Viridor

Proposed Development of a Waste Treatment Plant, Lostock Gralam

Air Quality Assessment

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Air Quality Assessment

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CONTENTS

APPENDICES

DRAWINGS

1. INTRODUCTION

1.1.1 Viridor is seeking a planning consent for the development of a Waste Treatment Plant (WTP in Lostock Gralam.

1.1.2 Viridor has commissioned Wardell Armstrong LLP to prepare this air quality impact assessment of the development proposals as an appendix to the Environmental Statement. This report should therefore be read in conjunction with the Environmental Statement (Volume 2) which will be submitted as part of the planning application together with a Supporting Statement (Volume 1) and a Design and Access Statement (Volume 3).

1.1.3 The proposed development considered as part of this planning application is a Waste Treatment Plant (WTP) incorporating Mechanical Biological Treatment (MBT) processes; a HWRC waste treatment facility; a site office and education centre. Chapter 4 of the Environmental Statement (Volume 2) provides a detailed description of the development proposals. Chapter 13 of the Environmental Statement assesses the potential impacts on air quality of the development proposals and considers both the construction and operational phases.

1.1.4 Chapter 13, of the Environmental Statement, also refers to the findings of an assessment of road traffic emissions undertaken using the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 (HA 207/07), Air Quality, May 2007. This assessment is attached to the Environmental Statement as Appendix 13.2 and assesses the potential impact of emissions from vehicle movements to and from the site.

1.1.5 This report provides an assessment of the air quality impacts arising from the proposed WTP facility at Lostock Gralam. It considers in detail the operational phase impacts of the development. It provides information on the existing air quality and local meteorological conditions in the vicinity of the site and describes the mitigation measures that have been incorporated into the design proposals in order to minimise the potential adverse impacts and risk associated with the proposals. The assessment then considers whether adverse air quality impacts are likely to arise and draws conclusions as to whether these are significant.

1.1.6 In summary, this assessment considers the potential effects on air quality from residual sources of odour, particulates, dust and bioaerosols. The main sections of this report are as follows:

Section 2: Technical context

Section 3: Assessment methodology

Section 4: Proposed mitigation

Section 5: Assessment of effects

Section 6: Health Impacts

Section 7: Conclusion

2. TECHNICAL CONTEXT

2.1 Potential Sources of Emissions

2.1.1 At Lostock Gralam the proposed Mechanical Biological Treatment (MBT) process utilises mechanical pre-treatment of residual municipal solid waste to produce a range of recyclates, a component of the final output solid recovered fuel (SRF) and an organic fraction which is dried in the biodrying process. Following completion of the biodrying process the bio-dried fraction is then combined with the previously separated SRF component and component SRF material produced by the HWRC waste treatment facility, to form one homogenous SRF.

The MBT process will involve four main sections. These are:

- The Waste Reception Area
- Mechanical Treatment Area
- Biodrying
- Refining Plant

The HWRC Waste Treatment Facility, comprises two sections:

- The Waste Reception Area
- Mechanical Treatment Area

2.1.2 In addition to the processes taking place in each of these sections, a number of auxiliary functions will take place at the facility, which are relevant to this air quality assessment. They include the biofilters, ventilation system and dust filters (as a means of controlling odour, bioaerosols and dust);

2.1.3 The potential emissions from each of the sections of the waste treatment process are detailed in the following sections of this report. The performance of the biofilters, ventilation system and dust filters are also discussed. The ventilation and odour control systems are part of the mitigation measures proposed at the site and details are included in Section 4 of this report.

2.1.4 Further information regarding the types of emissions which may be generated by the on-site processes is detailed in Sections 2.3 to 2.6 of this report.

2.2 The Waste Treatment Process

Waste Reception Area

2.2.1 In this enclosed area, the waste is delivered by collection vehicles and fed to the plant. There is the potential for the delivered waste to generate odour, bioaerosols, dust and particulates. The approach to minimising and controlling these emissions is set out in Section 4 of this report.

Mechanical Treatment Area

2.2.2 In this area, the mixed waste is subjected to a variety of physical treatments in order to separate fractions of the waste suitable for recycling, energy recovery, disposal and the organic fraction for further biological treatment. There is the potential for odours, bioaerosols, dust and particulates to be generated during the processes taking place in this area. The approach to minimising and controlling these emissions is set out in Section 4.

Biodrying

2.2.3 During the biodrying phase the organic fraction of waste from the mechanical treatment phase is fed into one of thirteen biodrying tunnels, enclosed within the biodrying hall. Air is introduced into the tunnels promoting aerobic conditions and the waste begins to self heat via the action of micro-organisms. It is this self heating which helps to remove moisture whilst also minimising the need for additional heating within the biodrying tunnels.

2.2.4 Each biodrying tunnel will be separately maintained under negative pressure to avoid odour escaping into the biodrying hall. In addition the waste treatment buildings will operate under negative pressure to prevent the escape of air/odour.

Refining Plant

2.2.5 The bio-dried material discharged from the tunnels will be conveyed to the refining plant. The inert element of the material, which will consist of grit, sand and glass, will be removed. These materials are all readily recoverable and suitable for the manufacture of secondary aggregate. The bio-dried organic fraction is suitable for use as a component of SRF and this is combined with an SRF component derived from HWRC waste material to form one homogenous SRF. There will be only a minimal potential for odour and particulates to be generated in this area.

