Heath SSSI's will not be sensitive to acid or nitrogen deposition, thus no critical load applies. The relevant EALs applicable to the SSSI's are set out in Table 5.2.

**Table 5.2: Relevant Assessment Criteria for the Protection of Sensitive Ecosystems [a]**

| Pollutant | Averaging Period | Species/Habitat | EAL |
|---|---|---|---|
| $NH_3$ | Annual | All higher plants | 3 μg/m$^3$ |
| NOx | Annual | All sensitive communities (but does not apply as an objective or limit value within the study area) | 30 μg/m$^3$ |
| | 24 hour | All sensitive communities | 75 μg/m$^3$ |
| $SO_2$ | 24 hour | All higher plants | 20 μg/m$^3$ |
| HF | 1 hour | All sensitive communities | 5 μg/m$^3$ |
| | 15 minute | All sensitive communities | 0.5 μg/m$^3$ |

[a] Taken from the Environment Agency's "Air Emissions Risk Assessment" guidance (Environment Agency, 2016).

*Screening and Descriptive Criteria*

Criteria Issued by the Environment Agency

5.2.10 The Environment Agency has adopted criteria (Environment Agency, 2016) that allow health-related process contributions ('PC') to be screened out as insignificant regardless of the baseline environmental conditions. The emissions from a process can be considered to be insignificant if:

- the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
- the short-term (24-hour mean or shorter) process contribution is <10% of the short-term environmental standard.

5.2.11 It should be recognised that these criteria determine when an effect can be screened out as insignificant. They do not imply that effects will necessarily be significant above these levels, only that there is a potential for significant effects that should be assessed using a detailed assessment methodology, such as detailed dispersion modelling (as has been carried out for this project in any event), and taking into account background concentrations. The next step in the Environment Agency's screening process is to add the PC to the local background concentration to calculate the predicted environmental concentration (PEC). The emissions are insignificant if:

- the short-term PEC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- the long-term PEC is less than 70% of the long-term environmental standard.

5.2.12 However, the Environment Agency also advises that, where detailed dispersion modelling has been undertaken, no further action is required if resulting PECs do not exceed environmental standards.

5.2.13 In terms of the potential for ecological impacts on European sites or nationally designated sites (i.e. the SSSI's), the Environment Agency requires a detailed assessment where the process contribution is greater than 1% of the standard <u>and</u> the Predicted Environmental Contribution (PEC), effectively the total concentration or deposition rate, is greater than 70% of the standard.

*Environmental Protection UK and Institute of Air Quality Management Criteria*

5.2.14 While the Environment Agency's criteria are more relevant to this Proposed Development, given that the site will be permitted and regulated by the Environment Agency, consideration has also been given to the Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance aimed specifically at planning applications.

5.2.15 The approach developed jointly by EPUK & IAQM (2015), as described in **Appendix 5.4**, is that any change in concentration smaller than 0.5% of the long-term environmental standard will be negligible, regardless of the existing air quality conditions. Where the change in concentration represents more than 0.5% of the standard, existing conditions are taken into consideration when describing the impacts. This is more stringent than the Environment Agency screening criterion of 1% set out above. With respect to changes in short-term concentrations, the guidance explains that:

*"Where peak short term concentrations (those averaged over periods of an hour or less) from an elevated source are in the range 10-20% of the relevant Air Quality Assessment Level (AQAL), then their magnitude can be described as small, those in the range 20-50% medium and those above 50% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other local sources".*

*Approach Used in This Assessment*

5.2.16 As a first step, the assessment has considered the predicted Process Contributions using the following criteria:

- is the long-term (annual mean) Process Contribution less than 0.5% of the long-term environmental standard?; and
- is the short-term (24-hour mean or shorter) Process Contribution less than 10% of the short-term environmental standard?

5.2.17 Where both of these criteria are met, then the impacts are negligible and thus insignificant. Where these criteria are breached then a more detailed assessment, considering total concentrations, has been undertaken.

5.2.18 It should be noted that the above approach to long-term process contributions is very conservative, given that the IAQM guidance specifically states that *"this guidance…is* *not intended to replace other guidance. For example, industrial development regulated by the Environment Agency, and requiring an Environmental Permit, is subject to the Horizontal Guidance Note H1"*. Where long-term process contributions fall between 0.5% an 1% of the long-term environmental standard then consideration should be given to this, as this assessment is very worst-case in applying the 0.5% criterion and could potentially have just applied the 1% criterion.

*Construction Dust Criteria*

5.2.19 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management (2014a) has been used. Full details of this approach are provided in **Appendix 5.5**.

*Odour Criteria*

5.2.20 There are currently no statutory standards in the UK covering the release and subsequent impacts of odours. This is due to complexities involved with measuring and assessing odours against compliance criteria, and the inherently subjective nature of odours.

5.2.21 It is recognised that odours have the potential to pose a nuisance for residents living near to an offensive source of odour. Determination of whether or not an odour constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the Environment Agency. The Environmental Protection Act 1990 (HMSO, 1990) outlines that a local authority can require measures to be taken where any:

*"dust, steam, smell or other effluvia arising on an industrial, trade and business premises and being prejudicial to health or a nuisance…" or*

*"fumes or gases are emitted from premises so as to be prejudicial to health or cause a nuisance".*

5.2.22 Odour can also be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act.

*Bioaerosol Criteria*

5.2.23 There is currently no guidance relevant to bioaerosol releases from the storage, disposal or thermal treatment of refuse derived fuel (RDF). All current guidance in the UK relates to composting activities, which have a much greater propensity for bioaerosol production than would be expected from RDF.

5.2.24 In 2001, the Environment Agency commissioned a study into the health effects of composting which included close examination of bioaerosols (Environment Agency, 2001). The study examined three major UK composting sites at which bioaerosol monitoring was undertaken for a number of sources at each site during visits at different times of year. The monitoring provided information on the concentration of bioaerosols, measured in colony forming units per cubic metre of air (cfu/m$^3$), and the reduction in concentrations with distance from the source brought about by the dilution and dispersion of microorganisms during transport in air.

5.2.25 The study set out the following threshold limit values for short-term non-occupational exposure to bioaerosols:

- Bacteria = 1000 cfu/m$^3$;
- Fungi = 1000 cfu/m$^3$; and

- Gram-negative Bacteria = 300 cfu/m³.

5.2.26 Although these limit values were not supported by significant scientific evidence, they were accepted as being a conservative estimate of "safe" levels of exposure.

5.2.27 In addition, an Environment Agency position statement on the health effects of bioaerosols from composting (Environment Agency, 2010) states that bioaerosol concentrations *"generally decline to background levels within 250 m"* of composting activities. This statement was based on general consensus at the time of publication.

5.2.28 Until new, industry-specific guidance is released, the information available on bioaerosols from composting remains the only available guidance that is applicable to the waste industry. However, as stated above, composting activities will have a much greater propensity for bioaerosol production than would be expected from the handling of RDF.

*Approach- Existing Conditions*

5.2.29 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority and by Defra. The background concentrations across the study area have also been defined using the national pollution maps published by Defra (2016b), adjusted to local background monitoring data. These cover the whole country on a 1x1 km grid. Further information about background concentrations can be found in **Appendix 5.6**.

*Approach- Stack Emissions*

*Study Area*

5.2.30 The study area for consideration of the health impacts of emissions from the stack covers a number of specific receptors and an 8 x 8 km area, centred on the Proposed Development.

5.2.31 The Environment Agency requires an assessment of the impacts on European designated ecological sites (SPAs, SACs etc) within 10 km of the facility, of which there are none, and on national and local ecological sites within 2 km of the facility (Environment Agency, 2016). The relevant sites for this assessment are as follows:

- Whitacre Heath SSSI, located approximately 760 m northeast; and
- River Blythe SSSI, located approximately 1.6 km to the southeast.

*Modelling Impacts from the Proposed REC*

5.2.32 The impacts of emissions from the proposed REC have been modelled using the ADMS-5.1 dispersion model. ADMS-5.1 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer.

*Receptors*

5.2.33 Impacts have also been predicted across an 8 x 8 km grid, centred on the Proposed Development, with receptors spaced 25 m apart across this grid. These receptors have been modelled at a height of 1.5 m, to represent ground-level human exposure. The gridded receptors are shown in **Figure 5.1**.

5.2.34 Impacts have also been predicted at a number of specific sensitive receptor locations. In terms of human health impacts, this has been done for a selection of local residential properties. The local sensitive locations assessed are shown in **Figure 5.2**. All sensitive locations (1 to 28) have all been modelled at heights of 1.5 m and 4.5 m to represent ground and first-floor levels. Wherever multiple heights have been modelled, the maximum process contribution at any height at that receptor has been used throughout this assessment. Receptors in the nearby nature conservation sites have been selected from the receptor grid, and have been modelled at a height of 1.5 m (see **Figure 5.2**).

*Meteorology*

5.2.35 Five years of hourly-sequential meteorological data (2011 to 2015 inclusive) from Coleshill have been used. The Coleshill meteorological station is located approximately 5.3 km to the south of the Proposed Development. It is the nearest station to the Proposed Development which measures all of the required parameters. Both the Proposed Development and the Coleshill meteorological station are located within relatively flat-lying, inland locations in the East Midlands where they will be influenced by the effects of inland meteorology on flat-lying topography.

5.2.36 **Appendix 5.7** provides a wind-rose for each meteorological dataset, and outlines the other meteorological parameters used in the model (such as surface roughness etc.). The maximum predicted process contribution during any year has been reported in the results section of this report.

*Building Wake Effects*

5.2.37 ADMS-5 has the ability to simulate the entrainment of exhaust plumes into the wake of nearby buildings. In order to ensure that the worst-case building configuration was covered, modelling has been carried out for two scenarios: 1) no buildings included in the model; 2) the main on-site and closest neighbouring buildings included in the model. **Figure 5.3** shows the buildings modelled and their heights. The maximum predicted concentrations from the two scenarios have been used throughout this assessment.

*Terrain Effects*

5.2.38 In order to ensure that the impacts of topography on dispersion are considered, the model has also been run to take account of terrain effects, with a grid of topographical data at 50 m spacing.

*Emissions*

5.2.39 The operator has provided data on efflux volumes in $Nm^3/s$ [1], as well as stack dimensions (there will be three flues of 0.9 m diameter each within the stack) and the actual release conditions. The release parameters are set out in Table A5.6.1 in **Appendix 5.6**. The pollutant emission rates used in the assessment are derived from IED limits, which are also set out in **Appendix 5.6** along with the emission rates entered into the dispersion model.

*Post-Processing*

5.2.40 ADMS-5 has been run to predict the contribution of the proposed facility to annual mean concentrations of the pollutants for which there are annual mean objectives and EALs in Table A5.3.1 in **Appendix 5.3**, as well as to the $99.79^{th}$ percentile of 1-hour mean nitrogen oxides concentrations, $90^{th}$ percentile of 24-hour mean $PM_{10}$ concentrations,

1 Throughout this report, 'normal' (N) is used to refer to conditions recorded in the absence of moisture, at 11% oxygen, and at 0 degrees Celsius. These are the reference conditions at which the relevant IED emissions limits are expressed.