2.3 Odour

2.3.1 Unpleasant odours can have an adverse effect on the environment and the quality of life of individuals and communities. The effects of odours can be a material consideration in the determination of planning applications.

2.3.2 Odorous compounds are derived from biological breakdown of complex organic compounds and from direct volatilisation of organic compounds present within the material being processed.

2.3.3 The commonest odour arising from poorly controlled decomposing organic materials is ammonia (usually described as a pungent, sharp smell). This tends to arise as a result of a low carbon to nitrogen ratio (i.e. where nitrogen is in excess).

2.3.4 Anaerobic conditions can produce compounds including alcohols, esters and sulphur containing compounds such as methanethiol. These have a known potential to cause odour problems. If anaerobic conditions are permitted to become firmly established, concentrations of sulphur containing compounds decrease and dialkylated compounds predominate (e.g. dimethyl sulphide and dimethyl disulphide). Aromatic hydrocarbons, cycloalkenes, alkenes and high molecular weight alkenes can also be formed. However this is an aerobic process and anaerobic zones inside the waste mass could inhibit the biological degradation process. Therefore the biodrying tunnels will be fitted with an automatic filling system to prevent the development of anaerobic zones.

2.4 Bioaerosols

2.4.1 Bioaerosols are airborne microbiological particulate matter derived from fungi, bacteria, viruses, protozoa, algae, pollen, mites and their cellular or cell mass components.

2.4.2 It is normal to find bacteria and fungi in both indoor and outdoor environments. The concentrations of bioaerosols in the outdoor environment at any one time will depend upon the surrounding land uses and the prevailing meteorological conditions.

2.4.3 Levels of bacteria and fungi can be found in concentrations in excess of 1000 colony forming units per m^3 (cfu/m^3) in agricultural and forest environments. For example temporal airborne bacterial concentrations measured above a grass seed field indicated a maximum of 1,370 cfu/m^3 (Lighthart and Shaffer 1995[1]).

[1] B Lighthart and B Shaffer, Airborne Bacteria in the Atmospheric Surface Layer: Temporal Distribution above a Grass Seed Field. Applied and Environmental Microbiology, April 1995 p1492-1496.

Background sources of these high levels of bacteria and fungi include decomposing organic waste such as dead vegetation and manure.

2.4.4 Fungi and bacteria can also be found at high levels indoors, where they are associated with the presence of organic matter (e.g. wood and foodstuff) (IEH 1996)[2]. The outdoor air which enters the property is also one of the major sources of fungi and bacteria in indoor environments, particularly during the summer and autumn (Wanner at al 1993)[3]

2.4.5 Common indoor bioaerosols include fungi and bacteria and concentrations in the indoor environment vary significantly. For example a study undertaken by Hunter et.al (1996)[4] monitored 163 homes for the presence of fungi and bacteria over the period of November 1990 to December 1992. The mean count was 234 cfu/m^3 air of fungi and 366 cfu/m^3 air for bacteria. In a more intensive study of 35 of the houses mean counts were 912 and 818 cfu/m^3 for fungi in living rooms and bedrooms respectively, and 917 and 933 cfu/m^3 for bacteria.

2.4.6 As set out above bioaerosols are present in both indoor and outdoor air. Airborne micro-organisms are inhaled throughout normal everyday life and rarely cause any ill effects, as the body's own defence mechanisms normally provide adequate protection.

2.4.7 Bioaerosols fall into a number of particle size definitions. Viruses and some bacteria are respirable (i.e. they than have a mean diameter less than 4μm and can be deposited in the air sacs of the lungs where gases are exchanged). As such they have a greater potential to become harmful to health than larger fragments.

2.4.8 Bacteria fall partly within the respirable particulate definition, and are normally within the inhalable definition (i.e. particles that have a mean diameter less than 100μm). Inhalable particles are typically deposited anywhere within the respiratory tract, and have lower potential for harm than respirable particles. Fungi are more often found in dust, and are therefore more commonly found in the larger fraction.

2.4.9 Bioaerosols are likely to be formed and released into the atmosphere when any agitation of organic materials takes place, for example during the mechanical shredding and screening of waste before processing in the MBT.

[2] IEH 1996. IEH assessment on indoor air quality in the home. Institute for Environment and Health, Leicester, UK.
[3] Wanner H.U. 1993 Sources of pollutants in indoor air. IARC Scientific Publications 109, 19-30.

2.4.10 In October 2001 the Environment Agency (EA) produced a guidance document on composting operations that includes recommendations for best practice operating procedures and consideration of environmental effects including bioaerosols. No EA guidance has been produced in relation to the processing of waste at MBTs; however elements of the physical treatment are similar to composting.

2.4.11 The EA's 2001 guidance recognises that there are currently no exposure limits defined for airborne micro-organisms. The guidance states that health outcomes are dependent on the individual and therefore their potential effect on individuals is virtually impossible to predict.

2.4.12 The EA's guidance confirms that a review of threshold exposure limits suggested by researchers, funded by the Agency, has indicated that fungi and bacterial levels above 1000 colony forming units (cfu)/m^3 may be appropriate to assess safety issues in the absence of appropriate dose response relationships.