99.7th percentile of 1-hour mean sulphur dioxide concentrations, 99.9th percentile of 15-minute sulphur dioxide concentrations and 99.18th percentile of 24-hour mean sulphur dioxide concentrations.

5.2.41 The approach recommended by the Environment Agency (Environment Agency, 2005) has been used to predict annual mean nitrogen dioxide concentrations and 99.79th percentiles of 1-hour mean nitrogen dioxide concentrations. This assumes that:

- Annual mean nitrogen dioxide concentrations = Annual mean nitrogen oxides x 0.7; and
- 99.79th percentiles of 1-hour mean nitrogen dioxide concentrations = 99.79th percentiles of 1-hour mean nitrogen oxides x 0.35.

*Assumptions and Uncertainty*

5.2.42 The limitations of this assessment are set out in detail in paragraphs 5.2.96 to 5.2.97. It is important to highlight that some of the assumptions made with regard to the stack emissions modelling will ensure a worst-case assessment. It has been assumed that the facility will operate continuously, although it will close for maintenance for at least three weeks each year. Predicted annual mean concentrations should, therefore, be some 6% lower than presented in this chapter.

5.2.43 IED emission rates have also been assumed. The gasification technology is expected to result in emission rates lower than these maxima permitted under IED, and the Environment Agency often imposes even lower limits, especially for nitrogen oxides. The assessment has been founded on the maximum predicted concentration from any of the five years modelled. These assumptions ensure that the assessment is worst-case, and that the actual impacts of the REC will be considerably lower than those described in this chapter.

*Approach- Road Traffic Emissions*

5.2.44 The approach taken in this assessment has been to screen the potential changes in traffic flows as a result of the Proposed Development against criteria set out in the EPUK & IAQM guidance (EPUK & IAQM, 2015). Where the change in flows is below the published screening criteria no further assessment is required.

*Approach- Construction Dust*

5.2.45 The construction dust assessment considers the potential for impacts within 350m of the site boundary; or within 50m of roads used by construction vehicles. The assessment methodology is that provided by the IAQM (Institute of Air Quality Management, 2014a). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts. **Appendix 5.5** explains the approach in more detail.

*Approach- Odour*

5.2.46 There are a number of odour assessment methods and tools that have been developed, and which are widely used in the UK, including desk-based methods, such as complaints analysis and qualitative risk assessment, through to field odour testing (sniff testing) and dispersion modelling. Each has its advantages and disadvantages and not all assessment methods are appropriate in every case; for example, where a potentially odorous process is proposed rather than existing, then assessment methods such as sniff testing and odour sampling are less relevant than predictive methods such as odour risk assessment.

5.2.47 The approach to assessing the odour impacts from the Proposed Development has been to utilise the qualitative risk-assessment approach described in the IAQM guidance on the assessment of odours for planning (IAQM, 2014b).

*Risk Assessment*

5.2.48 The odour risk assessment set out in the IAQM guidance follows a Source-Pathway-Receptor approach. This approach describes the concept that, in order for an odour impact (such as annoyance or nuisance) to occur, there must be a source of odour, a pathway to transport the odour to an off-site location, and a receptor (e.g. people) to be affected by the odour.

5.2.49 The risk of odour effects at a given receptor location may be estimated using the following fundamental relationship:

Effect ≈ Dose x Response

5.2.50 In this relationship, the **dose** is a measure of the likely exposure to odours, in other words the ***impact***. The **response** is determined by the sensitivity of the receiving environment and thus the overall ***effect*** is the result of changes in odour exposure at specific receptors, taking into account their sensitivity to odours.

5.2.51 In order to determine the risk of potential odour effects from the REC, the 'FIDOR' factors for odour exposure have been used. These factors are commonly used in the assessment of odours and are outlined in the IAQM guidance, but are also described in the Environment Agency's H4 guidance document on odour management (Environment Agency, 2011b), as well as Defra's odour guidance for local authorities (Defra, 2010). The FIDOR factors are:

- **F**requency – the frequency with which odours are detected;
- **I**ntensity – the intensity of odours detected;
- **D**uration – the duration of exposure to detectable odours;
- **O**ffensiveness – the level of pleasantness or unpleasantness of odours; and
- **R**eceptor – the sensitivity of the location where odours are detected, and/or the proximity of odour releases to an odour-sensitive location.

5.2.52 Odour emissions from the proposed REC have been assigned a risk-ranking based on the "effect ≈ dose x response" relationship, whereby the dose (impact) is determined by the "FIDO" part of FIDOR, and the response is determined by the "R" (receptor sensitivity). The risk of odour effects can therefore be described as:

Effect ≈ Impact (FIDO) x Receptor Sensitivity (R)

5.2.53 The key factors that will influence the effects of odours are the magnitude of the odour source(s), the effectiveness of the pathway for transporting odours, and the sensitivity of the receptor. The methodology set out in the IAQM guidance document describes in detail a Source-Pathway-Receptor approach to odour risk assessment, and includes tables and matrices to assist in determining the likely risk of odour effects. The IAQM methodology is outlined below. It includes an element of professional judgement.

5.2.54 The assessment examines the source odour potential (source magnitude) of the renewable energy centre, and then identifies the effectiveness of the pathway and receptor sensitivity at sensitive locations.

5.2.55 Table 5.3 describes the risk-rating criteria (high, medium and low) for source odour potential, pathway effectiveness and receptor sensitivity applied in this assessment. This table has been adapted from Table 8 in the IAQM odour guidance.

**Table 5.3: Source-Pathway-Receptor Risk Ratings**

| Source Odour Potential | Pathway Effectiveness | Receptor Sensitivity |
|---|---|---|
| **Large Source Odour Potential:** Large-scale odour source and/or a source with highly unpleasant odours (hedonic tone -2 to -4); no odour control. | **Highly Effective Pathway:** Very short distance between source and receptor; receptor downwind of source relative to prevailing wind; ground level releases; no obstacle between source and receptor. | **High Sensitivity:** Highly sensitive receptors e.g. residential properties and schools. |
| **Medium Source Odour Potential:** Medium-scale odour source and/or a source with moderately unpleasant odours (hedonic tone 0 to -2); basic odour controls. | **Moderately Effective Pathway:** Receptor is local to the source; releases are elevated, but compromised by building effects. | **Medium Sensitivity:** Moderately sensitive receptors e.g. commercial and retail premises, and recreation areas. |
| **Small Source Odour Potential:** Small-scale odour source and/or a source with pleasant odours (hedonic tone +4 – 0); best practise odour controls. | **Ineffective Pathway:** Long distance between source and receptor (>500 m); receptors upwind of source relative to prevailing wind; odour release from stack/high level. | **Low Sensitivity:** Receptors not sensitive e.g. industrial activities or farms. |

5.2.56 The risk ratings for source magnitude and pathway effectiveness (for each receptor) identified using the criteria in Table 5.3 are then combined using the matrix shown in Table 5.4 to estimate an overall risk of odour impact at each specific receptor location.

**Table 5.4: Assessment of Risk of Odour Impact at a Specific Receptor Location**

| Pathway Effectiveness | Source Odour Potential (Source Magnitude) | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| **Highly Effective** | High Risk | Medium Risk | Low Risk |
| **Moderately Effective** | Medium Risk | Low Risk | Negligible Risk |
| **Ineffective** | Low Risk | Negligible Risk | Negligible Risk |

5.2.57 The next stage of the risk assessment is to identify the potential odour effect at each receptor location. This is done using the matrix presented in Table 5.5, which combines the overall odour impact risk descriptor for each receptor with the receptor sensitivity determined using the criteria in Table 5.4.

**Table 5.5: Assessment of Potential Odour Effect at a Specific Receptor Location**

| Risk of Odour Impact | Receptor Sensitivity | | |
|---|---|---|---|
| | **High** | **Medium** | **Low** |
| **High Risk** | Substantial Adverse Effect | Moderate Adverse Effect | Slight Adverse Effect |
| **Medium Risk** | Moderate Adverse Effect | Slight Adverse Effect | Negligible Effect |
| **Low Risk** | Slight Adverse Effect | Negligible Effect | Negligible Effect |
| **Negligible Risk** | Negligible Effect | Negligible Effect | Negligible Effect |

5.2.58 As a final stage of assessment, an overall significance of odour effects is determined, based on professional judgment and taking into account the significance of effect at each specific receptor location.

*Approach- Bioaerosols*

5.2.59 A qualitative approach has been taken to the bioaerosol assessment, based upon the likelihood of the generation of bioaerosols, the quantity likely to be generated, the potential for them to be released to the air outside of the facility, and the potential for such releases to lead to significant impacts at the nearest sensitive receptors.

Assessment of Significance

*Construction Dust Significance*

5.2.60 Guidance from the IAQM (Institute of Air Quality Management, 2014a) is that, with appropriate mitigation in place, the impacts of construction dust will be 'not significant'. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that impacts will normally be 'not significant'.

*Operational Air Quality Impact Significance*

5.2.61 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. While the Environment Agency's "Air Emissions Risk Assessment" (Environment Agency, 2016) guidance does not set out a method of describing air quality impacts or determining how significant they are, it does set out screening criteria below which impacts can be considered insignificant (see paragraphs 5.2.10 and 5.2.11). These screening criteria have therefore been used in this assessment, along with the approach developed jointly by EPUK & IAQM (2015). The EPUK & IAQM approach includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors. Full details of the EPUK/IAQM approach are provided in **Appendix 5.4**. The approach includes elements of professional judgement, and the experience of the consultants preparing the assessment is set out in **Appendix 5.9**.

5.2.62 It is important to differentiate between the terms impact and effect with respect to the assessment of air quality. The term impact is used to describe a change in pollutant concentration at a specific location. The term effect is used to describe an environmental response resulting from an impact, or series of impacts. Within this chapter, the air quality assessment has used published guidance and criteria described in the following sections to determine the likely air quality impacts at a number of sensitive locations. The potential significance of effects has then been determined by professional judgement, based on the frequency, duration and magnitude of predicted impacts and their relationship to appropriate air quality objectives.

*Operational Odour & Bioaerosol Significance*

5.2.63 The IAQM guidance document (IAQM, 2014b) contains a method for estimating the significance of potential odour impacts, and has been used in determining the significance of potential odour impacts. There is no guidance that sets out how to determine the significance of bioaerosol impacts, thus, a professional judgement has been applied.

Policy Framework

*European Legislation*

*European Framework Directive on Ambient Air Quality and Cleaner Air for Europe, 2008*

5.2.64 The European Union has set limit values (concentrations which must not be exceeded) for a range of air pollutants. These limit values are set out in the EU Framework Directive (2008/50/EC, 2008). Achievement of these values is a national obligation and was required by 2010 for nitrogen dioxide and benzene, by 2005 for all other pollutants apart from $PM_{2.5}$, which was required by 2015.

*Waste Framework Directive, 2008*

5.2.65 The Waste Framework Directive (2008/98/EC, 2008) sets out the EU member state obligations for the planning, operation and management of waste sites and processes. With respect to air quality, the Directive states:

*"Member States shall take the necessary measures to ensure that waste management is carried out without endangering human health, without harming the environment and, in particular:*

*without risk to water, air, soil, plants or animals;*

*without causing nuisance through noise or odours; and*

*without adversely affecting the countryside or places of special interest."*

*European Industrial Emissions Directive, 2010*

5.2.66 The Industrial Emissions Directive (IED) (2010/75/EU, 2010) brings together seven existing directives, including the Waste Incineration Directive, into one piece of legislation. The IED sets total emission limit values (ELVs) for a number of pollutants typically emitted during waste incineration. These are nitrogen oxides, carbon monoxide, total dust, hydrogen chloride, hydrogen fluoride, sulphur dioxide, organic substances, trace metals, and dioxins and furans. The design and operation of all new waste incineration facilities must ensure compliance with the ELVs.

<u>*National Legislation*</u>

*The Environmental Permitting Regulations in England and Wales, 2010*

5.2.67 The Environmental Permitting Regulations (2010) sets the legislative background for environmental permitting in England and Wales. The Regulations include a commitment to minimise emissions to air from permitted processes, and include obligations for compliance with all legislated emissions limits for permitted processes, including the IED emission limits for waste incineration processes.

*The Environmental Permitting Regulations in England and Wales (Amendment) Regulations, 2013*

5.2.68 The requirements of the IED were transposed into UK law on 27th February 2013 by the Environmental Permitting (England and Wales) (Amendment) Regulations (2013). These make any new installation seeking a permit after 28th February 2013 subject to the IED.

*The Waste (England and Wales) Regulations 2011*

5.2.69 The Waste Framework Directive (2008/98/EC, 2008) and its obligations, including those on air quality, are transposed in English law by The Waste (England and Wales) Regulations (2011).

*The UK Air Quality Strategy, 2007*

5.2.70 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment (Defra, 2007). The 'standards' are set as pollutant concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale.

5.2.71 The Strategy also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives (AQO). Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

*Air Quality (England) Regulations, 2000 and Air Quality (England) (Amendment) Regulations 2002*

5.2.72 These Regulations define the air quality objectives for the Local Air Quality Management (LAQM) Regime.

*Air Quality Standards Regulations, 2010*

5.2.73 The air quality limit values set out in EU Directive (2008/50/EC, 2008) are transposed in English law by the Air Quality Standards Regulations (2010). These impose duties on the Secretary of State relating to achieving the limit values.

National Planning Policy

*National Planning Policy Framework, 2012*

5.2.74 The National Planning Policy Framework (NPPF) (2012) sets out planning policy for the UK. It replaces previous Planning Policy Statements, including PPS23 on Planning and Pollution Control.

5.2.75 The NPPF contains advice on when air quality should be a material consideration in development control decisions. Existing, and likely future, air quality should be taken into account, as well as the EU limit values or national objectives for pollutants, the presence of any AQMAs and the appropriateness of both the development for the site, and the site for the development.

5.2.76 The NPPF places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should *"contribute to…reducing pollution".* To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location. The NPPF states that the effects of pollution on health, and the sensitivity of the area and the development, should be taken into account.

5.2.77 The need for compliance with any statutory air quality limit values and objectives is stressed, and the presence of AQMAs must be accounted for in terms of the cumulative effects on air quality from individual sites in local areas. New developments in AQMAs should be consistent with local air quality action plans.

5.2.78 The NPPF also sets out the national planning policy on biodiversity and conservation. This emphasises that the planning system should seek to minimise effects on biodiversity and provide net gains in biodiversity wherever possible as part of the Government's commitment to halting declines in biodiversity and establishing coherent and resilient ecological networks.

*National Policies to Protect Ecosystems*

5.2.79 The Environment Act (1995) and the Natural Environment and Rural Communities Act (2006) both require the conservation of biodiversity. National planning policy on biodiversity and conservation is set out in the NPPF (National Planning Policy Framework, 2012). This emphasises that the planning system should seek to minimise impacts on biodiversity and provide net gains in biodiversity wherever possible as part of the Government's commitment to halting declines in biodiversity and establishing coherent and resilient ecological networks.

5.2.80 Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife sites will be judged, making distinctions between different levels of site designation. If significant harm from a development cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.

<u>*Local Planning Policy*</u>

*North Warwickshire Development Plan*

5.2.81 The Local Plan for North Warwickshire, which was adopted in July 2006, is made up of a number of documents, all forming part of the Development Plan. The Core Strategy (North Warwickshire Borough Council, 2014) was adopted on 9th October 2014 and replaces some of the saved policies. However, in terms of air quality, the original policy from the 2006 Plan remains in force:

ENV9 Air Quality:

*"POLICY ENV9 - AIR QUALITY*

*The air quality of the Borough will be safeguarded and enhanced by:*

- *Not permitting new potentially polluting forms of development within and bordering the Borough's Air Quality Management Areas (AQMA) to minimise potential risks to health. The existing AQMA is shown on the Proposals Map.*

- *Not permitting development that would include hazardous substances likely to have an unacceptable risk to nearby areas and people.*

- *Not permitting development in the vicinity of notifiable hazardous installations or premises if there is an unacceptable risk to occupiers."*

5.2.82 The Core Strategy also includes a saved policy from the Waste Local Plan for Warwickshire (Warwickshire County Council, 1995), which was adopted in 1995. This Plan was then superseded by the Warwickshire Waste Core Strategy, which was adopted on 9th July 2013 (Warwickshire County Council, 2013). The latest Core Strategy contains Policy CS6 which states that:

*"Proposals for anaerobic digestion, mechanical-biological treatment and other energy or value recovery technologies will be encouraged provided that the development accords with all other policies and*

- *energy or value recovery products are maximised; and*

- *it is demonstrated that any resulting residues are satisfactorily managed and disposed of."*

<u>*Air Quality Action Plans*</u>

*National Air Quality Plans*

5.2.83 Defra has produced Air Quality Plans to reduce nitrogen dioxide concentrations in major cities where exceedences of the EU limit values for nitrogen dioxide have been forecast in 2020 and beyond (Defra, 2015). Along with a suite of national measures, the Air Quality Plans identify the need to establish Clean Air Zones within five Zones (Birmingham, Leeds, Southampton, Nottingham and Derby). Within these Zones, lower-emission vehicles will be encouraged. The precise nature of these Clean Air Zones is still to be decided. In Greater London, Defra will continue to support and monitor the delivery of the Mayor's plans for improving air quality to meet the EU limit value for nitrogen dioxide by 2025. The Proposed Development is not within an affected Zone.

5.2.84 There is currently no practical way to take account of the effects of these Air Quality Plans on the modelling presented in this report, which is for assessment against the air quality objectives.

*Local Air Quality Action Plan*

5.2.85 North Warwickshire Council no longer has any AQMAs and thus there is no local Air Quality Action Plan.

<u>*Guidance Notes*</u>

*Environment Agency Air Emissions Risk Assessment, 2016*

5.2.86 The Environment Agency's "Air Emissions Risk Assessment" (Environment Agency, 2016) provides methods for quantifying the air quality effects of industrial emissions. It contains long- and short-term Environment Assessment Levels (EALs) for releases to air derived from a number of published UK and international sources.

5.2.87 In addition, the Environment Agency's Interim Guidance Note for Metals provides guidance for applicants for environmental permits, on how to consider the air quality effects from Group III metals in stack emissions from incineration and co-incineration plant (Environment Agency, 2012).

*Health and Safety Executive, Workplace Exposure Limits, 2005*

5.2.88 The Health and Safety Executive's EH40/2005 Workplace exposure limits (HSE, 2005) document contains a list of the workplace exposure limits for substances hazardous to health. For pollutants assessed in this report which have no AQO or EALs, the occupational exposure emissions limits in EH40 have been used, following the advice set out in the EA's Air Emissions Risk Assessment guidance.

<u>*Odour Guidance*</u>

*Defra Guidance*

5.2.89 Defra released Odour Guidance for Local Authorities in March 2010 (Defra, 2010). This is a reference document aimed at environmental health practitioners and other professionals engaged in preventing, investigating and managing odours. The purpose of the guide is:

*"…to support local authorities in their regulatory roles in preventing, regulating and controlling odours..."*

5.2.90 The guidance outlines tools and methods which may be employed by environmental health practitioners in determining whether there is a statutory nuisance from odours; it covers the fundamentals of odours, the legal framework, assessment methods, mitigation measures and intervention strategies which may be adopted.

*Environment Agency Guidance*

5.2.91 The Environment Agency has produced a horizontal guidance note (H4) on odour assessment and management (Environment Agency, 2011b), which is designed for operators of Environment Agency-regulated processes (i.e., those which classify as Part A(1) processes under the Pollution Prevention and Control (PPC) regime). The H4 guidance document is primarily aimed at methods to control and manage the release of odours, but also contains a series of recommended assessment methods which can be used to assess potential odour impacts.

*Institute of Air Quality Management Guidance*

5.2.92 The latest UK guidance on odour was published by the Institute of Air Quality Management (IAQM) in 2014 (IAQM, 2014b). The IAQM guidance sets out assessment methods which may be utilised in the assessment of odours for planning applications. It is the only UK odour guidance document which contains a method for estimating the significance of potential odour impacts.

5.2.93 The IAQM guidance endorses the use of multiple assessment tools for odours, stating that, "best practice is to use a multi-tool approach where practicable". This is in order to improve the robustness of the assessment conclusions. Only one of the methods outlined in the IAQM guidance could realistically be adopted in this odour assessment.

*Bioaerosol Guidance*

5.2.94 The limited guidance addressing bioaerosols has been summarised in paragraphs 5.2.23 to 5.2.28.

Consultation

5.2.95 This assessment follows a methodology agreed with North Warwickshire Council via a telephone discussion and subsequent email correspondence between Dean Walters (Senior Pollution Control Officer at North Warwickshire Council) and Paul Outen (Air Quality Consultants) held in early May 2016.

Limitations to the Assessment

5.2.96 There are many components that contribute to the uncertainty of modelling predictions. The point source model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which in reality are variable as the plant will operate at different loads at different times. There are then additional uncertainties, as the model is required to simplify real-world conditions into a series of algorithms.

5.2.97 A number of assumptions have also been made regarding the stack emissions. It has been assumed that the facility will operate continuously throughout the year, when the plant is only expected to operate at maximum continuous rate for approximately 91% of the time, being shut for maintenance for at least three weeks each year. When maintenance is undertaken, single lines will be shut down for maintenance whilst the other two lines are operational; complete shutdown will only occur when maintaining common services for all three lines (e.g. the turbine). IED emission rates have also been assumed; emission rates far lower than these maxima are expected in practice due to the gasification technology that will be used. These assumptions ensure that the assessment is worst-case, and that the actual impacts of the REC will be lower than those described in this chapter.