2.5 Particulates and Nuisance Dust

2.5.1 There is the potential for activities at the site to generate both primary fine particles and coarse particles. For waste facilities in general, the M17[5] guidance from the Environment Agency indicates that primary fine particles are directly derived from combustion sources such as road traffic, power generation and industrial process. Coarse particles may comprise emissions from a wide range of abrasion sources including construction works, wind blown dust and soils.

2.5.2 There is the potential for fine particulates to be generated from the loading shovels and road vehicles. The physical handling and processing of the material in the reception hall and mechanical treatment area will also generate some coarse particles, which may become suspended in air.

2.5.3 The size of the particles will influence how far they may potentially travel from the site. The M17 guidance indicates that large particles (>30µm) responsible for most dust annoyance mostly deposit within 100m of the source. Intermediate sized particles (10-30 µm) may travel up to 200-500m. Smaller particles (<10µm) can travel further from the source.

2.5.4 The unloading and handling of waste may potentially result in the generation of dust particles in the range of sizes from 1µm to 75 µm diameter. Vehicle

[4] Hunter CA, Hull AV, Higham DF, Grimes CP, Lea RG, 1996. Fungi and Bacteria In: Berry, RW Brown, VM Coward, SKD et al (Eds). Indoor Air Quality in Homes, the Building Research Establishment, Indoor Environment Study, part 1 Construction Research Communications, London (1996).

[5] M17 Environment Agency – Monitoring of particulate matter in ambient air around waste facilities

movements around the site may also potentially entrain any mud/materials on the floor of the site, up into the air and generate dust.

2.6 Air Pollution Control Measures

2.6.1 The Waste Reception Halls of the MBT and the HWRC waste treatment building will be fitted with fast acting roller shutter doors. These doors will remain closed unless a vehicle requires entry/exit from the halls. When a door of the waste reception halls is opened, the entrance will be shielded by an air curtain to maintain a barrier to fugitive emissions.

2.6.2 The control of dust, odour and bioaerosol levels within the waste treatment buildings will be maintained by a constant change of air provided by the process air treatment system.

2.6.3 The process air treatment system comprises a ventilation system to maintain the building under negative pressure; biofilters, and dust filters. Further information regarding these control measures is included in Section 4 'Proposed Mitigation' of this report.

2.6.4 Treated air from the ventilation system and the biofilters will be emitted via a 27m high stack, located to the south of the biofilters.

3. ASSESSMENT METHODOLOGY

3.1 Consultation and Proposed Scope

3.1.1 A Scoping Report was submitted to Cheshire West and Chester Council on 21st May 2009. A response was provided by the Environmental Health Officer and the following was requested as part of the air quality and odour assessments:

- Consideration be given to the inclusion of a housing development at the former Wade Works Site;
- The air quality assessment should include current air pollution levels around the development site, details of potential sources of air pollutants as a result of the development activities, measurable changes (increase and/or decrease) to air pollution concentrations as a result of development activities, comparison of predicted changes in air pollution concentrations to current air quality standards; details of methodology/guidance used in the assessment of air quality impact and measures to address potential air quality issues where appropriate.

3.1.2 The scope of works included in this assessment is as follows:

Odour

3.1.3 An odour assessment has been carried out. This takes into account the mitigation measures proposed at the site to control odour. The odour levels likely once the site is operational have been predicted using dispersion modelling software. The predicted concentrations have then been compared with criteria outlined in the relevant Environment Agency guidance to determine whether significant adverse effects are likely to occur.

Ammonia

3.1.4 A cumulative assessment of ammonia emissions has been undertaken to consider the emissions from the proposed Bedminster Bio-Energy Plant, which has received planning permissions adjacent to the proposed WTP, as well as the proposed WTP. The information on the potential emissions arising from the approved Bedminster Bio-Energy Plant has been taken from the air quality assessment[6] submitted as part of the planning application in December 2007. A cumulative assessment of odour has not been undertaken as it was not

[6] Planning Application Air Quality Assessment for Bedminster International, Lostock Works, Northwich. Smith Grant LLP Environmental Consultancy. December 2007.

considered necessary for the Bedminster application to carry out an odour assessment and therefore no information is available as to potential odour emissions arising from this facility.

3.1.5 The ammonia levels likely once the site is operational have been predicted using dispersion modelling software.

Bioaerosols

3.1.6 In view of the comprehensive abatement and controls of bioaerosols proposed at the site a qualitative assessment was carried out. This assessment includes detailed consideration of the proposed mitigation measures and controls. Further information regarding control of bioaerosols will be included with the Environmental Permit Application.

Dust and Particulates

3.1.7 The potential release of dust from the site has been assessed qualitatively and information has been provided regarding the proposed dust control measures at the site.

3.1.8 The significance criteria used for assessing the potential magnitude of particulate and dust impacts are included in Table 13.1:

Table 13.1. Methodology for Assessing Magnitude of Particulate and Dust Impact

Magnitude of Impact	Criteria for Impact Magnitude
Substantial	Substantial impact; issue justifies consideration as a determining factor in granting planning permission. Significant release of dust from the site. Reduction in visibility and rapid accumulation of dust on clean surfaces. Possible acute health effects on people with existing respiratory and/or cardiovascular disorders.
Moderate	Moderate impact; issue justifies consideration as a determining factor in granting planning permission. Visible release of dust from the site. No significant loss of visibility, but steady accumulation of dust observed on clean surfaces. Health effects are very unlikely.