## 5.3 Baseline Conditions

Site Description and Context

5.3.1 The Proposed Development is located in the Hams Hall Industrial Park, adjacent to the APH Birmingham Airport car park. The immediate surrounding area is predominantly industrial, with the Hams Hall BMW Plant located approximately 300 m to the east. The

M42 motorway runs north to south, approximately 1.3 km to the west of the Proposed Development. The closest residential properties are sparsely located around the Proposed Development, with Orchard Cottage at Newlands Farm being the closest, 650 m to the west. The closest residential estate is located over 1.3 km to the southwest.

<u>Baseline Information</u>

*<u>Air Quality Review and Assessment</u>*

5.3.2 North Warwickshire Council has investigated air quality within its area as part of its responsibilities under the LAQM regime. In March 2001 an AQMA was declared for exceedences of the annual mean nitrogen dioxide objective that covered an area of Coleshill bounded by Stonebridge Road, Coleshilll Heath Road, the M42 Motorway, M6 Motorway and junction 4 of the M6. This AQMA was revoked on 1st February 2013, when it was identified that the objective was no longer being exceeded at relevant locations; there are currently no AQMAs in the borough.

*<u>Local Air Quality Monitoring</u>*

*2014 Baseline Measurements*

5.3.3 North Warwickshire Council operated one automatic monitoring station within its area, located approximately 5 km south of the Proposed Development; however this site was decommissioned in 2012. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Gradko International Ltd (using the 20% TEA in water method). These include one deployed in a rural background area in Kingsbury, one on Farthing Lane in Curdworth, one at Water Orton and one in Gilson. Data for these sites have been provided by North Warwickshire Council. Results for the years 2010 to 2015, where available, are summarised in Table 5.6 and the monitoring locations are shown in **Figure 5.4**.

**Table 5.6: Summary of Annual Mean Nitrogen Dioxide Monitoring in 2010-2015 ($\mu g/m^3$) [a]**

| Site No. | Site Type | Location | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| **Automatic Monitor - Annual Mean ($\mu g/m^3$)** | | | | | | | | |
| 1 | Motorway | M6/M42 Motorways | 38.0 | 38.6 | - | - | - | - |
| **Objective** | | | **40** | | | | | |
| **No. of Hours > 200 $\mu g/m^3$** | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1** | Motorway | M6/M42 Motorways | 6 | 1 | - | - | - | - |
| **Objective** | | | **18** | | | | | |
| **Diffusion Tubes - Annual Mean (µg/m³)** | | | | | | | | |
| **2** | Rural | Kingsbury | 25 | 21 | 26 | 24 | 23 | 23 |
| **3** | Roadside | Farthing Lane | 29 | 22 | 25 | 26 | 23 | 21 |
| **4** | Roadside | Water Orton | 34 | 29 | 32 | 31 | 30 | 23 |
| **5** | Roadside | Gilson | 34 | 29 | 32 | 31 | 30 | 28 |
| **Objective** | | | **40** | | | | | |

[a] All data provided by North Warwickshire Council's Pollution Control Department

5.3.4 Annual mean nitrogen dioxide concentrations at the automatic monitor were below the objective in 2010 and 2011. Concentrations of nitrogen dioxide have remained well below the objective at the four diffusion tube monitoring sites in the six years of data presented. Diffusion tubes 3 and 4 are located in residential areas in close proximity to a number of discrete, sensitive receptors used in this assessment, and are thus likely to be representative of air quality conditions within these areas.

5.3.5 There are no clear trends in monitoring results for the past six years.

5.3.6 The automatic monitor also measured $PM_{10}$ concentrations, however, monitoring ceased in 2008 due to consistently low concentrations, well below both the objectives. There has been no monitoring of Particulate Matter in North Warwickshire since 2008.

*Exceedences of EU Limit Value*

5.3.7 There are no AURN monitoring sites within the study area with which to identify exceedences of the annual mean nitrogen dioxide limit value. Neither the national maps of roadside annual mean nitrogen dioxide concentrations (Defra, 2016c), used to report exceedences of the limit value to the EU, nor Defra's mapping for 2020, which takes account of the measures contained in its 2015 Air Quality Plan (Defra, 2015) identify any exceedences within the study area.

*Background Concentrations*

5.3.8 Where necessary (i.e. where total concentrations have been calculated in the impact assessment), estimated background concentrations in the study area have been determined.

5.3.9 Background concentrations of nitrogen oxides, nitrogen dioxide and $PM_{2.5}$ across the study area have been determined for both 2014 and the opening year 2019 (Table 5.8) using Defra's background maps (Defra, 2016b). The background concentrations have been derived as described in **Appendix 5.6**. The background concentrations are all well below the objectives.

**Table 5.8: Estimated Annual Mean Background $NO_2$ Concentrations in 2014 and 2019 ($\mu g/m^3$)**

| Year | NOx | $NO_2$ | $PM_{2.5}$ |
|---|---|---|---|
| **2014** | 28.7 – 52.6 | 18.9 – 31.6 | 11.4 – 13.8 |
| **2019 [a]** | 23.1 – 40.0 | 15.6 – 25.1 | 10.7 – 12.8 |
| **Objective** | **-** | **40** | **25** |

The range of values is for the different 1x1 km grid squares covering the study area.

[a] In line with Defra's forecasts.

[b] Assuming higher emissions from modern diesel vehicles as described in **Appendix 5.6**.

5.3.10 Estimated background concentrations of sulphur dioxide, benzene and 1,3-butadiene in the study area have been determined from Defra's published maps of background concentrations. The sulphur dioxide data have been taken for 2001; this is the base year for the most recent set of published maps, and is the approach recommended by Defra. Concentrations of benzene and 1,3-butadiene have been factored to 2014 from the 2001 mapped values using the projection factors published by Defra. Table 5.9 shows the maximum background concentrations in the study area, with these maxima then applied at every receptor location. 2014 values have been used in the impact assessment for benzene and 1,3-butadiene rather than 2019 values, representing a worst-case.

**Table 5.9: Annual Mean Background Pollutant Concentrations Taken from Defra's Background Maps (Defra, 2016b) ($\mu g/m^3$)**

| Pollutant | Maximum Background Concentration |
|---|---|
| Sulphur Dioxide ($SO_2$) | 2.0 |
| Benzene | 0.25 |
| 1,3-butadiene | 0.32 |

5.3.11 Defra has undertaken monitoring of trace elements at a number of locations in the UK since 1976 as part of the UK Urban and Rural Heavy Metals Monitoring Networks. To provide an indication of trace metal concentrations in the study area, measured annual mean concentrations of selected heavy metals at the nearest monitoring site in 2014 are summarised in Table 5.10. These data have been derived from the Defra website (Defra, 2016b). The background data used are considered worst-case, as measured concentrations at Walsall Bilston Lane are generally much higher than other sites in the UK due to the heavily industrialised location within which the monitor is located.

**Table 5.10: Trace Metal Background Concentrations in 2014 ($ng/m^3$) [a]**

| Pollutant | Walsall Bilston Lane |
|---|---|
| **Arsenic** | 1.25 |
| **Cadmium** | 2.44 |
| **Chromium** | 3.79 |
| **Lead** | 54.88 |
| **Manganese** | 12.61 |
| **Nickel** | 2.32 |
| **Vanadium** | 1.15 |

[a] 1,000 ng = 1 µg

## 5.4 Assessment of Likely Significant Effects

Construction Phase

5.4.1 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway.

*Potential Dust Emission Magnitude*

*Demolition*

5.4.2 There is no requirement for any demolition on site.

*Earthworks*

5.4.3 The characteristics of the soil at the development site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2016), as set out in Table 5.11. Overall, it is considered that, when dry, this soil has the potential to be highly dusty.

**Table 5.11: Summary of Soil Characteristics**

| Category | Record |
|---|---|
| **Soil layer thickness** | Deep |
| **Soil Parent Material Grain Size** | Arenaceous [a] – Rudaceous [b] |
| **European Soil Bureau Description** | River Terrace Sand/Gravel |
| **Soil Group** | Light (Silty) to Medium (Silty) |
| **Soil Texture** | Sand to Sandy Loam [c] |

[a] grain size 0.06 – 2.0 mm.

[b] grain size > 2.0 mm.

[c] a loam is composed mostly of sand and silt.

5.4.4 The site covers approximately 2 ha and most of this will be subject to earthworks, involving the breaking up of existing paved areas, then excavation, haulage, tipping, stockpiling and landscaping of the topsoil and subsoil. During the earthworks, dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials, such as dry soil. Based on the example definitions set out in Table A5.5.1 in **Appendix 5.5**, the dust emission class for earthworks is considered to be *large*.

*Construction*

5.4.5 Construction will involve the laying of foundations and the building of the main REC buildings along with all of the ancillary structures. The buildings will primarily be constructed of steelwork, reinforced concrete, cladding and sheet roofing. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. Based on the example definitions set out in Table A5.5.1 in **Appendix 5.5**, the dust emission class for construction is considered to be *medium*.

*Trackout*

5.4.6 It is anticipated that there will be up to 70 outward heavy vehicle movements per day during the early stages of construction, decreasing to between 25 and 40 movements per day as the works progress. The length of unpaved surface over which they may travel is not currently known but, given that the main access through the site to the proposed REC buildings is already paved, along with much of the rest of the site, it is expected to be fairly short, certainly no longer than 100 m. Based on the example definitions set out in Table A5.5.1 in **Appendix 5.5**, the dust emission class for trackout is considered to be *medium*.

5.4.7 Table 5.12 summarises the dust emission magnitude for the Proposed Development.

**Table 5.12: Summary of Dust Emission Magnitude**

| Source | Dust Emission Magnitude |
|---|---|
| **Earthworks** | Large |
| **Construction** | Medium |
| **Trackout** | Medium |

<u>*Sensitivity of the Area*</u>

5.4.8 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline $PM_{10}$ concentrations.

*Sensitivity of the Area to Effects from Dust Soiling*

5.4.9 The IAQM guidance explains that residential properties and long-term car parks are 'high' sensitivity receptors to dust soiling, while industrial and commercial premises and short-term car parks are 'medium' sensitivity receptors (see Table A5.5.2 in **Appendix 5.5**). There are no residential properties within 350 m of the site; however the long-term APH Birmingham Airport Carpark is located adjacent to the Proposed Development; within 20 m of the site boundary. There are also numerous low and medium sensitivity receptors within 100 m of the site boundary (see **Figure 5.5**). Using the matrix set out in Table A5.5.3 in **Appendix 5.5**, the area surrounding the onsite works is of 'medium' sensitivity to dust soiling.

5.4.10 Table 5.12 shows that dust emission magnitude for trackout is 'medium' and Table A5.5.3 in **Appendix 5.5** thus explains that there is a risk of material being tracked 200 m from the site exit. The site will be accessed via Faraday Avenue, and there are no residential properties within 50 m of this stretch of road, however there are a number of industrial units with associated parking, as well as the APH Airport Carpark within 20 m (see **Figure 5.6**). Table A5.5.3 in **Appendix 5.5** indicates that the area is of 'medium' sensitivity to dust soiling due to trackout.

*Sensitivity of the Area to any Human Health Effects*

5.4.11 Residential properties are also classified as being of 'high' sensitivity to human health effects, while places of work are of 'medium' sensitivity. The matrix in Table A5.5.4 in **Appendix 5.5** requires information on the baseline annual mean $PM_{10}$ concentration in the area. There is no local $PM_{10}$ monitoring and roadside $PM_{10}$ concentrations have not been modelled, however the nearest receptors are well away from local roads and thus the existing annual mean $PM_{10}$ concentration is best described by the background concentration from Defra's background maps (Defra, 2016b). The mapped annual mean background concentration of $PM_{10}$ at the development site in 2014 was 17.9 $\mu g/m^3$ (this background concentration has been derived as described in **Appendix 5.6**). Using the matrix in Table A5.5.4 in **Appendix 5.5**, the area surrounding the onsite works is of 'low' sensitivity to human health effects.

5.4.12 There are 'medium' sensitivity receptors in terms of nearby places of work within 20 m of the site. Using the matrix in Table A5.5.4 in **Appendix 5.5**, the surrounding area would be considered to be of 'medium sensitivity' to human health effects. This, however, does not take into account local $PM_{10}$ concentrations. Taking into account that local $PM_{10}$ concentrations are well below 24 $\mu g/m^3$, it is the professional opinion of the consultants completing the assessment that the sensitivity of the area to human health during the construction works will be 'low'.

5.4.13 Using the matrix in Table A5.5.4 in **Appendix 5.5**, the area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity to human health effects (Table 5.13).

*Sensitivity of the Area to any Ecological Effects*

5.4.14 The guidance only considers designated ecological sites within 50m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

**Table 5.13: Summary of the Area Sensitivity**

| Source | Sensitivity of the Surrounding Area | |
|---|---|---|
| | On-site Works | Trackout |
| **Dust Soiling** | Medium Sensitivity | Medium Sensitivity |
| **Human Health** | Low Sensitivity | Low Sensitivity |

<u>*Risk and Significance*</u>

5.4.15 The dust emission magnitudes in Table 5.12 have been combined with the sensitivities of the area in Table 5.13 using the matrix in Table A5.5.6 in **Appendix 5.5**, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 5.14. These risk categories have been used to determine the appropriate level of mitigation as set out in the next Section on mitigation. In this case, the level of mitigation recommended for all construction phases is that considered appropriate for a low to medium risk site.

**Table 5.14: Summary of Risk of Impacts Without Mitigation**

| Source | Dust Soiling | Human Health |
|---|---|---|
| **Earthworks** | Medium Risk | Low Risk |
| **Construction** | Medium Risk | Low Risk |
| **Trackout** | Low Risk | Low Risk |

5.4.16 The IAQM does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (Institute of Air Quality Management, 2014a).

Operational Phase

*Air Quality Impacts – Road Traffic Emissions*

5.4.17 The EPUK & IAQM guidance summarised in **Appendix 5.4** sets out screening criteria for development traffic generation. It explains that, outside of an AQMA, development can be screened out as not requiring a detailed assessment of road traffic impacts on the local area where:

- the development will lead to a change in LDV flows of less than 500 AADT; and
- the development will lead to a change in HDV flows of less than 100 AADT.

5.4.18 The transport assessment work undertaken by Curtins shows that the Proposed Development will result in an increase in traffic on the local roads of 74 AADT; 64 of which will be HGVs.

5.4.19 The predicted increases in all vehicles associated with the Proposed Development are below the relevant screening criteria. The impact of the Proposed Development on air quality in terms of road traffic vehicle trip generation has been screened out as insignificant, and is not considered further.

*Air Quality Impacts – Stack Emissions*

*Predicted Concentrations Relevant to Human Health*

Screening of Maxima

5.4.20 Table 5.15 sets out the maximum predicted process contribution (PC) anywhere within the Cartesian grid of receptors (for short term averaging periods) and at any of the specific sensitive receptors (for annual mean averaging periods), in any of the meteorological years modelled. For most of the pollutants and averaging periods, the process contribution is less than 0.5% of the long-term EAL or less than 10% of the short-term EAL, and the impacts can thus be discounted as insignificant (see paragraphs 5.2.10 to 5.2.17 on screening criteria). It should be noted that the PCs presented in this table for heavy metals have been generated assuming that the emission rate of each individual pollutant is at the emission rate for all pollutants combined, which is a highly unrealistic and worst-case assumption. The VOC concentrations presented assume that all TOCs are VOCs, and that all VOCs are benzene, 1,3 butadiene and dimethyl sulphate respectively, which is an extremely conservative assumption. The implications of these conservative assumptions are addressed further below.

**Table 5.15: Maximum Predicted Process Contributions in the Study Area (µg/m³) [a]**

| Pollutant | Averaging Period | Maximum PC | | EAL |
|---|---|---|---|---|
| | | PC | % of EAL | |
| **$NO_2$** | Annual Mean | **0.782** | **2.0** | **40** |
| | 99.79th%ile of 1-hour Means | **24.935** | **12.5** | **200** |
| **$SO_2$** | 99.7th%ile of 1-hour Means | 3.649 | 2.9 | **350** |
| | 99.18th%ile of 24-hour Means | **35.014** | **10.0** | **125** |
| | 99.9th%ile of 15-minute Means | **53.701** | **20.2** | **266** |
| **$PM_{10}$** | Annual Mean | 0.072 | 0.2 | **40** |
| | 90.4th%ile of 24-hour Means | 0.084 | 0.2 | **50** |
| **$PM_{2.5}$** | Annual Mean | **0.237** | **0.9** | **25** |
| **CO** | Rolling 8-hour Mean | 40.846 | 0.4 | **10,000** |
| **HCl** | Annual Mean | **0.447** | **2.2** | **750** |
| | Max Hourly Mean | 28.522 | 3.8 | **20** |
| **HF** | Annual mean | 0.007 | <0.1 | **16** |
| | Max Hourly Mean | 1.901 | 1.2 | **160** |
| **VOCs (as benzene)** | Annual Mean | **0.075** | **1.5** | **5** |
| **VOCs (as 1,3-butadiene)** | Annual Mean | **0.075** | **3.3** | **2.25** |
| **VOCs (as dimethyl sulphate)** | Max Hourly Mean | **9.507** | **60.9** | **15.6** |
| **Cd** | Annual Mean | **0.0004** | **7.5** | **0.005** |
| **Tl** | Annual Mean | 0.0004 | <0.1 | **1** |
| | Max Hourly Mean | 0.024 | 0.1 | **30** |
| **Hg** | Annual Mean | 0.0004 | 0.1 | **0.5** |
| | Max Hourly Mean | 0.024 | 0.3 | **7.5** |
| **Sb** | Annual Mean | 0.004 | 0.1 | **5** |
| | Max Hourly Mean | 0.238 | 0.2 | **150** |

| | | | | |
|---|---|---|---|---|
| **As** | Annual Mean | **0.004** | **124.2** | **0.003** |
| **Pb** | Annual Mean | **0.004** | **1.5** | **0.25** |
| **Total group 3 metals as Cr III** | Annual Mean | 0.004 | 0.1 | **5** |
| | Max Hourly Mean | 0.238 | 0.2 | **150** |
| **Total group 3 metals as Cr VI** | Annual Mean | **0.004** | **1,862.7** | **0.0002** |
| | Max Hourly Mean | 0.238 | 1.6 | **15** |
| **Co** | Annual Mean | 0.004 | 0.4 | **1** |
| | Max Hourly Mean | 0.238 | 0.8 | **30** |
| **Cu** | Annual Mean | 0.004 | <0.1 | **10** |
| | Max Hourly Mean | 0.238 | 0.1 | **200** |
| **Mn** | Annual Mean | **0.004** | **2.5** | **150** |
| | Max Hourly Mean | 0.238 | <0.1 | **1,500** |
| **Ni** | Annual Mean | **0.004** | **18.6** | **0.02** |
| **V** | Annual Mean | 0.004 | 0.1 | **5** |
| | Max Hourly Mean | **0.238** | **23.8** | **1** |
| **$NH_3$** | Annual Mean | 0.447 | 0.2 | **180** |
| | Max Hourly Mean | 28.522 | 1.1 | **2,500** |
| **Dioxins and furans** | Annual Mean | 0.000000001 | 0.2 | **0.0000003 [b]** |

[a] Where the PC as a% of the EAL is more than 0.5% of an annual mean EAL or more than 10% of a short-term EAL, it is shown in bold.

[b] This is the WHO indicator concentration (300 fg/m$^3$) above which it would be considered necessary to identify and control emissions.

5.4.21 Concentrations of the following pollutants exceed the annual mean screening criteria (0.5% of EAL) for at least one of the discrete sensitive receptors modelled:

- Nitrogen dioxide;
- $PM_{2.5}$;
- Hydrochloric acid;
- Benzene;
- 1,3-butadiene;
- Cadmium;
- Arsenic;

- Lead;
- Chromium (VI);
- Manganese; and
- Nickel.

5.4.22 Concentrations of the following pollutants exceed the short-term mean screening criteria (10% of EAL) for at least one of the discrete sensitive receptors modelled:

- Nitrogen dioxide;
- Sulphur dioxide (1-hour and 15-minute);
- Dimethyl sulphate; and
- Vanadium.

Predicted Environmental Concentrations (PEC)

5.4.23 The long-term PEC has been calculated by adding the long-term local background concentrations (see Tables 5.9 and 5.10) to the PC, as shown in Table 5.16. Short-term emissions have been considered differently, by comparing the PC to the short-term environmental standards minus twice the long-term background concentration.

**Table 5.16: Maximum Predicted Environmental Concentrations in the Study Area (μg/m³) [a]**

| **Long-Term** | | | | |
|---|---|---|---|---|
| **Pollutant** | **Averaging Period** | **Maximum PEC** | | **EAL** |
| | | **PEC** | **% of EAL** | |
| **$NO_2$** | Annual Mean | 20.412 | 51.0 | 40 |
| **$PM_{2.5}$** | Annual Mean | 11.477 | 45.9 | 25 |
| **HCl** | Annual Mean | 0.694 | 3.5 | 20 |
| **VOCs (as benzene)** | Annual Mean | 0.325 | 6.5 | 5 |
| **VOCs (as 1,3-butadiene)** | Annual Mean | 0.390 | 17.3 | 2.25 |
| **Cd** | Annual Mean | 0.0006 | 12.5 | 0.005 |
| **As** | Annual Mean | **0.005** | **165.6** | **0.003** |
| **Pb** | Annual Mean | 0.059 | 24.3 | 0.25 |
| **Total group 3 metals as Cr VI** | Annual Mean | **0.008** | **3,762.7** | **0.0002** |
| **Mn** | Annual Mean | 0.016 | 11.2 | 0.15 |
| **Ni** | Annual Mean | 0.005 | 24.1 | 0.02 |
| **Short-Term** | | | | |

| Pollutant | Averaging Period | Maximum PC | | Adjusted EAL [b] |
|---|---|---|---|---|
| | | PC | % of EAL | |
| **$NO_2$** | 1-hour | 24.935 | 16.7 | 149.6 |
| **$SO_2$** | 1-hour | 35.014 | 10.1 | 346.0 |
| **$SO_2$** | 15-minute | **53.701** | **20.5** | **262.0** |
| **VOCs (as dimethyl sulphate) [c]** | 1-hour | **9.507** | **60.9** | **15.6** |
| **V** | 1-hour | **0.238** | **23.8** | **1.0** |

[a] Where the PEC exceeds the EAL it is shown in bold.