Table 13.1. Methodology for Assessing Magnitude of Particulate and Dust Impact	
Magnitude of Impact	**Criteria for Impact Magnitude**
Minor	Minor impact; issue need not be considered as a determining factor in granting planning permission. Air-borne dust occasionally visible over the site area. Slow accumulation of dust observed on clean surfaces, but not significantly quicker than on similar surfaces remote from, or upwind of, site activities. In comparison it would be similar to normal dust accumulation over the summer. No health effects associated with dust emission.
Negligible	Negligible impact; issue need not be considered as a determining factor in granting planning permission. Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Potentially Sensitive Receptor Locations

3.1.9 The site is located in Lostock Gralam, which is located to the east of Northwich. There are existing residential properties to the north of the site, along Manchester Road, as well as to the south and west. The A559 Manchester Road lies to the north of the site and the A530 lies to the east.

3.1.10 The nearest residential property to the site is located approximately 185m to the north of the site boundary. Residential land uses are also proposed to the south west of the site approximately 240m from the site boundary.

3.1.11 A number of representative, potentially sensitive locations have been included in the assessment. The sensitive locations are set out in Table 13.2 and Drawing Number LE10104/EIA020A.

Table 13.2 Sensitive Locations included in the Dispersion Modelling Exercise					
Receptor	**Location**		**Bearing from Site**	**Approximate Distance from Site**	**Address**
	Easting	**Northing**			
1	368300	374430	NE	310m	Youth Club
2	368199	374531	NE	300m	3 Works Lane
3	368384	374544	NE	450m	Grove Cottage
4	368318	374602	NE	430m	190 Manchester Road
5	368338	374661	NE	488m	353a Manchester Road
6	368251	374612	NE	395m	323 Manchester Road

7	368070	374615	N	315m	21 Victoria Street
8	368015	374533	N	220m	241 Manchester Road
9	367932	374486	N	187m	217 Manchester Road
10	367638	373998	W	210m	Proposed residential area
11	367667	373724	SW	400m	Proposed residential area
12	367757	373587	S	510m	Proposed residential area
13	368058	373571	S	545m	20 St. John's Close
14	367451	373741	SW	515m	38 James Street
15	368976	375083	NE	1240m	11 St. John's Avenue
16	368549	374181	E	475m	Griffiths Road
17	367664	374400	NW	240m	2 Ann Street

Significance Criteria

3.1.12 The significance of an air quality impact was determined by considering the magnitude of the impact together with the sensitivity of the location as shown in Table 13.3.

Table 13.3 Methodology for Determining Sensitivity

Sensitivity	Examples
High	The location has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Moderate	The location has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The location is tolerant of change without detriment to its character, is of low or local importance.

3.1.13 The receptor locations considered in this air quality assessment are residential in nature. These are considered to be moderately sensitive. Premises such as hospitals and nursing homes would be identified as highly sensitive; however no premises of this type were identified in the area surrounding the site.

3.1.14 The significance of an impact for odour, bioaerosols, particulates and dust emissions is determined by the interaction of magnitude and sensitivity. The Impact Significance Matrix used in this assessment is set out in Table 13.4.

Table 13.4 Impact Significance Matrix			
Magnitude	**Sensitivity**		
	High	**Moderate**	**Low**
Substantial	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial
Moderate	Major - Moderate Adverse/Beneficial	Moderate – Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

4. PROPOSED MITIGATION

4.1 The Plant Design

4.1.1 The design of the Waste Treatment Plant is such that waste is fully enclosed for the duration of the process between initial discharge and product loading.

4.1.2 Where there is the potential for odour to arise, the air from the activity will be air-extract ventilated to the biofilters prior to release. This system will control fugitive releases of odours and bioaerosols. It will also provide a safe working environment for the plant operators.

4.2 Odour and Bioaerosol Control

4.2.1 At the proposed facility, bioaerosols and odour will be minimised as the waste will be fully enclosed except at the initial discharge point in the waste reception area and the product loading point at the refining plant.

4.2.2 To control odour and bioaerosols within the waste treatment plant, the entire waste reception and processing area will be fully air–extract ventilated to treatment by the biofilters. The doors of the waste reception area will be kept closed at all times other than when the vehicles need to enter and leave.

4.2.3 At the biodrying tunnels and refinement plant the waste will be fully enclosed. Therefore the potential for the generation of bioaerosols is very low and any that are generated will be extracted with the ventilation air.

4.2.4 Within the MBT building the waste from the HWRC waste treatment plant is combined with the SRF and loaded into containers. The potential for odours generated from the containers is minimal as they will be sealed prior to removal from the building where they will be loaded onto freight trains for transport to Runcorn.