[b] This is the short-term environmental standard minus twice the long-term background concentration.

[c] There is no background concentration available for this pollutant and so the background has been assumed to be zero. While this may under-predict the PEC, it is considered highly unlikely that the background concentration could be sufficient for the EAL to be exceeded.

5.4.24 For the long-term averaging periods, with the exception of arsenic and chromium VI, the PEC is less than 70% of the EAL and thus the potential for significant impacts can thus be discounted. It is also worth noting that the PECs are all well below the EALs, with the highest being just 51%. For the short-term averaging periods, the PC is less than the short-term environmental standards minus twice the long-term background concentration for nitrogen dioxide and 1-hour sulphur dioxide and thus the potential for significant impacts can thus be discounted.

5.4.25 The PEC for VOCs as dimethyl sulphate and vanadium is exceeded and a detailed assessment (or dispersion modelling) is required. The guidance states that no further action is required if the PEC does not exceed environmental standards. The environmental standard (EAL) for dimethyl sulphate and vanadium will not be exceeded, thus no further action is required. When it is considered that, for Tables 5.15 and 5.16, the entire TOC emission has been assumed to be dimethyl sulphate and the entire Group III metal emission has been assumed to be vanadium, which is extremely conservative and quite unrealistic, it can safely be assumed that dimethyl sulphate and vanadium emissions from the proposed facility will have an insignificant impact on local concentrations. Furthermore, these exceedences are predicted at locations on the receptor grid where relevant exposure to the 1-hour mean objectives are unlikely to apply.

5.4.26 PECs of arsenic and chromium VI in Table 5.16 are above the EAL, and thus require further assessment. Environment Agency guidance (Environment Agency, 2012) states that this further assessment should be undertaken assuming each metal comprises 11% of the total heavy metals emissions. This factor has been applied to the process contributions of the plant to the PECs presented in Table 5.17.

**Table 5.17: Maximum Predicted Environmental Concentrations in the Study Area ($\mu g/m^3$) [a]**

| Pollutant | Averaging Period | Maximum PEC | | EAL |
|---|---|---|---|---|
| | | PEC | % of EAL | |
| **As** | Annual Mean | 0.002 | 57.4 | 0.003 |

| | | | | |
|---|---|---|---|---|
| **Total group 3 metals as Cr VI** | Annual Mean | **0.004** | **2,131.7** | **0.0002** |

[a] Where the PEC exceeds the EAL it is shown in bold.

5.4.27 Table 5.17 shows that the PEC of arsenic will not exceed 70% of the EAL, and as such the potential for significant impacts can also be discounted. However, concentrations of chromium VI continue to exceed the EAL. The Environment Agency guidance (Environment Agency, 2012) states that the next step in assessing concentrations of this pollutant is to consider more a realistic emission rate, as outlined in paragraphs A5.6.2 and A5.6.3 in **Appendix 5.6**. Using the maximum emission rate outlined in paragraph A5.6.3 in **Appendix 5.6** (0.00013 mg/Nm$^3$, which equates to 0.0064 mg/s), the Process Contribution of chromium VI is as shown in Table 5.18.

**Table 5.18: Maximum Predicted Process Contribution of Chromium VI in the Study Area (µg/m$^3$)[a]**

| Pollutant | Averaging Period | Maximum PC | | EAL |
|---|---|---|---|---|
| | | PC | % of EAL | |
| **Cr VI** | Annual Mean | 0.000001 | 0.48% | **0.0002** |

5.4.28 The annual mean process contribution to concentrations of chromium VI will be less than 0.5% of the EAL. The impacts of the facility on concentrations of this pollutant can thus be considered insignificant.

Annual Mean Nitrogen Dioxide

5.4.29 In considering the annual mean nitrogen dioxide impacts, a contour plot of the ground-level (1.5 m height) Process Contribution has been generated, and is shown in **Figure 5.7**. The impacts on nitrogen dioxide concentrations cannot be initially screened out as the Process Contribution exceeds 0.2 µg/m$^3$ (0.5%) across a proportion of the study area.

5.4.30 The next step in assessing annual mean nitrogen dioxide concentrations is to consider the total concentrations at sensitive receptors. The maximum ground-level Process Contribution to annual mean nitrogen dioxide concentrations from the proposed REC, as shown in **Figure 5.7**, is less than 1 µg/m$^3$. Table A5.4.1 from **Appendix 5.4** has been adapted so that it relates specifically to annual mean nitrogen dioxide impacts, and is shown in Table 5.19. Applying the Process Contributions shown in **Figure 5.7** to Table 5.19, it can be seen that:

- where Process Contributions are less than 0.2 µg/m$^3$ the impacts will be negligible, regardless of the total concentration;
- where Process Contributions are between 0.2 µg/m$^3$ and 0.6 µg/m$^3$ the impacts will be negligible provided that total concentrations are below 37.8 µg/m$^3$; and
- where Process Contributions are between 0.6 µg/m$^3$ and 0.84 µg/m$^3$ the impacts will be negligible provided that total concentrations are below 30.2 µg/m$^3$, or slight adverse if total concentrations are between 30.2 and 37.8 µg/m$^3$.

**Table 5.19: Air Quality Impact Descriptors for Individual Receptors for Annual Mean Nitrogen Dioxide (µg/m³)**

| Long-Term Average Concentration At Receptor In Assessment Year | Change in concentration | | | | |
|---|---|---|---|---|---|
| | **<0.2** | **0.2 – <0.6** | **0.6 - <2.2** | **2.2 - <4.0** | **>4.0** |
| **<30.2** | Negligible | Negligible | Negligible | Slight | Moderate |
| **30.2 - <37.8** | Negligible | Negligible | Slight | Moderate | Moderate |
| **37.8 - <41.0** | Negligible | Slight | Moderate | Moderate | Substantial |
| **41.0 - <43.8** | Negligible | Moderate | Moderate | Substantial | Substantial |
| **≥43.8** | Negligible | Moderate | Substantial | Substantial | Substantial |

5.4.31 The Process Contributions to annual mean nitrogen dioxide concentrations have been added to the 2019 background concentrations (set out in Table 5.8) in order for total concentrations to be considered. The total concentrations, with and without the development, are set out in Table 5.20 along with the impact at each location described using the impact descriptors given in **Appendix 5.4**. It has been judged sufficient to used mapped background concentrations to represent 2019 baseline conditions, due to the fact that the receptors located within areas experiencing PC's >0.2 µg/m³ are located well away from major roads.

**Table 5.20: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2019 (µg/m³) [a]**

| Receptor | Without Scheme | With Scheme | % Change [b] | Impact Descriptor |
|---|---|---|---|---|
| **1** | 17.8 | 18.4 | 1 | Negligible |
| **2** | 17.8 | 18.4 | 1 | Negligible |
| **3** | 17.8 | 18.3 | 1 | Negligible |
| **4** | 15.8 | 16.0 | 1 | Negligible |
| **5** | 15.6 | 15.7 | 0 | Negligible |
| **6** | 15.6 | 15.7 | 0 | Negligible |
| **7** | 15.6 | 15.7 | 0 | Negligible |
| **8** | 15.8 | 15.9 | 0 | Negligible |
| **9** | 15.8 | 15.9 | 0 | Negligible |
| **10** | 15.8 | 15.9 | 0 | Negligible |
| **11** | 15.8 | 16.0 | 0 | Negligible |

| | | | | |
|---|---|---|---|---|
| **12** | 15.8 | 15.9 | 0 | Negligible |
| **13** | 24.4 | 24.5 | 0 | Negligible |
| **14** | 25.0 | 25.1 | 0 | Negligible |
| **15** | 25.0 | 25.1 | 0 | Negligible |
| **16** | 25.0 | 25.1 | 0 | Negligible |
| **17** | 25.1 | 25.2 | 0 | Negligible |
| **18** | 20.2 | 20.3 | 0 | Negligible |
| **19** | 20.2 | 20.3 | 0 | Negligible |
| **20** | 25.1 | 25.2 | 0 | Negligible |
| **21** | 25.1 | 25.3 | 1 | Negligible |
| **22** | 20.1 | 20.3 | 1 | Negligible |
| **23** | 24.8 | 25.0 | 0 | Negligible |
| **24** | 17.9 | 18.0 | 0 | Negligible |
| **25** | 15.8 | 16.0 | 0 | Negligible |
| **26** | 19.4 | 19.5 | 0 | Negligible |
| **27** | 19.6 | 20.4 | 2 | Negligible |
| **28** | 19.6 | 20.1 | 1 | Negligible |
| **Objective** | **40** | | - | - |

[a] Exceedences of the objective are shown in bold.

[b] % changes are relative to the objective and have been rounded to the nearest whole number.

5.4.32 There are no predicted exceedences of the annual mean nitrogen dioxide objective anywhere in the study area, with or without the Proposed Development. Percentage changes in concentrations are predicted to range from zero to 2%, and all impacts are predicted to be *negligible*.

5.4.33 The impacts of the facility on concentrations of all pollutants relevant to human health are shown to be insignificant.

*Predicted Impacts on Designated Habitats*

5.4.34 Table 5.21 sets out the maximum process contributions to the relevant pollutant concentrations at each of the sensitive ecological sites considered.

**Table 5.21: Maximum Process Contributions in the Nearby Sensitive Ecological Sites**

| Pollutant | Averaging Period | Maximum PC | | EAL |
|---|---|---|---|---|
| | | PC | % of EAL | |
| **Whitacre Heath SSSI [a]** | | | | |
| **$NH_3$** | Annual Mean | **0.040** | **1.3** | **3** |
| **NOx** | Annual Mean | **0.596** | **2.0** | **30** |
| | Max 24-hour Mean | 5.648 | 7.5 | 75 |
| **$SO_2$** | Annual Mean | 0.191 | 1.0 | 20 |
| **HF** | Max 24-hour Mean | 0.038 | 0.8 | 5 |
| | Max Weekly Mean | **0.015** | **2.9** | **0.5** |
| **River Blythe SSSI [a]** | | | | |
| **$NH_3$** | Annual Mean | 0.014 | 0.5 | 3 |
| **NOx** | Annual Mean | 0.214 | 0.7 | 30 |
| | Max 24-hour Mean | 2.714 | 3.6 | 75 |
| **$SO_2$** | Annual Mean | 0.073 | 0.4 | 20 |
| **HF** | Max 24-hour Mean | 0.018 | 0.4 | 5 |
| | Max Weekly Mean | **0.006** | **1.3** | **0.5** |

[a] The APIS database indicates that the habitats at this site are not sensitive to acid deposition.

5.4.35 At the Whitacre Heath SSSI, Process Contributions to weekly hydrogen fluoride, annual mean NOx and annual mean ammonia concentrations exceed the screening criterion of 1% of the EAL. At the River Blythe SSSI, the Process Contributions to weekly hydrogen fluoride concentrations also exceed the screening criterion. It is therefore necessary to proceed to the second stage of assessment to determine the Predicted Environmental Concentrations, as shown in Table 5.22.

**Table 5.22: Maximum Predicted Environmental Concentrations in the Nearby Sensitive Ecological Sites**

| Pollutant | Averaging Period | Maximum PEC | | EAL |
|---|---|---|---|---|
| | | PEC | % of EAL | |
| **Whitacre Heath SSSI [a]** | | | | |
| **$NH_3$** | Annual Mean | 1.710 | 57.0 | 3 |
| **NOx** | Annual Mean | **30.826** | **102.8** | **30** |
| **HF** | Max Weekly Mean | 0.018 [a] | 3.5 | 0.5 |
| **River Blythe SSSI [a]** | | | | |
| **HF** | Max Weekly Mean | 0.009 [a] | 1.9 | 0.5 |

[a] No local monitoring or mapped background data are available for background concentrations of HF. The background concentration provided in the Expert Panel on Air Quality Standard's Guidelines for 'Halogens and Hydrogen Halides in Ambient Air for Protecting Human Health against Acute Irritancy Effects' (Expert Panel on Air Quality Standard's Guidelines, 2008) has therefore been used (0.003 µg/m$^3$).

5.4.36 For ammonia and hydrogen fluoride, the PEC is well below 70% of the EAL and thus the potential for significant impacts can thus be discounted. The calculated PEC for NOx exceeds the EAL, however, the background concentration of NOx in 2019 at this receptor is 30.2 µg/m$^3$, which is higher than the EAL. A Process Contribution of 0.596 µg/m$^3$ to annual mean NOx concentrations is low, and the impacts are judged to be not significant.

5.4.37 It is concluded that the proposed development will have an insignificant impact upon all local protected nature sites.

*Significance of Air Quality Impacts*

5.4.38 The stack emissions assessment has demonstrated that the ecological impacts of the stack emissions will be insignificant. Similarly, impacts upon human receptors within the study area will also be insignificant.

5.4.39 The operational air quality impacts without mitigation are judged to be 'not significant'. This professional judgement is made in accordance with the methodology set out in **Appendix 5.4** and takes account of the assessment that:

- concentrations of all modelled pollutants have been screened out as insignificant following Environment Agency screening criteria;
- annual mean concentrations of nitrogen dioxide will be well below the air quality objectives for all receptors within the study area in 2019, with or without the scheme, and all impacts are predicted to be negligible; and
- the predictions are based upon a number of worst-case assumptions, and the actual impacts of the scheme will likely be considerably less than those set out above.

*Odour Impacts*

*Odour Risk Assessment*

Process Description

5.4.40 The proposed development will accept up to 150,000 tonnes of RDF per year. This will all be delivered by HGV, which will enter the reception hall through fast-acting doors. These doors will be open for as little time as possible, and the reception hall will be maintained under negative pressure to ensure that the escape of air is kept to an absolute minimum. The delivered waste will be unloaded into the waste bunker within the reception hall.

5.4.41 Unprocessed waste will be removed from the waste bunker and passed through a shredder before passing underneath an overhead magnet where metals will be removed (the recovered metal will be collected in a separate skip and periodically sent for further recycling). The shredded waste will then be conveyed to the adjoining fuel bunker. All processes will be undertaken within the building which will be maintained under negative pressure.

5.4.42 Overhead fuel cranes operating on a pre-programmed cycle will move the waste around the fuel bunker to mix the fuel to create a more homogeneous mixture. The cranes will then deliver waste automatically to the fuel delivery chutes serving each gasification unit. From this point onwards the system is sealed, and there should be no escape of gases until they are exhausted from the flues.

5.4.43 The thermal conversion then takes place in two stages. Firstly drying, pyrolysis and gasification of the fuel will be carried out in the gasification unit creating the synthetic gas. The bottom ash produced is discharged from the gasification units and stored in an ash bays before being removed for offsite treatment. This bottom ash will be stored within the process building, and is not expected to be especially odorous as the volatile odourous compounds will have been removed by the high temperature in the gasifier. The synthetic gas is passed to the high-temperature oxidation unit, where it is mixed with the air extracted from the reception hall, and there is complete combustion of the synthetic gas.

5.4.44 Having been generated in the dual stage gasification process and passed through the Heat Recovery Steam Generator, the flue-gas will enter a gas cleaning system. This will comprise a bag-house filter, a storage silo for lime and activated carbon and a filter dust silo. In simple terms the lime and activated carbon will be injected at the inlet of the bag house filter and this will absorb acid components in the flue-gas. The activated carbon adsorbs dioxin, organic carbons and heavy metals prior to release to the atmosphere. This released air is highly unlikely to be especially odorous, as most odorous compounds will be destroyed in the combustion process.

Source Odour Potential

5.4.45 The first step of the odour risk assessment is to identify the source odour potential or odour magnitude. This takes into account the scale and nature of the odorous processes; the continuity, intensity and offensiveness of odour releases; and any odour control measures that are used. In essence, it must consider the odour potential of the source with respect to the FIDO part of FIDOR.

5.4.46 The proposed development will obviously handle waste, which has the potential to produce highly intense and highly offensive odours. However, the plant will mostly accept RDF, which will have been well-processed by the time it reaches the facility. RDF is combustible waste that has been shredded, dried and baled, and will have had most of the potentially odorous organic matter originally mixed in with the waste removed during processing. Some organic matter, and thus odour-generating potential, will undoubtedly remain though, and thus the feedstock for the plant remains a potentially significant odour source. The Proposed Development will also, however, have the capacity to accept Municipal Solid Waste (MSW) and Commercial and Industrial Waste (C&I), which will require some on-site pre-processing to prepare the fuel (i.e. shredding and metal removal). This waste, in particular MSW, will contain more organic material than RDF, and thus the odour generation potential and offensiveness will be higher. All processing will be carried out within the building.

5.4.47 Organic material is biodegradable, and biodegradation can result in odours being produced. The strength and nature of odours produced is dependent on a number of variables including the volume and composition of the waste, the length of time it has been stored, the influence of temperature and moisture, and mechanical action. Typically, fresh organic matter is less odorous than organic matter that is a number of days or weeks old and has had time for biological breakdown to begin (either aerobic or anaerobic). Conversely, organic matter which has been allowed to significantly biodegrade often becomes less odorous again (e.g. mature compost). Any residual organic matter within the RDF is likely to be at least a few weeks old, and could thus be quite odorous.

5.4.48 The feedstock for the plant is really the only source of odour, but there are three main ways in which odours may be released during the processes undertaken at the proposed facility. The first will be from the transport of the fuel to the facility, with odours released from the RDF as it is transported by road. The second will be from the process building itself, primarily the reception hall where the waste is stored, shredded and fed into the gasification units. The reception hall will be separate to the section of the building housing the gasifiers, oxidation units and generators; the latter part of the building will be naturally ventilated, as it is not expected to be a potential odour source, as the processes here are entirely sealed. The final potential odour source is the flues themselves, although the gases released here, at 55 m height, are not expected to be especially odorous, and will be released into an excellent environment for dispersion.

5.4.49 The main potential odour sources and overall source odour potential for the facility are described in Table 5.23.

**Table 5.23: Identification of Odour Sources and Overall Source Odour Potential**

| Odour Source | Description | Frequency and Duration | Intensity and Offensiveness |
|---|---|---|---|
| **Transport of Feedstock** | The delivery of the waste feedstock to the facility by HGV. | This will take place between the hours of 7am and 7pm on weekdays (approximately 63 in/63 out per day) and between 7am and 1pm on Saturdays (approximately 32 in/32 out per day) including public holidays. | There is the potential for the waste fuel to produce highly intense, highly offensive odours. Delivery vehicles will, however, be covered to minimise odorous emissions, and any emissions should be fairly fleeting as the vehicles pass by any sensitive receptors on their way to the facility. |
| **Process Buildings** | Handling of the waste fuel. | The gasification process will be continuous, so waste will be moved and shredded 24/7. | As outlined above, there is some potential for the waste fuel to produce highly intense, highly offensive odours (particularly during pre-processing of MSW and C&I waste). However, the process buildings will all be maintained under negative pressure, with extracted air used in the combustion process, so the potential for these odours to be released will be low. |
| **Flue Gases** | The leftover gases from the combustion process, post-cleaning. | The gasification process will be continuous, so flue gases will be emitted 24/7. | The flue gas is expected to have a low intensity and low offensiveness, as most odorous compounds will be destroyed in the combustion process. |

| | |
|---|---|
| **Overall Source Odour Potential** | The overall source odour potential of the proposed facility is judged to be **Medium**. This is judged to be a cautious classification, and thus represents a conservative assessment. |

Pathway Effectiveness

5.4.50 In order to consider the effectiveness of the pathway, it is important to consider receptor locations in terms of their proximity to the odour source(s) and the prevailing wind direction. A number of the closest receptor locations used in the air quality dispersion modelling have been selected for use in the odour risk assessment, as well as some additional receptors to represent the surrounding, low-sensitivity industrial premises. These receptor locations are shown in **Figure 5.8** and described in Table 5.24.

**Table 5.24: Odour Risk Assessment Receptors**

| Receptor ID | Description |
|---|---|
| 6 | Residential Property at Station Road |
| 8 | Residential Property at Cottage Lane |
| 12 | Residential Property at Birmingham Road |
| 21 | Residential Property at Water Orton |
| 23 | Residential Property at Chattle Hill |
| 25 | Residential Property at Keeper’s Cottage |
| 26 | Residential Property at Orchard Cottage |
| 27 | Residential Property off Church Lane |
| 28 | Residential Property off Church Lane |
| A | Industrial Premises (UTi Worldwide) |
| B | Industrial Premises (Expeditors International UK) |
| C | Industrial Premises (eon) |
| D | Industrial Premises (eon) |
| E | Industrial Premises (Incorporate Wear) |
| F | Industrial Premises (Beko) |

5.4.51 Individual wind roses from the Coleshill meteorological station for the years 2011 to 2015, as well as a combined wind rose for the five years, are presented in **Appendix 5.7**. These demonstrate that the prevailing wind in the region is from the south-southwest, with few other significant components. In general, odours will be transported by the wind and will not be detectable at locations upwind of a source. The exception to this is during very light wind conditions when odours may disperse against the wind direction, although typically only for relatively short distances. Given how dominant the south-southwesterly component of winds is, it can be assumed that odours will most often be carried from the site towards the northeast.

5.4.52 The effectiveness of the odour pathway between the proposed facility and the nearby sensitive receptors is summarised in Table 5.25, which draws upon the guidance set out in Table 5.3.