4.2.5 The following parts of the installation will be equipped with ventilation systems or source extraction:

- Waste reception area
- Mechanical treatment area
- Biodrying tunnels
- Refinement plant

4.2.6 All extracted air will be treated by the biofilters prior to release to air via the 27m high stack.

4.2.7 Any areas of the plant, where potentially odorous air may develop, will be extracted and the air ducted to treatment. The process air from the plant ventilation system will be cleaned of odour, dust and bioaerosols by the dust filters and biofilters.

The Proposed Air Pollution Control Measures

4.2.8 The proposed air pollution control measures will comprise:

- An air ventilation system to extract air from the waste reception and processing halls. The system will create negative pressure in these halls reducing the potential for fugitive emissions;
- Dust filters to remove dust from the air extracted from the buildings;
- Biofilters used to remove odours prior to the release of air from the stack.

4.2.9 The proposed biofilters will use a biomass material (woodchips) which will have a high surface area to act as a settlement area for the micro-organisms. The biofilters work through the action of micro-organisms which colonise the biomass within the biofilter chambers. The odour present in the air will initially be adsorbed by the biofilter material and then metabolised by the micro-organisms. the duration of the process between initial discharge and product loading.

4.2.10 The biofilters will be enclosed and the process air which passes through the biofilters will then be vented to atmosphere via a stack. The use of an enclosed biofilter system and stack will enable the parameters of the air quality to be controlled and monitored prior to release from the plant.

4.3 Measures to Mitigate Dust and Particulates

4.3.1 Dust from the reception hall area, mechanical treatment area and biodrying tunnels is unlikely to be generated in any significant quantity. The delivered waste will be unloaded promptly within the enclosed building. From this point until the final products are removed the materials are contained within the building so dust will be completely controlled. Therefore dust can only arise within enclosed buildings where it will be controlled by good housekeeping and air extraction.

4.3.2 In addition to the biofilter, dust filters will be installed at the site to filter air from the reception hall, mechanical treatment area and the biodrying tunnels. Once the air has been filtered, it will travel to the biofilter and then be released to the atmosphere via the proposed 27m high stack.

4.3.3 The plant e.g. loading shovels will emit particulates; however plant will undergo routine maintenance to minimise potential emissions.

4.3.4 Measures will be implemented at the site to ensure that all areas are kept clear of dust. These include:

- The site will be hard surfaced on all operational areas.
- All materials outside the waste treatment plant buildings will be suitably contained whilst on site and during their removal.
- The site will be kept clean by manual and mechanical sweeping as appropriate.

4.4 Summary of Effectiveness of Mitigation

4.4.1 The mitigation measures to be implemented at the Lostock Gralam WTP site may be categorised by their effectiveness. The following basis has been used:

- High certainty of being effective: The measure can reasonably be expected to be effective in avoiding or reducing the potential effect.
- Uncertainty of effectiveness: The measure cannot reasonably be expected to be effective and should not therefore influence the assessment of the effect. However the measure has been incorporated into the design of the scheme on the basis that, despite its potential ineffectiveness, it is worthwhile;
- No mitigation proposed: This may be because the effect is a positive one or that no means of mitigating the effect has been identified.

4.4.2 Due to the effectiveness of the mitigation measures which include the ventilation system, dust filters, biofilters, 27m high stack and general operational procedures (e.g. odour generating processes being carried out inside air extracted buildings) it is considered that the likely effectiveness of the mitigation measures at the site will be High.

4.4.3 The 27m stack height is specified to allow the dispersion of the emissions to ensure that ground level concentrations are within acceptable limits.

4.4.4 Other measures that will be incorporated into the proposals at the site include a proactive site management and general housekeeping maintenance measures, for example ensuring all external doors remain shut in order to prevent unabated release of bioaerosols or odour. Site staff will be trained in matters relating to risk of odours and other amenity impacts, and will implement a range of measures to mitigate any emissions as required.

4.4.5 The measures proposed to control emissions at the Lostock Gralam WTP will provide a high level of protection for local residents and the local environment. The potential effects of the emissions likely to be generated at the site has been assessed taking into account these proposed mitigation measures.

5. ASSESSMENT OF EFFECTS

5.1 Introduction

5.1.1 This section of the report details the air dispersion modelling undertaken to assess the potential significance of emissions of ammonia and odour from the biofilters.

5.1.2 The potential effects of bioaerosols, dust and particulates likely to be generated at the site are also considered against relevant significance criteria.

Air Dispersion Modelling

5.1.3 The emissions to atmosphere have been modelled using AERMOD (Lakes Environmental model Version 6.0). This is a proprietary quantitative air dispersion model which is based upon the Gaussian theory of plume dispersion. The model uses all input data, including the characteristics of the release (rate, temperature, velocity, height, location etc.), the terrain, meteorological data and the locations of the buildings adjacent to the proposed emission point to predict the concentration of the substance of interest at a specified point.

5.1.4 The model uses sequential hourly meteorological data and the locations of the buildings to predict the concentration of each substance at each point for each hour over the course of a year. This allows the long-term mean and short-term peak ground level concentrations to be estimated over the modelled area as required. The dispersion modelling has been carried out in accordance with Environment Agency guidance[7].

5.2 Assessing the Significance of Modelled Concentrations

Odour Predictions

5.2.1 The predicted odour levels have been assessed with reference to the Environment Agency's H4[8] IPPC guidance document. The H4 guidance indicates that when considering the potential for annoyance not all odours have the same potential. The activities at the site will involve the processing of putrescible waste. This is identified as a more offensive odour in H4, i.e. it falls into the High Offensiveness category.