**Table 5.25: Effectiveness of Odour Pathway**

| Receptor | Distance from Source [a] | Direction from Sources | % Winds from Source [b] | Pathway Effectiveness [c] |
|---|---|---|---|---|
| **6** | 1,914 m | SE (106°) | 2.4 | Ineffective |
| **8** | 1,803 m | NE (80°) | 2.3 | Ineffective |
| **12** | 1,724 m | NE (70°) | 2.7 | Ineffective |
| **21** | 1,179 m | SW (225°) | 2.3 | Ineffective |
| **23** | 1,371 m | SW (207°) | 2.1 | Ineffective |
| **25** | 1,994 m | SE (140°) | 2.6 | Ineffective |
| **26** | 608 m | NW (282°) | 1.3 | Ineffective |
| **27** | 541 m | NE (31°) | 5.2 | Moderately Effective |
| **28** | 693 m | NE (49°) | 4.2 | Moderately Effective |
| **A** | 5 m | SE (129°) | 2.6 | Highly Effective |
| **B** | 44 m | NE (63°) | 3.2 | Highly Effective |
| **C** | 80 m | SW (237°) | 1.7 | Ineffective |
| **D** | 140 m | SW (258°) | 1.2 | Ineffective |
| **E** | 282 m | NW (274°) | 1.1 | Ineffective |
| **F** | 372 m | NE (56°) | 3.2 | Moderately Effective |

[a] Measured as the distance to nearest site boundary of the proposed development.

[b] Average wind frequency in each 10° sector is 2.32% across all wind directions. The % wind from source figure has been calculated from the full five years of meteorological data.

[c] Overall pathway effectiveness is based on professional judgement, taking account of the distance between source and receptor, and frequency of winds with respect to the average.

5.4.53 The pathway is judged to be ineffective at Receptors 6, 8, 12, 21, 23, 25 and 26 largely due to the considerable distance at which they are located from the proposed development. The pathway is judged to be moderately effective at Receptors 27 and 28 as, although they are located over 500 m from the odour source, they are located downwind of the EfW and thus will experience above average wind frequencies. The pathway between the development and Receptors A and B is judged to be highly effective due to the very close proximity to the odour source; in addition Receptor B is downwind of the EfW. Receptors C, D and E are locations classed as being at ineffective locations in terms of odour pathway, as, although they are within 500 m of the proposed development, they are located upwind of the source and are thus likely to experience only very occasional odours during periods of calm or during rarer north easterly winds. The pathway to Receptor F is classed as being moderately effective, largely due to the relatively close proximity to the development, and the fact that this location is predicted to experience above average wind frequencies.

Receptor Sensitivity

5.4.54 Receptor sensitivities are based on the descriptors presented in Table 5.3; residential properties are considered high sensitivity receptors, whilst the industrial premises are considered low sensitivity receptors.

Potential Odour Effects

5.4.55 The assessments of the potential odour effects at sensitive receptor locations are presented in Table 5.26. This brings together the source odour potential, effectiveness of pathway and receptor sensitivity identified using the criteria described in Table 5.3, to identify an overall potential for odour effects, using the matrices set out in Table 5.4 and Table 5.5.

**Table 5.26: Assessment of Potential Odour Effects**

| Receptor | Risk of Odour Impact (Dose) | | | Receptor Sensitivity | Likely Odour Effect |
|---|---|---|---|---|---|
| | Source Odour Potential | Effectiveness of Pathway | Risk of Odour Impact | | |
| 6 | Medium | Ineffective | Negligible | High | Negligible |
| 8 | | Ineffective | Negligible | High | Negligible |
| 12 | | Ineffective | Negligible | High | Negligible |
| 21 | | Ineffective | Negligible | High | Negligible |
| 23 | | Ineffective | Negligible | High | Negligible |
| 25 | | Ineffective | Negligible | High | Negligible |
| 26 | | Ineffective | Negligible | High | Negligible |
| 27 | | Moderately Effective | Low | High | Slight Adverse |
| 28 | | Moderately Effective | Low | High | Slight Adverse |
| A | | Highly Effective | Medium | Low | Negligible |
| B | | Highly Effective | Medium | Low | Negligible |
| C | | Ineffective | Negligible | Low | Negligible |
| D | | Ineffective | Negligible | Low | Negligible |
| E | | Ineffective | Negligible | Low | Negligible |
| F | | Moderately Effective | Low | Low | Negligible |

5.4.56 The potential odour effects as set out in Table 5.26 have been identified using the effect ≈ dose x response relationship identified in paragraph 5.2.49. The process is described as follows:

1) Identify the impact:

5.4.57 Based on a *medium* source odour potential, where the pathway is deemed to be *highly effective*, then the risk of odour impacts (dose) is judged to be *medium* (see Table 5.8). Where the effectiveness of the pathway is deemed to be *moderately effective*, the risk of odour impacts is *low*. For receptors where the pathway is judged to be *ineffective,* the risk of odour impacts is *negligible.*

2) Consider the response:

5.4.58 Based on the matrix presented in Table 5.5, the odour effects at each receptor are identified as follows: a *negligible* risk of odour impacts will lead to a *negligible* odour effect regardless of receptor sensitivity; a *low* risk of odour impact at a low sensitivity receptor will also lead to a *negligible* odour effect, and a *low* risk at a high sensitivity receptor will lead to a *slight adverse* odour effect. A *medium* risk of odour impacts at a low sensitivity receptor will lead to *negligible* odour effects.

5.4.59 The final stage of the risk assessment is to make an overall judgement as to the likely significance of effects. In this case it is judged that that overall significance of odour effects is *insignificant*. This conclusion is based on the findings of the risk assessment that have identified a *negligible* to *medium* risk of odour effects at the worst-case receptor locations assessed, with the resultant odour effects being mostly *negligible*, and *slight adverse* at only two receptors. Where *slight adverse* impacts are predicted, the receptors are located some 600 to 700 m from the odour source, and thus this is considered a cautious assessment.

*<u>Bioaerosol Impacts</u>*

5.4.60 Fundamental to the breakdown of organic waste is microbiological activity. The storage, handling and physical disturbance of organic waste can lead to the release of airborne micro-organisms known as bioaerosols. While the REC will handle some organic waste, the overall organic content of the waste received by the facility is expected to be low, thus the potential for bioaerosol generation is also low. The consensus of published guidance on bioaerosols is that there is only the potential for significant impacts where large quantities of organic material are stored and handled, such as at large composting sites. The Proposed Development will not process such large quantities of organic matter. It can therefore be concluded that the Proposed Development will not represent a significant source of bioaerosols, and will thus have insignificant effects in terms of bioaerosols.

## 5.5 Mitigation and Enhancement

<u>Construction (including demolition)</u>

5.5.1 Measures to mitigate dust emissions will be required during the construction phase of the development in order to reduce impacts upon nearby sensitive receptors.

5.5.2 The site has been identified as a Medium Risk site during earthworks and construction, and Low Risk for trackout, as set out in Table 5.14. Comprehensive guidance has been published by IAQM (Institute of Air Quality Management, 2014a) that describes measures that should be employed, as appropriate, to reduce the impacts. This reflects best practice experience and has been used, together with the professional experience of the consultant and the findings of the dust impact assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in **Appendix 5.9**.

5.5.3 The mitigation measures should be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring. Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Operation

5.5.4 The assessment has shown that the Proposed Development will not have a significant impact on local air quality in terms of pollutants from combustion, odours or bioaerosols. No additional mitigation is, therefore, proposed for the operational impacts.

*Good Design and Best Practice Measures*

5.5.5 The EPUK & IAQM guidance advises that good design and best practice measures should be considered whether or not more specific mitigation is required. While the guidance is aimed at the operational air quality assessment rather than the assessment of construction dust or operational odour and bioaerosols, it is still useful to note where good design and best practice measures have been applied in terms of minimising these impacts, so they are also covered here. The Proposed Development incorporates the following good design and best practice measures:

- the use of the Best Available Technology for the recovery of energy from waste in terms of emissions to air (gasification);
- the installation of appropriate mitigation in the form of a gas cleaning system for the exhaust air from the combustion process;
- the use of a tall stack to ensure good dispersion of emissions;
- adherence to the best practice techniques set out in IAQM guidance during the construction phase;
- the use of fast-acting doors to minimise the escape of odorous air during deliveries;
- the use of an extraction system to maintain the reception hall under negative pressure, again minimising the escape of odorous air from the building;
- using the extracted air from the RDF bunker in the combustion process to destroy odorous compounds and bioaerosols that may be present in the air in this building;
- the implementation of an odour management plan to ensure that odour emissions are kept to an absolute minimum;
- continuous monitoring of emissions of several pollutants from the stack, allowing immediate identification of any breaches of the emissions limits;
- periodic monitoring of other pollutants to ensure compliance with emissions limits as part of the environmental permit for the Proposed Development; and
- the introduction of a travel plan to minimise the impact of the scheme on local road traffic flows, and thus air quality. The travel plan will be developed with the Local Planning Authority to develop a routing plan for HGVs.

## 5.6 Cumulative and In-Combination Effects

5.6.1 During consultation with North Warwickshire Council, no requirement to consider cumulative impacts was identified.

## 5.7 Summary

Introduction

5.7.1 The impacts of dust and $PM_{10}$ emissions during the construction phase have been assessed qualitatively following published guidance. The operational impacts of the Proposed Development on air quality, odour and bioaerosol conditions for local receptors have also been assessed. Air quality impacts have been assessed quantitatively using dispersion modelling, while odour impacts have been assessed qualitatively following a risk assessment technique outlined in published guidance. Bioaerosol impacts have been assessed based upon the levels expected to be generated and the likelihood of their being emitted from the proposed facility.

Baseline Conditions

5.7.2 Local monitoring and mapping shows both background and roadside pollutant concentrations to be below the objectives or EALs.

Likely Significant Effects

5.7.3 The odour risk assessment has demonstrated that the odour effects for most local receptors will be negligible, although there is a risk of slight adverse effects at two locations. However, the odour assessment is founded on conservative assumptions, and the overall impact of the Proposed Development is judged to be insignificant.

5.7.4 The qualitative bioaerosol assessment has demonstrated that the Proposed Development will have an insignificant effect on local receptors.

5.7.5 The impacts of road traffic generated by the Proposed Development have been screened out as insignificant, as the predicted volumes of traffic generated by the Proposed Development, including HGVs, are below the screening criteria required for a detailed assessment.

5.7.6 In terms of emissions from the facility's stack, the assessment has demonstrated that there will be an insignificant change to concentrations at all local sensitive receptor locations, for all pollutants, and all averaging periods. For nitrogen dioxide, impacts are predicted to be negligible at all of the worst-case locations assessed.

Mitigation and Enhancement

5.7.7 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emission. With these measures in place, it is expected that any residual effects will be 'not significant'. However, the guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

5.7.8 No additional mitigation has been proposed for the operational impacts as the assessment has demonstrated that none is necessary. The air quality assessment has employed a number of worst-case assumptions, thus impacts are likely to be less than those set out, further re-enforcing that no further mitigation is required.

Conclusion

5.7.9 The assessment has demonstrated that the Proposed Development will not have a significant impact on dust and $PM_{10}$ levels during construction, provided that the recommended mitigation is applied. Similarly, odour and bioaerosol emissions will be kept to a sufficiently low level that the local effects will be insignificant.

5.7.10 The overall operational air quality impacts of the development are judged to be 'not significant'. This judgement takes account of the uncertainties in future predictions of road traffic emissions, and the worst-case assumptions applied in the dispersion modelling assessment.