5.2.2 The indicative criterion for the assessment of high offensiveness category of odours is 1.5 ou_E /m^3 (1 hour 98^{th} percentile). Predicted concentrations of

[7] Environment Agency (EA) Air Dispersion Modelling Requirements
[8] Environment Agency 2002, IPPC H4 Draft Guidance for Odour Part 1 Regulation and Permitting

$1.5ou_E/m^3$ (1 hour 98^{th} percentile) or more are therefore considered potentially significant in this assessment.

5.2.3 The odour source included in the model is the air collected from the reception hall, mechanical treatment area, and biodrying tunnels. This air is transported to the biofilters for treatment before release from the proposed 27 metre high stack.

Ammonia Predictions

5.2.4 This air quality assessment has been prepared to support a planning application rather than an Environmental Permit; however it is considered appropriate to assess the predicted ammonia concentrations taking into account IPPC H1[9].

5.2.5 The AERMOD model produces computed concentrations that are the Process Contribution (PC). These can be added to the ambient background concentrations to give a total Predicted Environmental Concentration (PEC) at each assessment location. The PC and PEC values can then be compared against the relevant Air Quality Objectives (AQOs) and the likelihood of exceedance determined.

5.3 Study Inputs

Meteorology

5.3.1 Five years of hourly sequential data (2004 to 2008) was obtained for the Manchester Woodford meteorological station. This is the closest suitable meteorological station to the proposed site.

Terrain

5.3.2 The site and surrounding area do not experience sustained gradients of 1 in 10 or greater. In view of this, the terrain surrounding the site will not significantly affect the dispersion of pollutants from the site; however x.y.z data has been used for the surrounding terrain and proposed slab level data for the site has also been included when identifying the ground heights of on-site buildings and sources of emissions.

Surface Characteristics

5.3.3 The predominant characteristics of land use in an area provides a measure of the vertical mixing and dilution that takes place in the atmosphere due to factors such as surface roughness and albedo.

5.3.4 Examination of the local setting has shown that the area surrounding the site is a mixture of commercial/industrial buildings and residential areas. However there

[9] Environment Agency 2001

are also large open areas located to the south of the site in the form of Griffiths Park.

5.3.5 Buildings can have a significant influence on the behaviour of the local airflow and “downwash” can occur, where an emission plume can be drawn down in the vicinity of buildings. There will be buildings in close proximity to the sources of the emissions; therefore building effects have been included in the modelling carried out for this report.

Emission Parameters – Odour

5.3.6 Air from the reception hall, mechanical treatment area and biodrying tunnels will be treated by the biofilters prior to release from the 27m high stack. Air dispersion modelling has been carried out to assess the fugitive odour emissions from the proposed stack.

5.3.7 The air from the biofilters will be released to atmosphere from the biofilter stack located to the south of the biofilters. Over a 24 hour period the volume of air leaving the stack may vary. Therefore a worst case scenario has been modelled using the maximum flow rate exiting the stack.

5.3.8 At this stage it has not been possible to determine precisely what the residual odour concentration would be. However, the manufacturers of the MBT plant have confirmed that the maximum residual odour concentration from the biofilter system should be no more than 1000 ou_E/m^3. The odour modelling therefore considers an odour emission rate derived from this concentration.

5.3.9 The operating temperature of the biofilters may vary depending on season and operating conditions. Changing temperature may influence the pollutant emission rates. Therefore a temperature range has been modelled to illustrate emission concentrations at a minimum (293°K) and maximum (313°K) temperatures.

5.3.10 The model parameters included in the model are shown in Table 13.5. The emission rates are shown in Table 13.6.

Table 13.5: Model Parameters – Odour	
Parameter	
Flue location	367914.8, 374105.9
Flue height	27m
Flue diameter	1.8m
Scenario 1 (minimum temperature range)	
Gas Flow at exit m^3/s (Actual)	33.33
Efflux velocity m/s	13.09
Gas flow temperature °K	293
Scenario 2 (maximum temperature range)	
Gas Flow at exit m^3/s (Actual)	33.33

Efflux velocity m/s	13.09
Gas flow temperature °K	313

Table 13.6: Emission Rates modelled from the Stack - Odour		
Odour concentration	**Emission Temperature**	**Odour Emission Rate**
1000 ou_E/m^3	293°K	31060ou/s
1000 ou_E/m^3	313°K	29070ou/s

Emission Parameters – Ammonia

5.3.11 The model parameters for the proposed WTP are shown in Table 13.5. The emission rates for the proposed WTP included in the model are shown in Table 13.7. The model parameters and emission rates for the approved Bedminster bio-energy plant, taken from the air quality assessment submitted as part of the December 2007 planning application, are shown in Table 13.8.

Table 13.7: Emission Rates modelled from the Stack - Odour		
Ammonia concentration	**Emission Temperature**	**Ammonia Emission Rate**
$15mg/m^3$	293°K	0.466g/s
$15mg/m^3$	313°K	0.436g/s

Table 13.8: Model Parameters – Bedminster Bio-Energy Plant	
Parameter	
Stack location	367754, 374199
Stack height	20m
Stack diameter	1.1m
Gas Flow at exit m^3/s (Actual)	16.03
Efflux velocity m/s	16.87
Gas flow temperature °K	503
NH_3 Emission Limit Value (mgm^3)	10
NH_3 Emission Rate (g/s)	0.12

Treatment of Buildings and Site Plan

5.3.12 The buildings/structure included in the dispersion model are summarised in Table 13.9.

Table 13.9: Buildings/Structures included in the Dispersion Model		
Building	**Height**	**Grid Ref of South Western Corner**
Mechanical separation and process building	17.35m	367838, 374153
Waste reception hall	18.6m	367957, 374174
Biodrying tunnels	14m	367859, 374112
HWRC waste treatment plant	13.6m	367951, 374108
Office/educational building	9.9m	368011, 374230
Biofilters	8.6m	367875, 374098
Bedminster Facility	14m	367659, 374117

5.4 Predicted Effects and their Significance

Odour

5.4.1 The odour emissions from the biofilters were modelled using AERMOD and the modelled concentrations (as 1 hour 98th percentile concentrations) for each of the modelled receptors are included in Appendix A. The maximum modelled concentration is shown in Table 13.10.

Table 13.10: Maximum Modelled Odour Concentrations			
	Temperature	**Maximum Modelled Receptor Concentration**	**Maximum Modelled Site Fenceline Boundary Concentration**
Modelled residual odour concentration 1000 ou_E/m^3	293°K	0.49	1.35
	313°K	0.37	1.06

5.4.2 The dispersion modelling indicates that the modelled 98th percentile odour concentrations (for a 1 hour averaging time) will comply with the indicative criteria of 1.5ou/m^3 at the site boundary. All sensitive receptor locations modelled show an odour concentration of less than 1.0ou/m^3. On this basis, the controls on emissions from the biofilters are forecast to ensure that any residual odour is not significant and is predicted to give no reasonable cause for annoyance due to odour.

Ammonia

5.4.3 The modelled process concentrations of ammonia due to emissions from the biofilter stack and the Bedminster bio-energy plant are shown in Appendix A.

5.4.4 No background concentrations of ammonia are available. Therefore predicted environmental concentrations cannot be calculated. The process contributions (PC) and PC concentrations as a percentage of the relevant environmental limit values (EAL) have been determined for each receptor. The results are shown in Appendix A and the highest concentrations/percentages are summarised in Table 13.11:

Table 13.11: Maximum Modelled Concentrations			
Temperature	**Substance**	**PC**	**PC/EAL**
293°K	NH_3 Annual Mean (µg/m^3)	0.91	0.50%
293°K	NH_3 1 Hour (µg/m^3)	27.66	1.11%
313°K	NH_3 Annual Mean (µg/m^3)	0.71	0.40%
313°K	NH_3 1 Hour (µg/m^3)	16.53	0.66%

5.4.5 The pollutant concentrations shown in Annex A have been compared against the Environmental Limit Values as shown in Table 13.12.

Table 13.12 – Environmental Limit Values, Horizontal Guidance Note H1: Environmental Assessment and Appraisal of BAT, Appendix D, Environmental Benchmarks, Air.		
Pollutant	**Long Term EAL (µgm^{-3})**	**Short Term EAL (µgm^{-3})**
NH_3	180	2500

5.4.6 The results confirm that the PC concentrations do not exceed the relevant environmental limit values. On this basis it is therefore considered that the 27m high stack proposed at the site will be sufficient to aid the dispersion of NH_3 and no further mitigation will be required.

Bioaerosols

5.4.7 With regards to the bioaerosols generated at the site the mitigation measures detailed in section 4 of this report will be implemented to ensure that any potential emissions of bioaerosols are controlled and treated appropriately prior to release from the proposed stack.

5.4.8 The operating systems and biofilters have been designed to ensure that adequate bioaerosol control is provided. With the implementation of these control measures the potential impact of bioaerosols generated at the site is forecast to be negligible and no sensitive location close to the site will experience a significant impact.

Dust and Particulates

5.4.9 The ventilation system and dust filters will be implemented to ensure that any emissions of dust and particulates are contained within the building and process areas and that any dust/particulates are removed prior to air being released to atmosphere via the stack. These control measures will ensure that no significant impact occurs.

5.4.10 Any dust which may be generated outside the building will be mitigated by routine manual and mechanical sweeping as appropriate.

5.4.11 Taking into consideration the measures that will be implemented at the site it is anticipated that the magnitude of impact will be negligible in accordance with the criteria set out in Table 13.1.

5.4.12 To summarise, the magnitude of the potential impact of dust and particulates generated at the site will be negligible and any receptors surrounding the site will therefore experience a negligible impact.

6. HEALTH IMPACTS

6.1 Literature Review

6.1.1 The health effects of waste management facilities were reviewed in a report carried out for Defra[10]. This study found no published information specifically relating to the health effects of MBT processes. This reflects the relatively new status of MBT as a waste management technology, compared to other waste treatment and disposal techniques.

6.1.2 The processes involved in an MBT facility are likely to be comparable to those for an in-vessel composting facility. Similar approaches are taken to treatment of waste and control of releases of substances such as particulate matter, volatile organic compounds and bioaerosols. Composting facilities can affect the health of the workforce, and these potential impacts need to be properly controlled. There is limited evidence that large-scale open windrow composting processes could give rise to an increase in respiratory/irritative symptoms or disease such as bronchitis in people living close to such processes. The controls which can be applied to in-vessel systems mean that in-vessel composting and MBT processes are much less likely to give rise to respiratory or irritative symptoms for local people.

6.1.3 Hence, the evidence available indicates that MBT processes are not likely to give rise to significant adverse health effects for local residents.

6.1.4 This finding is supported by a Health and Safety Executive review of the health issues associated with composting facilities[11]. The HSE supported the Environment Agency's view that a site-specific risk assessment is needed in relation to premises located within 250 metres of an open composting facility. The HSE noted the variability and uncertainty in exposure to bioaerosols released from open composting facilities. Much of this uncertainty and variability is removed with an in-vessel system such as the proposed MBT process.

[10] Defra, "Review of Health and Environmental Effects of Waste Management Options, Phase 1:MSW and similar waste," Enviros Consulting Ltd, University of Birmingham and others, 2004, available from www.defra.gov.uk/environment/waste.

[11] Health and Safety Executive, "Occupational and environmental exposure to bioaerosols from composts and potential health effects – A critical review of published data, "J R M Swan, A Kelsey, B Crook and E J Gilbert, Research Report RR130, 2003.

6.2 Health Risk Assessment

6.2.1 In view of the proximity of residents to the proposed Lostock Gralam WTP, a site-specific assessment of potential risks to health has been carried out.

Control of micro-organisms

6.2.2 As set out above, releases of bioaerosols will be minimised by enclosing the process from the initial discharge point in the waste reception area up to the final refining plant stage. The biological activity of the final product stage is much lower than at the preceding stages in the process, and the material will remain enclosed up to and including the loading of the material for dispatch from the site.

6.2.3 The waste reception area will allow for the waste to be deposited within an enclosed building. All parts of the process, including the waste reception, treatment area and biodrying tunnels, will be enclosed and air will be extracted and passed through the dust filters and treated by the biofilters prior to air being vented to atmosphere via the 27m high stack. These mitigation measures will minimise the risk of fugitive releases of micro-organisms and the discharge conditions specified will give sufficient dispersion of any residual micro-organisms. This will be designed such that local people are not exposed to any significant increase in the levels of exposure to micro-organisms which are normally experienced in an urban environment.

6.2.4 On the basis of this information, it is concluded that adequate control of micro-organisms is available. The predicted levels of exposure would not be expected to give rise to significant adverse effects on health. This is consistent with the indications of the available evidence in relation to the potential health effects of MBT processes.

7. CONCLUSIONS

7.1 Odour

7.1.1 With regards to the odour generated at the site the mitigation measures detailed in section 4 of this report will be implemented to ensure that any potential emissions of odour are controlled and treated appropriately prior to release from the proposed stack.

7.1.2 Dispersion modelling was undertaken to assess the odour concentrations at receptor locations surrounding the site due to residual emissions from the stack. The model considered a residual concentration of 1000 ou_E/m^3.

7.1.3 The dispersion modelling indicates that the modelled 98^{th} percentile odour concentrations (for a 1 hour averaging time) will comply with the H4 indicative criterion of 1.5 ou_E/m^3. On this basis, the controls on emissions from the biofilter are predicted to ensure that any residual odour is not significant and is forecast to give no reasonable cause for annoyance due to the odour.

7.2 Ammonia

7.2.1 Dispersion modelling was undertaken to provide a cumulative assessment to consider ammonia emissions from the proposed WTP and the adjacent Bedminster Bio-Energy Plant.

7.2.2 The dispersion modelling indicates that both the short term and long term environmental assessment limit values for ammonia are not exceeded at any of the receptor locations considered. On this basis it is considered that the 27m high stack proposed at the site will be sufficient to aid the dispersion of NH_3 and no further mitigation will be required.

7.2 Bioaerosols

7.2.1 With regards to the bioaerosols generated at the site, the mitigation measures detailed in Section 4 of this report will be implemented to ensure that any potential emissions of bioaerosols are controlled and treated appropriately prior to release from the proposed stack.

7.2.2 The operating processes, dust filters and biofilters have been designed to ensure that adequate bioaerosol control is provided. With the implementation of these control measures the potential impact of bioaerosols generated at the site is forecast to be negligible and no sensitive location close to the site will experience a significant impact.

7.3 Dust and Particulates

7.3.1 The ventilation system and dust filters will be implemented to ensure that any emissions of dust and particulates are contained within the building and process areas and that any dust/particulates are removed prior to air being released to atmosphere via the stack. These control measures will ensure that no significant impact occurs.

7.3.2 Any dust which may be generated outside the building will be mitigated by routine manual and mechanical sweeping as appropriate.

7.3.3 Taking into consideration the measures that will be implemented at the site it is anticipated that the magnitude of impact will be negligible in accordance with the criteria set out in Table 13.1.

7.3.4 To summarise, the magnitude of the potential impact of dust and particulates generated at the site will be negligible and any receptors surrounding the site will therefore experience a negligible impact.

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